

COIMBATORE CANES IN CULTIVATION

Their morphological descriptions and
agricultural characteristics

by

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INDIA, NEW DELHI.

December 2, 1955.

FOREWORD.

During the four decades that have preceded, the improved hybrid varieties of sugarcane evolved at the Sugarcane Breeding Institute, Coimbatore, and popularly known as Coimbatore varieties have almost replaced the low-yielding indigenous varieties and greatly contributed to the stabilisation of our sugar industry. In India today we have no less than 40 improved varieties of sugarcane in cultivation in different regions. These varieties possess distinct morphological and agricultural characters and have been bred to suit varying soils and climatic conditions.

The first edition of 'Coimbatore Canes in Cultivation' was published in 1950 and covered the botanical descriptions and agricultural characteristics of 25 varieties of sugarcane which were then in commercial use. That edition made available to the sugarcane workers and sugarcane growers a descriptive account of the varieties so that they may be correctly identified in the field and the seed material may be kept pure. The cultivator benefited through the right selection of sugarcane which would best respond to the local conditions of soil and climate. The response given to the first edition has encouraged the authors to go in for the second edition which has been revised and enlarged with additional detailed information for 14 more varieties which have since been brought into cultivation.

I hope that the second edition will serve the needs of the sugarcane research workers and progressive cane growers. It would be a useful thing to translate this book into regional languages so that the useful information contained may reach the cultivator in the language which, he knows.

Ajit Prasad Jain

(Ajit Prasad Jain)

COIMBATORE CANES IN CULTIVATION

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P R E F A C E

This second edition of the publication is being brought out to meet the continuous demand. Since the publication of the first edition, the varietal position has changed in a few areas and the changes have been indicated under the descriptions of the respective canes. Six new Co. varieties have now been added to the twenty-five already described and illustrated. It was felt that certain other canes bred by the sister stations at Pusa (Bihar) and Hebbal (Mysore), and which have also been adopted in cultivation might usefully be included in this publication. They have accordingly been added with full morphological descriptions and agricultural characteristics as also paintings and line drawings. These are B.O. 10, B.O.11, B.O.21, B.O.22 and B.O.24 and H.M.320, H.M.645 and H.M.661. Because of the inclusion of the above-mentioned 8 varieties which are not Co. canes the title of the publication should have been suitably modified, but since the publication has become popular in its original name, *viz.* "Coimbatore Canes in Cultivation " and as even now, the majority of the canes described conic under Co. canes, it was decided after careful consideration that for the purposes of the present revised edition the old title may be retained.

A new feature in this edition is that an attempt has been made to give in brief the stem epidermal pattern of the varieties and a separate key covering the epidermal pattern has been included. In this key all the 39 canes as also 7 others which were described in the previous publications from Coimbatore, *viz.* Co.205, Co.210, Co.213, Co.214, Co.223, Co.281 and Co.290 have been included. It is hoped that this additional information will be useful as an aid to the separation and identification of varieties.

A. revised map showing the area under sugarcane varieties for the year 1952-53 is attached to the publication.

In the recording of the agricultural characteristics of the new fourteen varieties, the help of (1) Shri K. L. Khanna, Director, Sugarcane Research and Development, Sugarcane Research Station, Pusa, Bihar; (2) Shri S. Harbans Singh, Sugarcane Botanist and Cane Commissioner, Sugarcane Research Station, Jullundur, Punjab (I) ; (3) Shri B. Venkoba Rao, Economic Botanist, Department of Agriculture, Mysore; and (4) Dr. R. K. Tandon, Director, Sugarcane Research, Shahjahanpur, Uttar Pradesh, is gratefully acknowledged.

The chromosome numbers of most of the varieties have now been given. These were determined by the Second Cane Breeding Officer at this Institute, Dr. T. S. Raghavan. The authors are indebted to the Botanist, Shri R. R. Panje and the Senior Botany Assistant Shri S. A. Hussainy for carefully going through the manuscript.

SUGARCANE BREEDING INSTITUTE
COIMBATORE

27th November, 1955.

N, L. D.

J.

T. R.

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I. INTRODUCTION

The descriptions of the Coimbatore (Co.) canes that have been adopted in commercial cultivation in India during the past two decades are long overdue. The last publication was by Venkatraman and Thomas (1931) when Co.281 and Co.290 were described. Previous to that there was only one publication describing Co.205, Co.2K), Co.213, Co.214 and Co.223 (Venkatraman and Rao, 1928). There have thus been so far only two publications describing a total of seven Co. canes.

In the present publication, the following canes which are being grown in the various cane growing tracts of India have been described and illustrated : (1) Co.244, (2) Co.285, (3) Co.301, (4) Co.312, (5) Co.313, (6) Co.331, (7) Co.349, (8) Co.356, (9) Co.370, (10) Co.385, (11) Co.393, (12) Co.395, (13) Co.419, (14) Co.421, (15) Co.449, (16) Co.453, (17) Co.508, (18) Co.513, (19) Co.527 and (20) Co.K.32.

A botanical description in not too technical a language is a necessity to sugarcane workers to enable them to identify the varieties in the field. Along with this description, an enumeration of the agricultural characteristics will also be of help to cane growers. Such a description, to be of value, should be available to the cane worker as also to the cane grower as soon as it is known that the variety after being tested at the Research Stations is worthy of being adopted into general cultivation. It is on this ground that it is regretted that the descriptions given in this publication were not published earlier.

The senior author of the present publication has had under contemplation the publication of these descriptions ever since he took over charge at Coimbatore in 1942. In the meanwhile the Indian Central Sugarcane Committee in its fifth meeting held on the 31st October, 1946, desired that a bulletin in popular language be prepared describing for the use of the educated cane grower the canes evolved at the Coimbatore Station. A tour to the important cane growing tracts and the Provincial Research Stations was accordingly undertaken by the Coimbatore staff during 1947 and 1948 for describing the canes and recording line drawings, paintings and photographs on the spot. It is hoped that the descriptions and other details given here will be helpful to those for whom they are intended.

All the varieties that have been described here are such as have established themselves with the cane growers on a bulk scale and are the main commercial varieties in their respective tracts. Co.467 and Co.475 have also been included as they have come out successful in the varietal trials and have recently been released to the cultivators. Co.L.9 has been included at the instance of the Sugarcane Botanist, Jullundur, East Punjab. Co.S.109 and Co.S.245 have been included at the suggestion of the Director, Sugarcane Research, Shahjahanpur, United Provinces. Owing to the inclusion of Co.S.109 at a rather late hour when the bulletin was almost complete, its coloured plate and drawing have had to be recorded from the cane plots at Coimbatore.

In the recording of agricultural characteristics and in certain cases of milling characteristics, the help of (1) Dr. B. K. Mukerji, Director, Sugarcane Research, Shahjahanpur (Uttar Pradesh); (2) Shri K. L. Khanna, Sugarcane Specialist, Sugarcane Research Station, Pusa (Bihar); and (3) the officers in charge of the other Sugarcane Research Stations is gratefully

acknowledged. Mr. S. A. Hussainy, who was the Superintendent at the Sugarcane Sub-Station, Karnal and is now at Coimbatore, has helped in checking up the descriptions. Thanks are also due to Dr. R. S. Vasudeva, Head of the Division of Mycology, I.A.R.I., New Delhi, for information regarding the behaviour of the varieties to diseases.

II. SCOPE OF THE DESCRIPTIONS

The main object of the bulletin is to provide to the educated cane grower the means for identifying the sugarcane varieties that have been described. An attempt has been made to keep the technical terms at a minimum. A system of scientific description of sugarcane was first developed at Coimbatore by Barber (1915). Later appeared the publications of Cowgill (1917) and Jeswiet (1918) on the identification and description of sugarcane varieties. Jeswiet developed a detailed hair group method of identification. Very good descriptions of sugarcane are also to be found in Noel Deerr's book on 'Cane Sugar' (Deerr, 1921) and in Earle's 'Sugarcane and Its Culture' (Earle, 1928). Artschwager (1940) has recently described in detail the morphology of the vegetative organs of sugarcane.

The terms used in the present publication are those employed by Barber in his descriptions, though a free use has also been made of the terms employed by other authors. The publications of Panje (1933), Rosenfeld (1927) and Venkatraman (1927, 1928 and 1931) have also been freely consulted.

Though it is felt that certain floral characters would be very useful as reliable criteria for distinguishing varieties (Dutt, 1939), it is realised that it is not all sugarcane varieties that flower regularly and in all places, and reliance will therefore largely have to be placed on vegetative characters. Another tool in the hands of an experienced botanist would be the cytological behaviour of the varieties and their chromosome numbers (Bremer, 1923, 1924, 1925 ; Dutt and Rao, 1933), but in a popular description the details regarding the chromosome numbers are perhaps better omitted. It is hoped, however, that in future the descriptions of sugarcane varieties will contain not only a mention of the floral characteristics and cytological details (at least the chromosome numbers) but also anatomical details like the density and size of vascular bundles in the peripheral region of stem, arrangement of bundles in the leaf blade and the epidermal patterns of stem and leaf, all of which have been so well set out in Artschwager's paper.

The coloured plates in this publication were painted from fresh canes cut on the spot and in the localities where the cane was at about its best. These plates have been reduced to about 2/3 natural size. The line drawings were, except those of the bud and the cane top, drawn to natural size, but have been reduced to about 1/2 in reproduction. Photographs of buds have been given in Plate II and should be of help in identification. They are slightly more than the natural size. The root systems given in Plate XX are of the eight months' crop at Coimbatore.

For quick identification a key has been included and in this key the seven canes which were described in the previous publications from Coimbatore, *viz.*, Co.205, Co.210, Co.213, Co.214, Co.223, Co.281 and Co.290, have also been included. As a further help, a comparative table is also given with the object of indicating at a glance most of the important characters. These have been adopted from Hole's excellent memoir on 'Some Indian Forest Grasses' (Hole, 1911).

One recognises a sugarcane variety more or less as one brings back to memory or recollects the features of a friend or an acquaintance and therefore what is more necessary as an aid to identification is a familiarity with the cane as grown in the field. The coloured plates of the canes will help to recall even to the layman the main features of the variety provided he has observed it keenly in the field. Detailed characters like the hair bud groups, floral characters or anatomical details have no doubt their own uses for the technical man in tracing out varieties somewhat like the finger-prints and anthropometrical measurements kept by the Criminal Investigation Department for establishing the identity of individuals. For the educated cane grower, however, broad details correctly described are enough, and as Noel Deerr so aptly remarks "familiarity with the cane growing in the field in combination with coloured drawings made by a skilled artist under the direction of a competent Botanist will not fail to have its uses".

III. STANDARDS ADOPTED FOR MORPHOLOGICAL AND OTHER CHARACTERS

It is well known that certain characters like the colour of the cane vary in different canes of one and the same variety and such characters as the shape of bud, the size of ligular process, etc. differ in different portions of the same cane. It is therefore essential to standardize the particular place or places in the cane for examination and description of these characters. The study of a large number of sugarcane varieties has given an indication of the variations of the characters and those on which reliance can be placed. In a previous publication (Dutt, Krishnaswami and Rao, 1947) the following standards have been suggested for the characters and in the present descriptions, these standards have been followed.

1. AGE OF THE PLANT

It has been found that a crop ten months old is about the best for descriptive study and identification.

2. COLOUR OF THE STALK

The most reliable portion for this character is the mature naturally exposed portion of the stalk from the inside of the field which has thus not blushed by exposure to sun.

3. BUD

For this character the bud from the topmost joint whose leaf had fully dried was found to be the most reliable.

4. NODAL AND INTERNODAL CHARACTERS

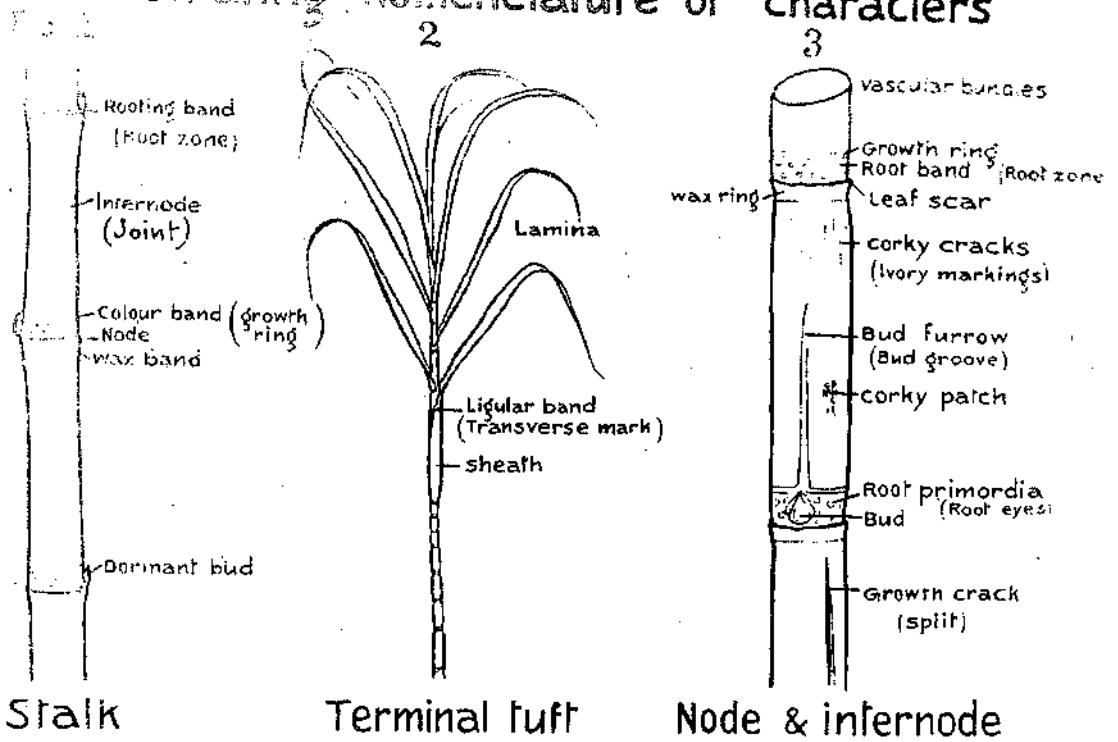
The middle portion of the stalk preferably the topmost dry leaf joint.

5. IVORY MARKINGS, SPLITS AND BUD GROOVE

From the top dry leaf joint or about two or three joints below.

Plate I

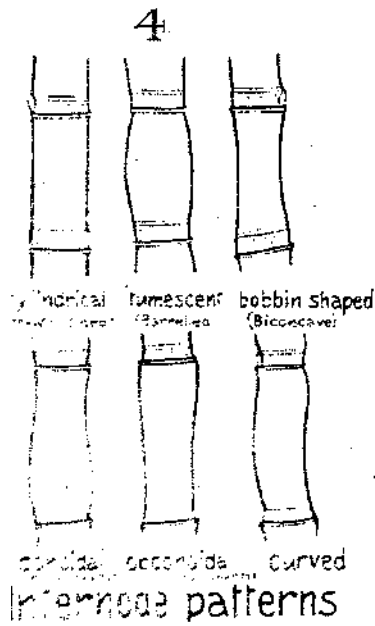
Illustrating nomenclature of characters



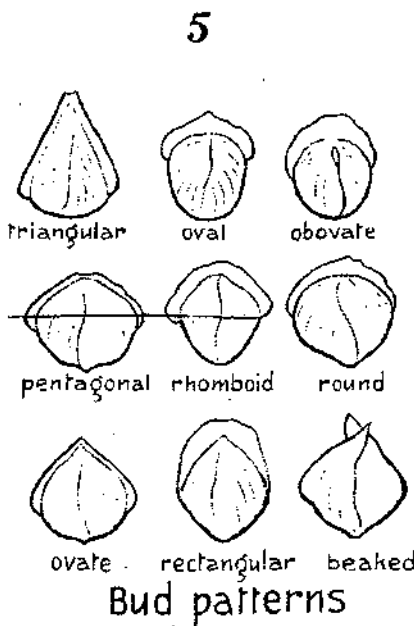
Stalk

Terminal tuft

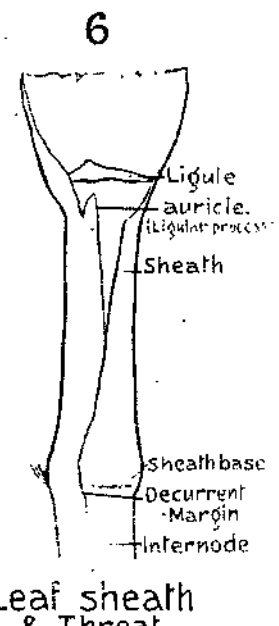
Node & internode



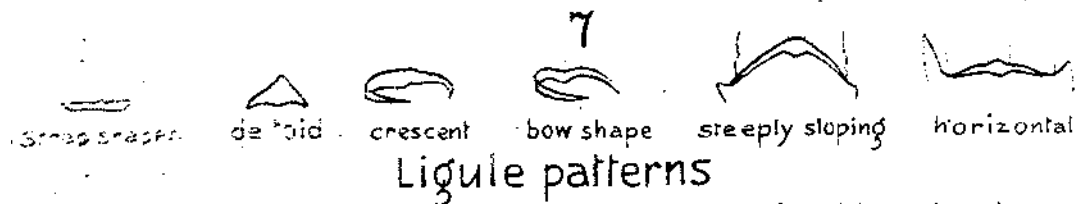
Internode patterns



Bud patterns



Leaf sheath & Throat



Ligule patterns

Figures 1, 2, 3, 4, 5, 6, 7 are copied from Antschwager (12)

6. LEAF CHARACTERS

(a) SIZE :— For this the leaf from the second green leaf above the top dry leaf joint was taken.

(b) LIGULE, LIGULAR PROCESS AND TRANSVERSE MARK :-.....- From the third fully unfurled leaf from top.

The following are the characters taken into account for description of the varieties. The nomenclature of certain of these is illustrated in Plate I.

(a) PARENTAGE

Each description starts with the parentage of the seedling. Strictly speaking, as the crosses made at Coimbatore are open-pollinated crosses and are thus not controlled crosses, it is not correct to use the word 'parentage' unless of course the chromosome number bears out the genuineness of the parentage. Till the exact chromosome numbers are available, it would be better to state that the seedling is derived from the open-pollinated cross of say A (female variety) x B (male variety). But in order to keep conformity with the previous publication from Coimbatore, the parentage has been given on the lines of the previous publication.

(6) HABIT AND GENERAL APPEARANCE

The habit and general appearance of the crop in the held is of immense help in identification of many of the varieties. The characters contributing to the general appearance are broadly, the habit, thickness and colour of cane and the nature of leaves.

(c) LEAF

The arrangement or general position of the leaves is a character of considerable importance in the identification of varieties and often aids identification in the field without the necessity for minute and closer examination. The number of leaves may be scanty or abundant. The carriage may be spreading, erect with the tips drooping or strictly erect. The top may remain open or may be compact.

The leaf is divisible into two portions, *viz.*, the lamina or leaf blade, that is, the expanded portion and the sheath or the portion clasping the stem. The portion connecting these two is the blade joint.

(i) LAMINA :—The colour and size of the lamina have been described. The width of the leaf, at its broadest, is often a diagnostic character of importance. Below 4 cm. it is regarded as narrow. Between 4 and 6 cm. it is regarded as medium and above 6 cm. as broad. The width of the lamina is given in relative terms.

(M) SHEATH :—The colour of the sheath and the presence or absence of spines on the back of the sheath are characters of use in identification. When spines are present their distribution also is an additional character for identification. When the leaf sheath does not have spines, then it is called glabrous. When the spines fall off from older sheaths, the spines are deciduous. When there is heavy coating of wax on the sheath or on the transverse mark then it is referred to as glaucous. The edges of the sheath especially towards the upper portion get dried up and are in contrast with the colour of the rest of the sheath. This is termed the scarious border. In some varieties this is prominent and in others not prominent.

(ii) **TRANSVERSE MARK (OR DEWLAP)** :—Three characters are described under this and they are --

The transverse mark (also called dewlap) :—These are discoloured areas on the outside, two in number one on each side with folds which aid in the movement of the leaf. The two areas may or may not meet. Their size, colour and the amount of wax deposit over them are the characters described.

Ligule : - This is a small membranous flap-like structure on the inside and is an extension of the sheath. It varies in length, shape, symmetry and position and is often a character of considerable importance and one on which reliance can be placed for identification. The different patterns of ligule are given in Fig. 7, Plate I.

Ligular process (also called *auricle*) :—These are outgrowths or lateral extensions of the leaf sheath. These may be present or absent, long or short and of various shapes. They may be present on one side or both sides. The length varies with the different leaves of the same cane. When the ligular process is small and tooth-like, it is called as dentoid and lanceolate when it is long and triangular.

(d) CANE OR STALK

(1) **GENERAL** : The thickness and alignment of the cane and the shape of the individual joints are of importance in identification and can easily be recognised by a cane grower. In the descriptions, canes under 2.0 cm. in diameter are classified as slender or thin, those from 2.0 cm. to 2.5 cm. as medium-thin, those from 2.5 cm. to 3.0 cm. as medium and those from 3.0 cm. to 3.5 cm. as medium-thick. Above 3.5 cm. they are classified as thick.

(2) **COLOUR** :—The colour of the cane varies with age and exposure to sun and is often misleading unless a proper sample is selected. Very often the portions faded by light take a different hue from the natural colour of the cane. As stated above the colour of the cane referred to in the descriptions is that of the bottom naturally exposed portion of the stalk which has not blushed due to exposure.

The cane is made up of two different portions, (i) the joint or internode and (n) the node. In the descriptions that follow the term 'joint' has been applied to the portion of the stem between two leaf scars. The bud has been kept as a distinct unit and hence the term 'node' refers only to the leaf scar portion.

(?) **JOINT** :—The joint is characterized by the following characters :—

(a) *Shape* /—This is often characteristic of a variety and is a reliable character for identification. The different shapes are shown in Fig. 4, Plate I.

(b) *Splits* :—These are cracks in the epidermis which extend deep into the rind region. These are often reliable for identification. They may be long or short, deep or shallow (Fig. 3, Plate I).

(c) *Ivory Markings* :—The surface of the joint is often characterized by markings which aid in the identification of those varieties wherein they are profuse. These are splits in the epidermis and occur as short or long thin lines (Fig. 3, Plate I).

(d) *Weather Markings* :—.....Sometimes greyish patches develop on the joints due to the reactions of the weather. These are known as weather markings (Fig. 3, Plate I).

- (e) *Bud groove* ;— Often depressions are noticed on the joint just above the bud and these are known as bud grooves. They may be long or short, deep or shallow (Fig. 3, Plate I).
- (f) *Growth Ring* .—This is the region above the root zone. It varies among varieties in width, colour and nature. The width varies from 2 mm. to 5 mm. Below 3 mm. the root zone has been referred to as narrow, between 3 and 4 mm. as medium and above 4 mm. as wide. The colour of the growth ring is either different from that of the other portions of the joint or the same when it is spoken of as concolorous. The growth ring may be either even with the other portions of the joint, depressed or swollen (Fig. 3, Plate I).
- (g) *Root Zone* :.....This is the region just above the leaf scar. It has rows of dormant root initials which develop into roots when planted. The root zone varies among varieties in width, colour and shape, that is, whether even, depressed or swollen. The root zone is referred to as narrow when the width is below (i mm., medium when the width is between 6 mm. and 8 mm. and broad when above 8 mm. The root zone may differ in colour from, the rest of the joint or may be concolorous. It may be even with the rest of the joint, depressed or swollen. The number of rows of root eyes also differs among varieties. The root eyes may be in regular or irregular rows. When irregular the rows are referred to as staggered (Fig. 3, Plate I).
- (h) *Wax Band* :— This is the region immediately below the leaf scar and with a heavy deposit of wax. The amount of wax varies and the band may be prominent or not. The region may be even with the other portions of the joint, constricted or swollen (Fig. 3, Plate I).

(ii) *NODE* :— This region may be even with the joint, depressed or swollen. It is made up of the leaf scar. When the leaf falls off from the cane, a scar is left behind which is prominent in some varieties. The leaf scar may be straight or inclined. Sometimes the leaf scar is prominent below the bud with protrusion which is often referred to as 'lip' (Fig. 1, Plate I).

(e) BUD

This is a character of considerable importance in the identification of varieties, especially when the typical bud for the variety has been selected. The different shapes of bud are illustrated (Fig. 5, Plate I). The following characters have been described.

(1) *SIZE, SHAPE AND POSITION* :— The size, shape and point of origin of bud differ among varieties. In size the bud may be small, medium or big. The shape differs considerably among the varieties. In some varieties there is a space between the bud and the leaf scar which is referred to as the 'cushion'. When the cushion is present it is often a fairly reliable character.

(2) *FLANGES* :—These are two lateral outgrowths extending generally over the upper half of bud. The nature of the flanges and their point of origin afford points for identification.

(3) *VENATION AND GERMPORE* :—The number and arrangement of the nerves is also a character of help in identification. The gerpore is the point of origin of the shoot which sprouts from the bud. This pore may be situated either at the uppermost end of the bud when it is termed apical, slightly below the top when it is known as subapical or about the middle of the bud when it is referred to as dorsal.

(e) STEM EPIDERMAL PATTERN

The pattern of the stem epidermis is of importance as an auxiliary character in the identification of varieties. It is a fairly uniform and constant characteristic of a variety. Artschwager (1930) has given an account of the epidermal pattern of some varieties and its usefulness as a diagnostic character.

The most reliable portion of a stalk for study of the epidermal pattern is the bottom mature joint of a ten months old crop. The peelings have been taken from the middle of the joint on the side opposite to the bud.

Quantitative data have been recorded of the number of long cell rows, cork cells, silica cells, solitary cork cells, solitary silica cells, pointed cork cells and size of cork and silica cells. The regularity of the long cells and the extent of waviness of the walls have also been noted. The stem epidermal pattern has been given in brief for each variety and a separate key included.

In the descriptions, where the number of cork cells per sq. mm. is below 100, it has been designated as 'low' and above 100 as 'high'. The width of the long cells is often a diagnostic character of importance. Below 12μ it is regarded as narrow. Between 12 and 15μ it is regarded as medium and above 15μ as broad. The waviness of the long cell walls is given in relative terms.

BUD PHOTOGRAPHS
of Co. Canes in cultivation



Co. 205



Co. 210



Co. 213



Co. 214



Co. 223



Co. 244



Co. 281



Co. 285



Co. 290



Co. 301



Co. 312



Co. 313



Co. 331



Co. 349



Co. 356



Co. 370

1933 PHOTOGRAPHS
of Co. Cases in cultivation

PLATE II (contd.)



Co. 385



Co. 393



Co. 395



Co. 419



Co. 421



Co. 449



Co. 453



Co. 467



Co. 475



Co. 508



Co. 513



Co. 527



Co. K. 32



Co. L. 9



Co. S. 109



Co. S. 245

BUD PHOTOGRAPHS
of Sugarcane varieties in cultivation

PLATE II (contd.)



Co. 622



Co. K. 30



Co. L. 29



Co. S. 321



Co. S. 443



Co. S. 510



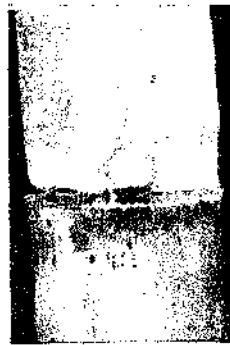
B.O. 10



B.O. 11



B.O. 21



B.O. 22



B.O. 24



H.M. 320



H.M. 645



H.M. 661

IV. KEY TO MORPHOLOGICAL CHARACTERS

I. CANE PURPLE, REDDISH OR WITH PURPLISH TINGE

A. CANE THIN OR MEDIUM-THIN :

I. LEAK MEDIUM. Bud ovate triangular, spines present on back of sheath, joint cylindrical, node swollen. Co 210

Bud orbicular, spines absent on back of sheath, joint conoidal, node even. Co.223

II. LEAK BROAD. Bud obovate, spines absent on back of sheath, joint cylindrical, node even, ligular process present on one side. B.0.21

B. CANE MEDIUM :

I. LEAK MEDIUM. Bud round.

(i) Spines present on back of sheath, joint cylindrical, node even, ligule crescentiform, foliage characteristically drooping to one side. Co.290

(ii) Spines absent on back of sheath, joint cylindrical, node even, ligule bow shaped. Co.281

(iii) Joint conoidal, node swollen, ligule crescentiform, growth ring swollen, root zone truncated cone like. Co.331

Bud suborbicular, spines sparse on back of sheath, joint tumescent, node even, ligular process absent. Co.213

Bud ovate, spines absent on back of sheath, joint cylindrical, node slightly swollen, wax band prominent, weather markings common. Co.385

II. LEAF BROAD. Bud ovate-triangular, spines sparse on back of sheath, joint cylindrical, node even, ligular process present on both sides. B.0.24

Bud ovate, spines absent on back of sheath, joint cylindrical, node even, wax band constricted, root zone swollen, canes characteristically brownish purple. H.M.661

C. CANE MEDIUM-THICK TO THICKISH :

I. LEAF BROAD. Bud ovate, spines profuse on back of sheath, joint cylindrical, sometimes obconoidal, node depressed. Co.419

Bud ovate triangular, spines sparse on back of sheath, joint conoidal, root zone truncated cone like, cane with characteristically reddish blotches. H.M.320

II. CANE GREEN OR GREEN WITH YELLOW

A. CANE THIN OR MEDIUM-THIN :

I. LEAF NARROW. Bud ovate.

(i) Spines absent on back of sheath, joint cylindrical, sometimes conoidal, node swollen. Co.285

(ii) Spines sparse on back of sheath, joint bobbin-shaped, node even, wax band constricted, ligule deltoid. Co.K.30

II. LEAF BROAD. Bud ovate triangular, spines present on back of sheath, joint cylindrical, ligule crescentiform, ligular process indicated on one side. H.M.645

B. CANE MEDIUM :

I. LEAF MEDIUM. Bud ovate.

(i) Spines present on back of sheath.

(a) *Joint cylindrical.*

(i) Node even. Ivory markings absent, cane straight. Co.350

Ivory markings profuse, cane straight, wax band constricted, brick red blotches characteristic on joints. Co.513

(ii) Node swollen, ivory markings sparse, cane staggered, splits common. Co. 393

(b) *Joint conoidal.*

Node even, ivory markings profuse. Co.395

(ii) Spines absent on back of sheath.

(a) *Joint cylindrical.*

(i) Ligular process present on one side. Root zone swollen, typically straight sided joints with heavy bloom throughout ; generally short. Co.508

Root zone even, joints generally long. Co.S.245

(ii) Ligular process present on both sides. Co.S. 109

(b) *Joint conoidal.*

Node swollen, cane straight. Co.L.9

(c) *Joint bobbin shaped.*

Node swollen, cane straight. Co.301

(d) *Joint tumescent.*

Node even, cane staggered, wax band constricted. Co.370

Bud ovate lanceolate, spines present on back of sheath, joint cylindrical with bulge opposite bud, ivory markings profuse.	Co.244
(iii) Spines present on back of sheath.	
(a) <i>Joint straight.</i>	
Ivory markings absent, bud groove absent, node swollen.	Co.S.443
(b) <i>Joint slightly staggered.</i>	
Ivory markings present, bud groove present, node even.	Co.8.510
Bud oval.	
(i) Spines sparse on back of sheath, joint bobbin shaped, node swollen, ligule deltoid.	Co.K.32
(ii) Spines absent on back of sheath, joint cylindrical, node even, ligule bow shaped.	Co.2.14
Bud obovate, spines profuse on back of sheath, joint cylindrical, node even, ivory markings profuse.	Co.205
II. LEAF MEDIUM. Bud ovate or roundish.	
(i) Ligule deltoid.	
(a) Ivory markings profuse, growth ring narrow, even, ligular process present on both sides.	B.C.22
(b) Ivory markings absent, growth ring medium, swollen, ligular process present on one side.	Co.622
(ii) Ligule crescentiform, ivory markings present, growth ring medium, even, ligular process indicated on both sides.	Co.S.321
Bud elliptic.	
Joint conoidal with bulge opposite bud, ligule crescentiform, ivory markings profuse, ligular process indicated on both sides.	Co.L.29
Bud obovate.	
Spines sparse on back of sheath, joint cylindrical, ligule deltoid.	Co.312
Bud elliptic.	
Spines present on young sheaths, joint cylindrical with bulge opposite bud, node depressed.	Co.313
III. LEAF BROAD. Bud ovate.	
(i) Cane straight, bud groove common, ligular process indicated on both sides.	Co.449
(ii) Cane staggered, bud groove absent, ligular process present, on both sides, one long and lanceolate and the other deltoid.	Co.453
Bud rhomboid.	
Spines sparse on back of sheath, joint cylindrical, ligule deltoid, ligular process present on both sides, one long.	Co.421

C, CANE MEDIUM-THICK TO THICKISH

I. LEAF BROAD. Bud ovate.

(i) *Joint Cylindrical.*

(a) Spines present on back of sheath.

(i) Ivory markings absent. Node prominently swollen, cane staggered, ligular process indicated on one side.

Co.467

Node slightly swollen, cane straight, ligular process present on both sides, one prominent and lanceolate, bud groove prominent.

Co.475

Node even, cane staggered, ligular process absent, splits profuse.

B.O.10

(ii) Ivory markings common, node even, cane slightly staggered, ligular process present on both, sides.

Co.349)

(b) Spines absent on back of sheath.

Ivory markings absent, node even, cane staggered, ligular process present on both sides, bud groove present.

B.O.I 1

(i) *Joint colloidal.*

Node swollen, cane staggered, spines profuse on back of sheath, lip prominent below leaf scar.

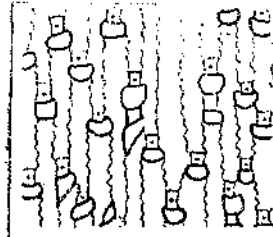
Co.527

!Sh>!Si

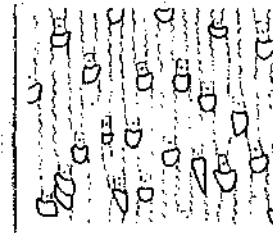
STEM EPIDERMAL PATTERN of Sugarcane varieties



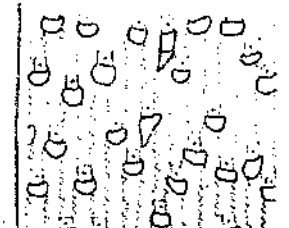
Co.205



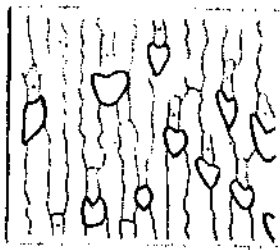
Co.210



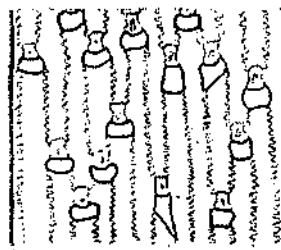
Co.215



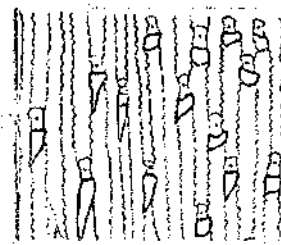
Co.214



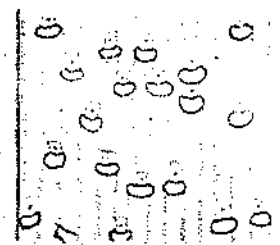
Co.223



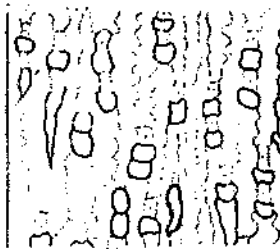
Co.244



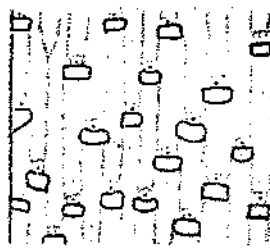
Co.281



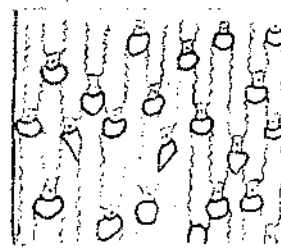
Co.285



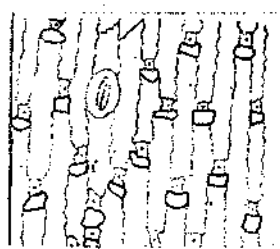
Co.290



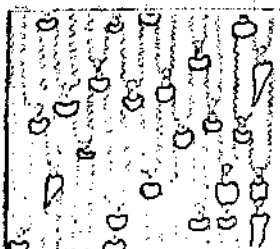
Co.301



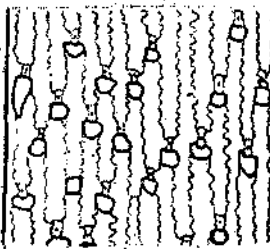
Co.312



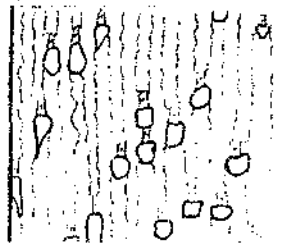
Co.313



Co.331



Co.349

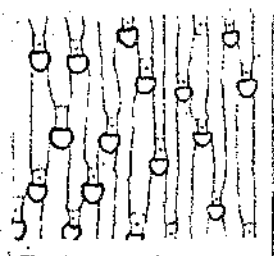


Co.356

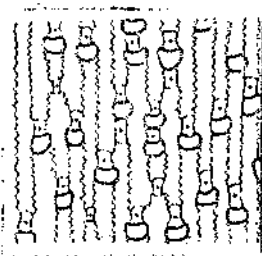


Co.370

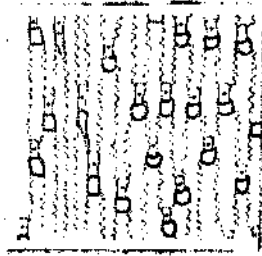
STEM EPIDERMAL PATTERN of Sugarcane varieties



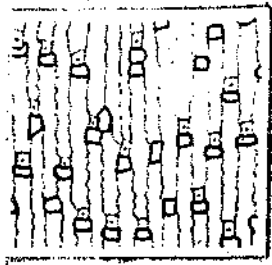
Co.L.29



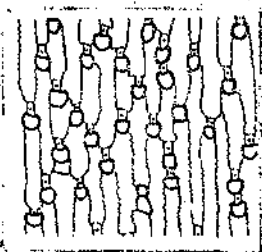
Co.S.109



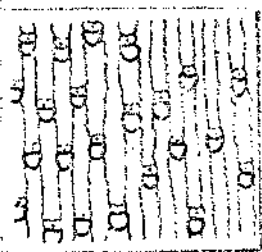
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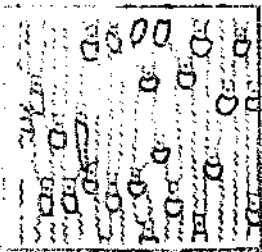
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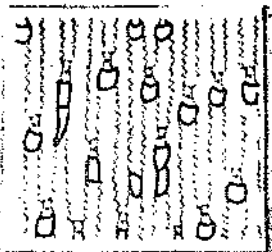
Co.S.445



Co.S.510



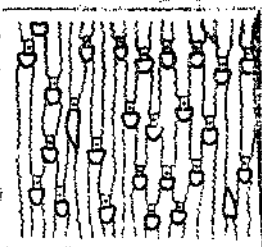
B.O.10



B.O.11



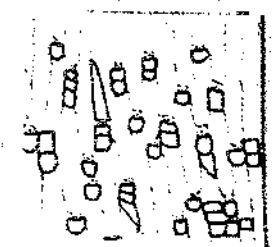
B.O.21



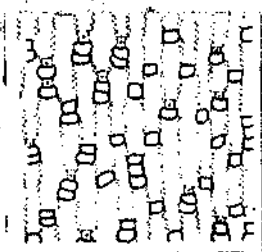
B.O.22



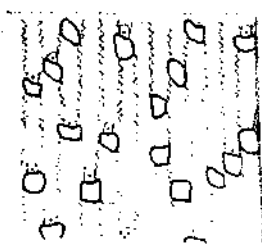
B.O.24



H.M.520



H.M.645

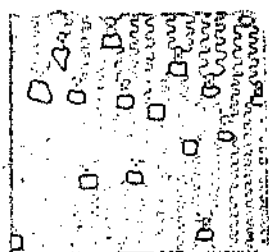


H.M.661

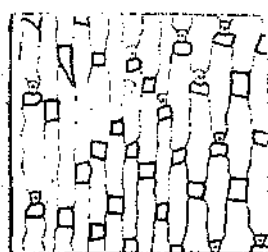
STEM EPIDERMAL PATTERN of Sugarcane varieties



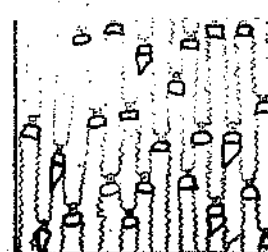
Co.385



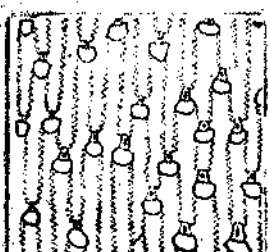
Co.393



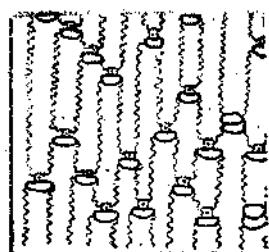
Co.395



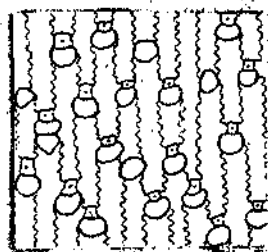
Co.419



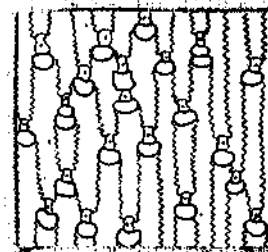
Co.421



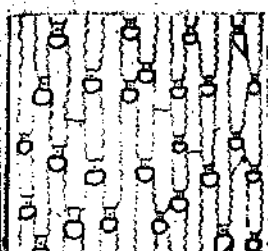
Co.449



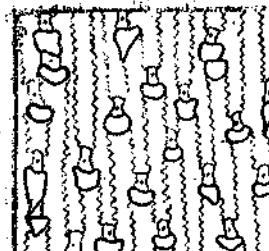
Co.453



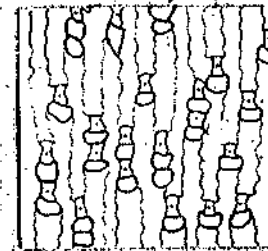
Co.467



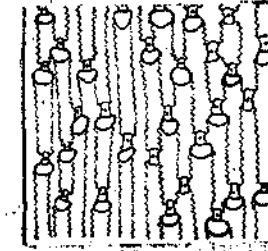
Co.475



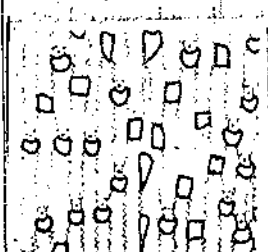
Co.508



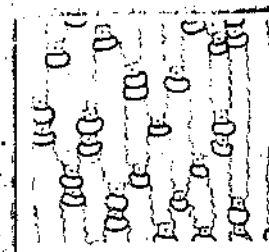
Co.513



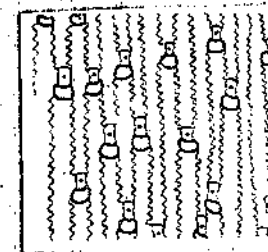
Co.527



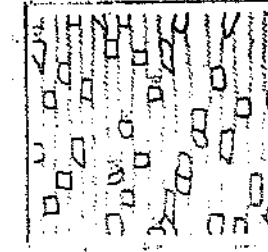
Co.622



Co.K.30



Co.K.32



Co.L.9

V. KEY TO STEM-EPIDERMAL CHARACTERS

GROUP I

CORK AND SILICA CELLS IN STRICTLY SINGLE PAIRS

A. SOLITARY CORK CELLS PRESENT.

I. POINTED CORK CELLS PRESENT.

(A) Number of cork cells per square mm. low.

(i) *Size of cork cells below 150 sq. μ*

(a) LONG CELLS NARROW.

(i) Pointed cork cells short. Long cells regular ; silica cells small in size.

Co.349

Long cells irregular ; silica, cells big in size.

H.M.661

(ii) Pointed cork cells long ; long cells irregular.

Co.281

(ii) *Size of cork cells above 150 sq. μ*

(a) Long cells very narrow ; pointed cork cells long and in profusion ; long cell walls highly wavy.

B.0.24

(b) Long cells narrow ; pointed cork cells long and in profusion ; long cell walls slightly wavy ; often two cork cells occur together.

B.0.21

(c) Long cells medium ; pointed cork cells rare ; long cell walls fairly straight.

Co.385

(B) Number of cork cells per sq. mm. high.

(i) *Size of cork cells below 150 sq. μ*

(a) LONG CELLS NARROW.

(i) Long cell walls highly wavy.

Co.421

(ii) Long cell walls slightly wavy.

Co.S..321

(ii) *Size of cork cells above 150 sq. μ*

(b) LONG CELLS NARROW.

(i) Long cell walls straight ; large number of solitary cork cells.

Co.'{05

(ii) Long cell walls wavy ; few solitary cork cells.

Co.L.O

- (b) LONG CELLS BROAD.
Long cell walls slightly wavy ; few solitary cork cells. Co.L.29
- II. POINTED CORK CELLS ABSENT.
- (A) Number of cork cells per square mm. low.
- (i) Size of cork cells below 150 sq. μ long cells fairly narrow ; long-cell walls highly wavy. Co.393
- (ii) Size of cork cells above 150 sq. μ ; long cells fairly narrow ; long cell walls highly wavy. Co.285
- (B) Number of cork cells per sq. mm. high.
Size of cork cells above 150 sq. μ ; long cells broad ; long cell walls medium wavy ; silica cells small. Co.453
- B. SOLITARY CORK CELLS ABSENT.
- I. POINTED CORK CELLS PRESENT.
- (A) Number of cork cells per sq. mm. low.
- (i) Size of cork cells below 150 sq. μ ; long cells medium ; long cell walls highly wavy ; no solitary cork or silica cells. Co.K.32
- (ii) Size of cork cells above 150 sq. μ ; long cells medium ; long cell walls highly wavy ; silica cells big. Co.244
- (B) Number of cork cells per sq. mm. high.
Size of cork cells below 150 sq. μ ; long cells narrow ; long cell walls fairly wavy ; frequent occurrence of two cork cells together. Co.419
- II. POINTED CORK CELLS ABSENT.
- (A) Number of cork cells per sq. mm. low.
- (i) *Size of cork cells below 150 sq. μ .*
- (a) Long cells narrow ; long cell walls highly wavy ; silica cells small. Co.301
- (b) Long cells broad ; long cell walls highly wavy ; cork cells semi-circular. Co.449
- (B) Number of cork cells per sq. mm. high.
- (i) Size of cork cells below 150 sq. μ ; long cells narrow ; long cell walls fairly wavy ; numerous solitary silica cells present. Co.527
- (u) Size of cork cells above 150 sq. μ ; long cells broad ; long cell walls slightly wavy ; no solitary cork or silica cells. Co.S.510

GROUP II
CORK AND SILICA CELLS IN SINGLE AND DOUBLE PAIRS

A. SOLITARY CORK CELLS PRESENT.

I. POINTED CORK CELLS PRESENT.

- (A) Number of cork cells per sq. mm. low.
- (i) Size of cork cells below 150 sq. μ ; long cells very narrow ; long cell walls slightly wavy ; silica cells small. Co.356
- (ii) *Size of cork cells above .150 sq. μ .*
- (a) LONG CELLS VERY NARROW.
- (i) Long cell walls highly wavy ; solitary silica cells absent. Co.205
- (ii) Long cell walls slightly wavy ; solitary silica cells present. Co.223
- (b) LONG CELLS NARROW.
 Long cell walls wavy ; solitary silica cells rare. B.O.I I
- (c) LONG CELLS MEDIUM.
 Long cell walls slightly wavy ; solitary cork cells rare. Co.312
- (B) Number of cork cells per sq. mm. high.
- (i) *Size of cork cells below 150 sq. μ .*
- (a) Long cells narrow ; long cell walls highly wavy ; cork cells often in twos or threes. H.M.645
- (b) Long cells broad ; long cell walls wavy ; silica cells very small. H.M.320
- (ii) *Size of cork cells above 150 sq. μ .*
- (a) LONG CELLS NARROW.
 Long cell walls slightly wavy. Co.213
- (b) LONG CELLS MEDIUM.
- (i) Long cell walls highly wavy ; numerous solitary cork cells. Co.622
- (ii) Long cell walls highly wavy ; few solitary cork cells. Co.S.245

II. POINTED CORK CELLS ABSENT.

(A) Number of cork cells per sq. mm. low.

(i) *Size of cork cells above 150 sq. μ .*

(a) Long cells medium ; long cell walls wavy ; solitary silica cells present.

Co.S.109

(b) Long cells broad ; long cell walls highly wavy.

Co.467

(B) Number of cork cells per sq mm. high.

Size of cork cells below 150 sq. μ ; long cells medium ; long cell walls highly wavy.

Co.S.443

B. SOLITARY CORK CELLS ABSENT.

I. POINTED CORK CELLS PRESENT.

(A) Number of cork cells per sq mm. low.

(i) *Size of cork cells below 150 sq. μ .*

(a) Long cells narrow; long cell walls highly wavy; cork cells triangular.

Co.370

(b) Long cells medium ; long cell walls highly wavy ; cork cells semi-circular or squarish.

Co.214

(ii) *Size of cork cells above 150 sq. μ .*

(a) Long cells narrow ; long cell walls fairly wavy.

B.O.10

(b) Long cells broad ; long cell walls fairly wavy.

Co.508

(B) Number of cork cells per sq. mm. high.

(i) *Size of cork cells below .150 sq. μ .*

(a) Long cells narrow ; long cell walls slightly wavy ; solitary cork cells few.

B.O.22

(b) Long cells medium ; long cell walls wavy.

Co.331

(c) Long cells broad ; long cell walls wavy ; most of the cork-silica cells in double pairs.

Co.290

(d) Long cells very broad ; long cell walls slightly wavy ; silica cells small. Co.475

(ii) *Size of cork cells above 150 sq. μ .*

(a) Long cells narrow ; long cell walls fairly straight. Co.513

(b) Long cells medium ; long cell walls slightly wavy. Co.210

II. POINTED CORK CELLS ABSENT.

(A) Number of cork cells per sq. mm. low.

Size of cork cells below 150 sq. μ ; long cells fairly broad ; long cell walls fairly straight. Co.313

(B) Number of cork cells per sq. mm. high.

Size of cork cells below 150 sq. μ ; long cells broad ; long cell walls slightly wavy. Co.K.30

VI. COMPARATIVE TABLE GIVING THE IMPORTANT

Variety	Co.205	Co.210	Co.213	Co.214	Co.223	Co.244	Co.281
I. CANE							
(a) Colour ..	Glaucous green	Purple	Purple	Greenish yellow	Purple	Green	Purple
(b) Thickness ..	Thin	Medium-thin	Medium	Thin	Medium-thin	Medium	Medium
(c) Alignment ..	Straight	Straight	Straight	Straight	Straight	Staggered	Staggered
II. JOINT							
(a) Shape ..	Cylindrical	Cylindrical	Tumescant with bulge opposite bud	Cylindrical	Conoidal	Cylindrical with bulge opposite bud	Cylindrical
(b) Split ..	Common	Absent	Absent	Rare	Rare	Common	Moderate
(c) Ivory markings	Profuse	Absent	Occasional	Occasional	Moderate	Profuse	Absent
(d) Bud groove	Absent	Present	Occasional	Indicated	Absent	Common	Absent
(e) Wax band ..	Even	Even	Even	Even	Even	Even	Constricted
(f) Growth ring	Narrow, even	Medium, even	Narrow, depressed	Narrow, even	Narrow, even	Medium, even	Narrow, even
(g) Root zone ..	Medium, even	Medium, even	Medium, even	Medium, swollen	Narrow, even	Medium, swollen	Medium, even
III. NODE	Even	Swollen	Even	Even	Even	Even	Even
IV. BUD	Obovate	Ovate triangular	Sub orbicular	Oval	Orbicular	Ovate Lanceolate	Round
(a) Width of lamina	Narrow	Medium	Medium	Narrow	Medium	Medium	Medium
(b) Spines on back of sheath	Profuse	Sparse	Sparse	Absent	Absent	Sparse	Absent
(c) Ligule ..	Deltoid	Crescentiform	Crescentiform	Bow shaped	Crescentiform	Crescentiform	Bow shaped
(d) Ligular process	Present on both sides, one long	Absent	Absent	Indicated one side	Present one side	Present on both sides, one long	Absent
(e) Carriage ..	Erect with drooping tips	Erect with drooping tips	Erect	Erect with drooping tips	Erect with older leaves curving	Erect with drooping tips	Erect with drooping tips

MORPHOLOGICAL CHARACTERS OF THE VARIETIES

Co.285	Co.290	Co.301	Co.312	Co.313	Co.331	Co.340	Co.356	Co.370
Green	Green with purple	Greenish yellow	Green	Greenish yellow	Purple	Green	Yellowish green	Yellow with green
Medium-thin	Medium	Medium	Medium	Medium	Medium	Medium thick	Medium	Medium
Staggered	Staggered	Straight	Straight	Straight	Staggered	Slightly staggered	Straight	Slightly staggered
Cylindrical rarely conoidal	Cylindrical	Bobbin shaped	Cylindrical	Cylindrical with bulge opposite bud	Conoidal	Cylindrical, sometimes conoidal	Cylindrical	Tumescant
Common	Occasional	Absent	Occasional	Absent	Occasional	Absent	Absent	Occasional
Common	Absent	Absent	Rare and few	Absent	Absent	Common	Absent	Absent
Absent	Absent	Absent	Indicated	Present	Absent	Prominent	Common	Common
Even	Even	Even	Constricted	Constricted	Even	Even	Even	Constricted
Narrow, swollen	Medium, even	Medium, even	Medium, swollen	Narrow, even	Medium, swollen	Narrow, slightly swollen	Medium, even	Medium, broad swollen
Medium, swollen	Broad, even	Medium, swollen	Medium, even	Medium, even	Medium, truncated cone like	Medium, even	Medium, broad even	Broad, even
Swollen	Even	Swollen	Even	Depressed	Swollen	Even	Even	Even
Ovate	Roundish or Obovate	Ovate	Obovate, big	Elliptic, small	Round or pentagonal	Ovate	Ovate	Ovate
Narrow	Medium	Medium	Medium	Medium	Medium	Broad	Medium	Medium
Absent	Sparse	Absent	Sparse	Present on young sheath	Absent	Profuse	Sparse on middle of sheath	Absent
Crescenti-form	Crescenti-form	Crescenti-form	Deltoid	Crescenti-form	Crescenti-form	Crescenti-form	Crescenti-form	Crescenti-form
Indicated both sides	Present on both sides	Indicated one side	Indicated one side	Indicated one side	Indicated one side	Present both sides, one dentoid, other indicated	Present both sides, one dentoid, other indicated	Present both sides, one dentoid, other indicated
Erect with drooping tips	Curved	Erect with tips curving	Erect with drooping tips	Ascending	Erect	Erect with drooping tips	Erect with drooping tips	Erect

VI. COMPARATIVE TABLE GIVING THE IMPORTANT

Variety Character	Co.385	Co.393	Co.395	Co.419	Co.421	Co.449	Co.
I. CANE							
(a) Colour ..	Purple	Greenish yellow	Greenish yellow	Green with purple	Green	Green with yellow	Glauco-green
(b) Thickness ..	Medium	Medium	Medium	Medium-thick to thickish	Medium	Medium	Medium
(c) Alignment ..	Straight	Staggered	Straight	Slightly Staggered	Straight	Straight	Stagger
II. JOINT							
(a) Shape ..	Cylindrical	Cylindrical with swollen ends	Conoidal	Cylindrical to obconoidal	Cylindrical	Cylindrical	Cylindrical with ends
(b) Splits ..	Common	Common	Common	Absent	Occasional	Absent	Rare
(c) Ivory markings	Absent	Common sparse	Profuse	Absent	Absent	Absent	Absent
(d) Bud groove ..	Common	Common	Absent	Indicated	Occasional	Common	Absent
(e) Wax band ..	Slightly constricted	Slightly swollen	Even	Constricted	Even	Slightly constricted	Constricted
(f) Growth ring	Medium, even	Medium, slightly swollen	Narrow, even	Medium, even	Medium-broad, swollen	Medium, swollen	Medium, slight swollen
(g) Root zone ..	Broad, slightly swollen	Medium, even	Medium, broad, slightly depressed	Medium, even	Broad, even	Medium, even	Broad, even
III. NODE	Slightly swollen	Swollen	Even	Depressed	Slightly swollen	Swollen	Swollen
IV. BUD	Ovate	Ovate	Ovate	Ovate	Rhomboid	Ovate	Ovate to round
V. LEAF							
(a) Width of lamina	Medium	Medium	Medium	Broad	Broad	Broad	Broad
(b) Spines on back of sheath	Absent	Present sparse	Present	Profuse	Sparse	Sparse	Profuse
(c) Ligule ..	Crescentiform	Crescentiform	Crescentiform	Crescentiform	Deltoid	Crescentiform	Crescentiform
(d) Ligular process	Absent	Indicated both sides	Present on both sides, dentoid	Present on one side, dentoid	Present on both sides; one lanceolate, other dentoid	Indicated both sides	Present both; one lanceolate, other dentoid
(e) Carriage ..	Erect with drooping tips	Erect with drooping tips	Erect with drooping tips	Erect with broad curve at tips	Erect with broad curve at tips	Erect with drooping tips	Erect with tips droop

MORPHOLOGICAL CHARACTERS OF THE VARIETIES—(Continued)

Co.467	Co.475	Co.508	Co.513	Co.527	Co.K.32	Co.L.9	Co.S.109	Co.S.245
Greenish yellow	Yellowish green	Ashy green	Green with reddish blotches	Ashy green	Green	Greenish yellow	Green	Green with yellow
Medium-thick to thickish	Medium-thick to thickish	Medium	Medium	Medium-thick to thickish	Medium, thin	Medium	Medium	Medium
Staggered	Straight	Straight	Straight	Slightly staggered	Straight	Straight	Straight	Straight
Cylindrical with swollen ends	Cylindrical with bulge opposite bud	Cylindrical	Cylindrical	Conoidal	Bobbin shaped	Conoidal	Cylindrical	Cylindrical
Absent	Rare	Absent	Common	Absent	Absent	Absent	Absent	Absent
Absent	Absent	Absent	Profuse	Sparse	Absent	Absent	Absent	Absent
Indicated	Common, prominent	Common, indicated	Absent	Absent	Absent	Absent	Absent	Common
Even	Even	Even	Constricted	Even	Even	Swollen	Even	Slightly constricted
Medium, even	Medium, even	Narrow, even	Medium, even	Medium, swollen	Narrow, even	Medium, slightly swollen	Medium, even	Medium, slightly swollen
Medium, prominently swollen	Medium, slightly swollen	Medium, swollen	Medium, even	Broad, even	Broad, even or slightly depressed	Broad, even or slightly swollen	Medium-broad, slightly swollen	Broad, even
Swollen	Even or slightly swollen	Even	Even	Swollen	Swollen	Swollen	Even	Even
Ovate	Ovate	Ovate	Ovate	Ovate	Oval	Ovate	Ovate	Ovate
Broad	Broad	Medium	Medium	Broad	Narrow	Medium	Medium	Medium
Sparse	Sparse	Absent	Sparse	Profuse	Sparse	Absent	Absent	Absent
Deltoid	Crescentiform	Crescentiform	Crescentiform	Crescentiform	Deltoid	Crescentiform	Crescentiform	Crescentiform
Indicated one side	Present on both sides; one big and lanceolate, other indicated	Indicated one side	Indicated both sides	Present on one side, dentoid	Indicated both sides	Present on one side, dentoid	Present on both sides; dentoid one side, other indicated	Present one side
Erect with drooping tips	Erect with broad curve at tips	Erect	Erect with sharp curve at tips	Erect with drooping tips	Erect with sharp curve at tips	Erect with drooping tips	Erect with drooping tips	Ascending

VI. COMPARATIVE TABLE GIVING THE IMPORTANT

Variety	Co.022	Co.K.30	Co.L.29	Co.S.321	Co.S.443	Co.S.510	B.C
I. CANE							
(a) Colour ..	Greenish yellow	Green with yellow	Green with yellow	Dark green with yellow	Green	Dark green	Green
(b) Thickness ..	Medium-thin	Thin	Medium-thin	Medium-thin	Medium-thin	Medium-thin	Medium-thin
(c) Alignment ..	Straight	Straight	Slightly staggered	Straight	Straight	Slightly staggered	Staggered
II. JOINT							
(a) Shape ..	Cylindrical	Bobbin shaped sometimes conoidal	Conoidal with bulge opposite bud	Cylindrical	Cylindrical	Cylindrical	Cylindrical
(b) Splits ..	Very rare	Absent	Very rare	Absent	Absent	Rare	Profuse
(c) Ivory markings	Absent	Absent	Profuse	Present	Absent	Present	Absent
(d) Bud groove ..	Absent	Absent	Absent	Absent	Absent	Present	Absent
(e) Wax band ..	Constricted	Constricted	Even	Slightly constricted	Even	Even	Slightly constricted
(f) Growth ring	Medium, swollen	Medium, slightly swollen	Medium, even	Medium, even	Narrow, swollen	Medium, swollen	Narrow, swollen
(g) Root zone ..	Broad, swollen	Medium, even	Broad	Medium, even	Medium, even	Medium, swollen	Narrow, even
III. NODE	Even	Even	Even	Even	Swollen	Even	Even
IV. BUD	Ovate or roundish	Ovate	Elliptic or roundish	Ovate	Ovate	Ovate	Ovate
V. LEAF							
(a) Width of lamina	Medium	Narrow	Medium	Medium	Narrow	Narrow	Broad
(b) Spines on back of sheath	Absent	Sparse	Absent	Absent	Present	Present	Present
(c) Ligule ..	Deltoid	Deltoid	Crescentiform	Crescentiform	Crescentiform	Crescentiform	Crescentiform
(d) Ligular process	Indicated on one side	Present on both sides	Indicated on both sides	Indicated on both sides	Indicated on both sides	Present on both sides, one indicated	Absent
(e) Carriage ..	Erect with drooping tips	Erect with drooping tips	Erect with older leaves curving	Erect with drooping tips	Erect with older leaves curving	Erect with older leaves curving	Erect with older leaves curving

MORPHOLOGICAL CHARACTERS OF THE VARIETIES—(Concluded)

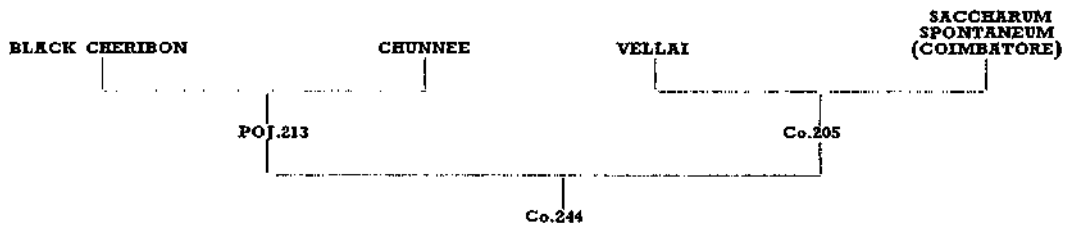
B.O.11	B.O.21	B.O.22	B.O.24	H.M.320	H.M.645	H.M.661
Green with yellow and pink	Dark green with purplish blotches	Dark green	Yellowish green with purple	Green with yellow and turning reddish	Greenish yellow	Brownish purple
Medium-thick	Medium-thin	Medium-thin	Medium	Medium-thick	Medium-thin	Medium
Staggered	Slightly staggered	Straight	Straight	Straight	Straight	Straight
Cylindrical	Cylindrical	Cylindrical	Cylindrical	Conoidal	Cylindrical	Cylindrical
Absent	Absent	Present	Absent	Absent	Absent	Rare
Absent	Absent	Profuse	Present	Absent	Absent	Absent
Present	Present	Absent	Present	Present	Absent	Present
Constricted forming bottle-neck	Even	Even	Even	Even	Constricted	Constricted
Medium, swollen	Medium, swollen	Narrow, even or slightly constricted	Medium, swollen	Narrow, swollen	Narrow, slightly swollen	Narrow, even
Narrow, even	Medium, forming a truncated cone	Medium, slightly swollen	Narrow, even	Broad, forming a truncated cone	Broad, even	Medium, swollen
Even	Even	Even	Even	Even	Even	Even
Ovate	Ovate	Ovate or roundish	Ovate-triangular	Ovate-triangular	Round	Ovate
Broad	Broad	Medium	Broad	Broad	Broad	Broad
Absent	Absent	Absent	Sparse	Sparse	Present	Absent
Crescentiform	Crescentiform	Deltoid	Crescentiform	Crescentiform	Crescentiform	Crescentiform
Present on both sides one indicated	Short on one side	Present on both sides, one indicated	Present on both sides, one indicated	Absent	Indicated on one side	Present on both sides, small
Erect with older leaves curving	Erect with older leaves curving	Erect with drooping tips	Erect with older leaves curving	Erect	Erect with older leaves curving	Erect with older leaves curving

VII. DESCRIPTIONS

1. Co. 244.

1. BOTANICAL

A. PARENTAGE



POJ.213 X Co.205.— Unbagged cross. The pistil parent, POJ.213, has practically cent per cent closed anthers. The pollen parent Co.205 has profuse pollen. The seedling possesses in it the complements of *Saccharum officinarum* (from Black Cheribon and Vellai), *Saccharum Barberi* (from Chunnee) and *Saccharum spontanem*. The chromosome number is $2n = 118$ which represents the sum of the haploid complements of its parents (POJ.213, $n = 62$ and Co.205, $n = 56$).

B. HABIT AND GENERAL APPEARANCE

A vigorous cane with an erect habit in the beginning and lodging habit at maturity. A mass of crooked, thin, green canes with the ivory markings and splits visible in the self-trashing joints. Foliage medium, older leaves curving broadly.

C. LEAF

1. LAMINA—(i) *Colour*. Light green. (ii) *Length and width*. Medium; of medium width.

2. SHEATH—(i) *General*. Pale green with purplish blotches ; slight bloom in young sheaths ; older ones without bloom and with a broad scarious border. (ii) *Clasping*. Loose. (iii) *Spines*. Sparse, found throughout the length of sheath, deciduous in older sheaths.

3. BLADE JOINT—(i) *Transverse mark*. Purplish green, small, glaucous. (ii) *Ligule*. Shallow, crescentiform, symmetrical, slightly arched. (iii) *Ligular process*. Present on both sides, one long and lanceolate, the other dentoid.

4. ARRANGEMENT—(i) *Number*. Medium-abundant. (ii) *Carriage*. Younger leaves with sharp curve below tips ; older ones broadly curved. (iii) *Top*. Open.

D. CANE

1. GENERAL—Medium-thin, staggered, round in cross section, solid; internal tissue greenish brown ; rind fairly hard.

2. COLOUR—Green, sometimes pale green with bone yellow or brown which in older internodes becomes concolorous ; growth ring yellowish brown.

3. JOINT—(?) *Shape and markings.* Cylindrical with slight bulge at bottom especially at the side opposite to bud ; splits common, medium-long and narrow ; ivory markings profuse as short, thin, brownish lines more common towards the top of internode ; bud groove common, short, shallow; weather markings present; bloom moderately spread throughout the joint. (ii) *Wax band.* Distinguishable, medium in width, even with joint. (iii) *Growth ring.* Medium in width, even, sometimes slightly swollen. (iv) *Root zone.* Medium in width, swollen having three rows of regular root eyes which are small and slightly swollen.

4. NODE—Even with joint ; leaf scar not prominent, straight or slightly slanting.

5. BUD—(i) *Size, shape and position.* Medium, rather plump ; ovate-lanceolate reaching top of growth ring ; inserted at leaf scar. (ii) *Flange.* Narrow, wider at base, arising from middle of bud, emarginate. (iii) *Venation and germ pore.* Nerves numerous, parallel, converging to top, not prominent ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

The shoots make an angle of about 35° at germination, but erect themselves in the 3rd month. They spread out at about the 7th month and begin to lodge by the 9th month.

F. SETT AND SHOOT ROOTS

Total number of root eyes less than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thicker than those of Hemja and Chunnee and as thick as those of Co.205 and Co.213 ; at thirty days from planting sett roots as long as those of Co.213, six times as long as those of Hemja and twice as long as those of Chunnee. Development of shoot roots earlier than in Hemja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

Roots quite well developed, though mostly superficial; a few thin ones penetrate to about three feet or more ; lacking in satisfactory lateral spread.

H. STEM EPIDERMAL PATTERN

Cork and silica cells in single pairs only ; number of cork and silica cells low ; no solitary cork or silica cells ; pointed cork cells present but rare ; long cells fairly broad ; walls of long cells prominently wavy.

2. VARIETAL POSITION

The cultivation of this variety is restricted to Bulandshahr district in Western Uttar Pradesh where it occupies about 2,500 acres.

It was sent from Coimbatore to State Stations in the year 1922.

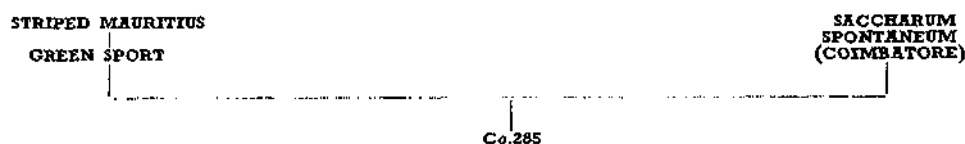
3. AGRICULTURAL

A hard-rinded cane of lodging habit, does fairly well even under indifferent cultivation and has therefore earned the name of 'poor man's cane' ; late in ripening, poor in sucrose and inferior in *rab* and sugar ; shows certain amount of resistance to insect attack ; fairly resistant to red rot, but susceptible to smut and tolerant to mosaic ; stem solid in texture.

1. Co. 285.

1. BOTANICAL

A. PARENTAGE



GREEN SPORT x SACCHARUM SPONTANEUM. In the records of the Station the remarks against the parentage of this cane are (1) "Green Sport G.C." signifying that it is an unhagged cross and (2) "likely cross with Co.205 or Co.206 which were flowering freely in the neighbourhood". But the chromosome number would reveal it to be a cross with *Saccharum spontaneum* (Coimbatore) and hence the parentage is now shown accordingly. The pistil parent is Green Sport of Striped Mauritius which has fifty per cent. open anthers but later work has indicated that it is self sterile. The pollen parent, *Saccharum spontaneum* (Coimbatore), has plenty of pollen. Co.285 has thus in its composition the complements of *Saccharum officinarum* (from Green Sport) and *Saccharum spontaneum*.

The chromosome number is $2n = 112$ which represents the sum of the unreduced complements of *Saccharum officinarum* ($2n = 80$) and the haploid complement of *Saccharum spontaneum* (Coimbatore) ($n = 32$).

B. HABIT AND GENERAL APPEARANCE

A fairly compact mass of thin, erect canes with longish joints, the swollen nodes and splits being visible on the exposed portions of the stalk ; leaves characteristically erect and narrow.

C. LEAF

1. LAMINA—(i) *Colour*. Dark green. (ii) *Length and width*. Long and narrow.
2. SHEATH—(i) *General*. Pale Green with purplish blotches ; covered by heavy bloom ; protruding prominently above bud due to the plump nature of bud. (ii) *Clasping*. Loose. (iii) *Spines*. Absent.
3. BLADE JOINT—(i) *Transverse mark*. Light green, small, glaucous. (ii) *Ligule*. Shallow, crescentiform, the width decreasing rapidly towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Indicated on both sides, one slightly bigger.
4. ARRANGEMENT—(i) *Number*. Rather scanty, (ii) *Carriage*. Younger leaves with tips erect ; older ones with a sharp curve at the tips. (iii) *Top*. Compact.

D. CANE

1. GENERAL—Thin to medium-thin, slightly staggered, round in cross section, internal tissue pale green towards the periphery and whitish towards the centre ; rind hard ; pithy with cavity in centre.

2. COLOUR—Green with tinge of yellow at the nodal region turning dark green on exposure ; growth ring brownish yellow turning concolorous in bottom joints ; root zone bone yellow turning concolorous in bottom joints.

3. JOINT—(i) *Shape and markings.* Cylindrical tending to conoidal shape in longer joints ; splits common, long and deep ; ivory markings common as thin, short, brownish lines pronounced in top joints ; bud groove absent ; bloom heavy throughout the joint. (ii) *Wax band.* Not distinguishable merging with the general bloom, medium in width, even with joint. (iii) *Growth ring.* Narrow, slightly swollen. (iv) *Root zone.* Wide, swollen, having two rows of rather regular root eyes which are prominent and swollen.

4. NODE—Swollen ; leaf scar not prominent, straight, sometimes slightly protruding below bud.

5. BUN—(i) *Size, shape and position.* Medium, fairly plump ; ovate, reaching bottom of growth ring ; hairs present on top ; inserted at leaf scar. (ii) *Flange.* Fairly wide, wider at base, arising from middle of bud. (iii) *Venation and gempore.* Nerves numerous, semi-radial, converging to centre, not prominent ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good. Soon after germination the shoots are more or less erect and at maturity the canes give a neat mass of practically straight canes.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thicker than those of Hemja and Chunnee and as thick as those of Co.205 and Co.213 ; at thirty days from planting, sett roots longer than those of Hemja, Chunnee, Co.205 and Co.213 being seven times as long as those of Hemja. Development of shoot roots later than in Hemja and Chunnee and at the same time as in Co.205 and Co.213.

G. ADULT ROOT SYSTEM

The roots start developing into almost an ideal system very early. Adult root system well developed for tapping the surface and deeper layers of soil ; large number of deep roots reach more than four feet depth ; lateral spread good.

H. STEM EPIDERMAL PATTERN

Cork and silica cells in single pairs ; number of cork cells per unit area low ; cork cells rarely occur ; solitary pointed cork cells absent ; long cells fairly narrow ; walls of long cells highly wavy.

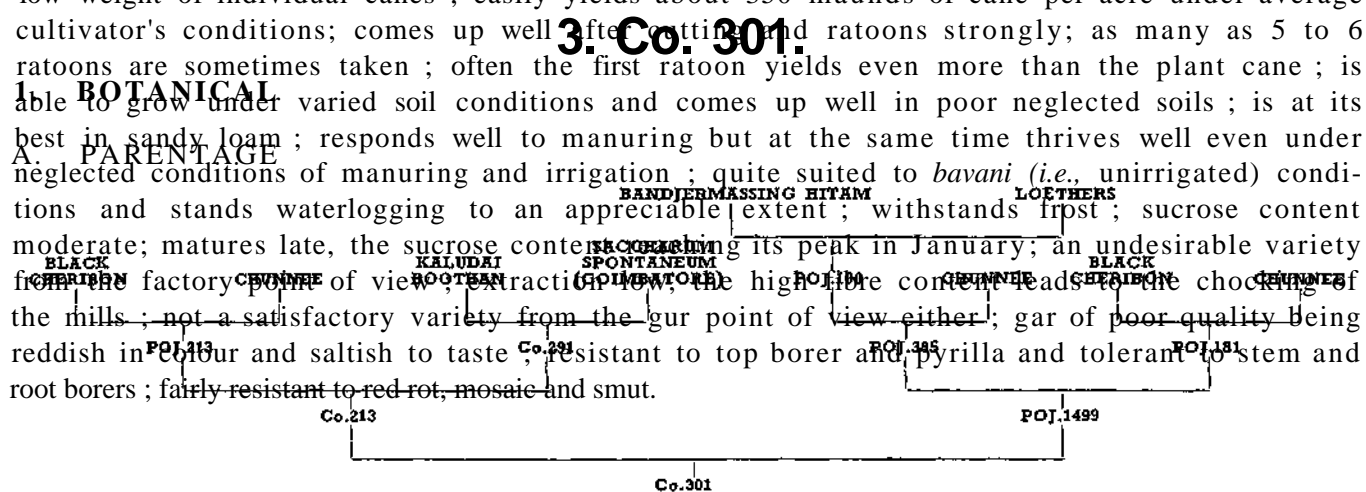
2. VARIETAL POSITION

The cultivation of this variety is restricted to Punjab only. In spite of its unsatisfactory juice quality and high fibre content, it was the main cane in Punjab for a number of years due to its satisfactorily good yield and ability to do well under indifferent conditions. It has now been mostly replaced by Co.312, a better variety from sucrose and yield points of view. It now occupies only 15 per cent. of the area in Punjab.

It was sent from Coimbatore to the State Stations in the year 1924.

3. AGRICULTURAL

The variety gets established quickly after germination ; early vigour not very marked, but it makes good growth after monsoon ; tillering fairly high with comparatively few late shoots ; fairly heavy yielder, the large number of tillers making up the yield in spite of the thinness and low weight of individual canes ; easily yields about 350 maunds of cane per acre under average cultivator's conditions; comes up well after cutting and ratoons strongly; as many as 5 to 6 ratoons are sometimes taken ; often the first ratoon yields even more than the plant cane ; is able to grow under varied soil conditions and comes up well in poor neglected soils ; is at its best in sandy loam ; responds well to manuring but at the same time thrives well even under neglected conditions of manuring and irrigation ; quite suited to *bavani* (i.e., unirrigated) conditions and stands waterlogging to an appreciable extent ; withstands frost ; sucrose content moderate; matures late, the sucrose content reaching its peak in January; an undesirable variety for factory of view on account of its high fibre content leads to chocking of the mills ; not a satisfactory variety from the gur point of view either; gar of poor quality being reddish in colour and saltish to taste ; resistant to top borer and pyrilla and tolerant to stem and root borers ; fairly resistant to red rot, mosaic and smut.



Co.213 x POJ.1499.—Unbagged cross. The pistil parent, Co.213, has sixty per cent. closed anthers. The pollen parent, POJ. 1490, has ninety-seven per cent. open anthers. Co.301 has in its composition the complements of *Saccharum officinarum* (from Black Cheribon, Kaludai Boothan, Bandjermassing Hitam, and Loethers), *Saccharum Barberi* (from Chunnee) and *Saccharum spontaneum*.

B. HABIT AND GENERAL APPEARANCE

A moderately good stand of fairly erect, medium canes with distinct wax band and swollen nodes. Foliage medium-abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Dark green. (ii) *Length and width*. Long; of medium width.

PLATE IV



Co. 244
Shahjahanpur



Co. 285
Juilundur



Co. 301
Coimbatore

2. SHEATH—(i) *General*. Young sheaths green; older ones with purplish blotches; fair bloom, ; scarious border narrow. (ii) *Clasping*. Loose. (iii) *Spines*. Absent.

3. BLADE JOINT—(i) *Transverse mark*. Pinkish, big, glaucous. (ii) *Ligule*. Shallow, crescentiform, the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Indicated on one side.

4. ARRANGEMENT—(i) *Number*. Medium-abundant, (ii) *Carriage*. Younger leaves with tips curving sharply ; older ones broadly curving. (iii) *Top*. Open.

D. CANE

1. GENERAL—Medium, straight, oval in cross section, internal tissue yellowish; rind fairly hard ; solid.

2. COLOUR—Greenish yellow turning purple on exposure; growth ring yellowish brown turning concolorous in bottom joints; root zone bone yellow turning concolorous in bottom joints.

3. JOINT—(i) *Shape and markings*. Bobbin shaped, flattened on the sides, bulge opposite bud prominent ; splits absent ; ivory markings absent ; bud groove absent ; bloom moderate throughout the joint. (ii) *Wax band*. Clearly distinguishable, medium-narrow, even, slightly constricted below bud. (iii) *Growth ring*. Medium, even. (iv) *Root zone*. Medium-broad, slightly swollen, having 2-3 rows of staggered, small, pinkish root eyes.

4. NODE—Slightly swollen; leaf scar prominent, straight to slightly slanting, slightly protruding below bud.

5. BUD—(i) *Size, shape and position*. Big, plump ; ovate reaching top of growth ring ; inserted at leaf scar ; hairs present at base ; pinkish or brown at bottom joints. (ii) *Flange*. Very prominent, wide, uniform width throughout, arising from middle of bud, margin wavy. (iii) *Venation and gempore*. Nerves rather few, radial, converging to centre, prominent ; germination dorsal.

This cane which is grown to a fair extent in South Africa has been described morphologically by staff of South African Experiment Station (1943). It is stated that corky cracks (ivory markings) and splitting are common in this variety. In the Coimbatore specimen, however, the ivory markings and splitting arc absent. The leaf colour is dark green at Coimbatore, while in the description of the South African Experiment Station, the leaf colour is described as light green.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good. Shoots make an angle of 60° at two months, become fairly erect at six months and are fairly erect at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thicker than those of Hemja and Chunnee but thinner than those of Co.205 and Co.213 ; at thirty days from planting sett roots longer than those of Hemja, Chunnee, Co.205 and Co.213 ; development of shoot roots later than those of Hemja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

Fairly well adapted for surface and deep feeding ; possesses a fair number of surface roots as well as those which go clown to three feet or more ; lateral spread not much.

H. STEM EPIDERMAL PATTERN

A regular and uniform pattern ; cork and silica cells in single pairs ; number of cork cells per unit area low ; solitary and pointed cork cells absent ; long cells narrow ; walls of long cells highly wavy.

2. VARIETAL POSITION

This is one of the two canes, the other being Co.281, which is grown to a very limited extent in India but which has won laurels outside India. In India the variety occupies hardly 1,000 acres and is confined to Banaras and Bareilly districts of Uttar Pradesh. In South. Africa it was till recently one of the main varieties.

It was sent from Coimbatore to the State Stations in the year 1926.

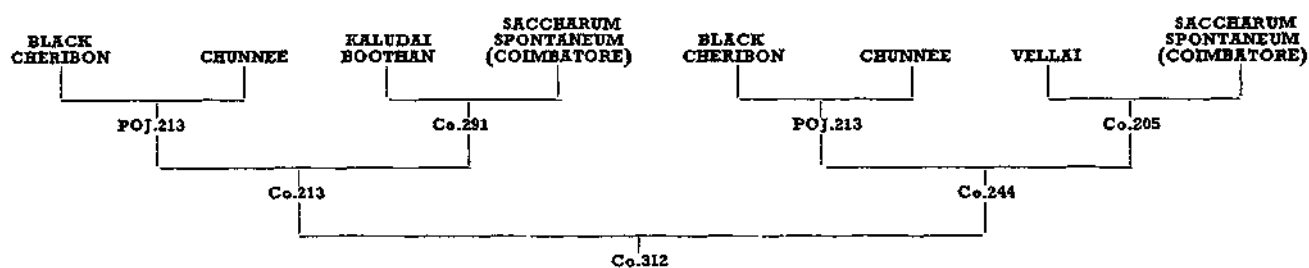
3. AGRICULTURAL

A vigorous grower and good stooler ; yield quite satisfactory. Early growth not marked but grows vigorously after the rains ; an excellent ratooner ; mid-season cane with good juice quality, sometimes a little late in ripening ; sucrose content and purity equal to Co.281 and Co.290 and retains these for a wide range of soils ; comes up well in light and medium soils ; responds well to manuring and irrigation ; requires proper drainage for good growth ; resistant to red rot and streak disease, but takes mosaic readily though it shows a high natural recovery ; susceptible to smut and liable to lodge and break in heavy rains accompanied by winds ; resistant to drought.

4 Co. 312.

1. BOTANICAL

A. PARENTAGE



Co.213 x Co.244.—Unbagged cross. The pistil parent, Co.213, has sixty per cent. closed anthers. The pollen parent, Co.244, has ninety-eight per cent. open anthers. Co.312 has in it the complements of *Saccharum officinarum* (from Black Cheribon, Kaludai Boothan and Vellai), *Saccharum Barberi* (from Chunnee) and *Saccharum spontaneum*.

The chromosome number is $2n = 118$ which represents the haploid complements of the parents (Co.213, $n = 59$ and Co.244, $n = 59$).

PLATE V



Co. 312
Muzaffarnagar



Co. 312
Bilaspur

B. HABIT AND GENERAL APPEARANCE

A rather loose mass of crooked canes, purplish with heavy bloom when exposed and purplish leaf sheaths ; foliage moderately abundant; leaves with tips drooping with a sudden curve ; lodges at maturity.

C. LEAF

1. LAMINA—(i) *Colour*. Light green, (ii) *Length and width*. Long; of medium width.

2. SHEATH—(i) *General*. Young sheaths purplish; older ones light green with purplish blotches ; heavy bloom ; scarious border rather prominent. (ii) *Clasping*. Rather tight. (iii) *Spines*. Sparse, present mostly in the middle portion of sheath, deciduous.

3. BLADE JOINT—(i) *Transverse mark*. Light green, small, glaucous. (ii) *Ligule*. Shallow, deltoid, the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Indicated on one side.

4. ARRANGEMENT—(i) *Number*. Medium-abundant. (ii) *Carriage*. Erect, the tips drooping with a sharp curve. (iii) *Top*. Fairly compact.

D. CANE

1. GENERAL—Medium, straight, slightly oval in cross section, internal tissue yellowish green at periphery and whitish at centre ; rind softish ; solid.

2. COLOUR—Green turning purple on exposure ; growth ring light yellow, sometimes brownish yellow turning concolorous in bottom joints ; root zone bone yellow turning concolorous in bottom joints.

3. JOINT—(i) *Shape and markings*. Cylindrical, flattened at the sides ; splits occasional, when present narrow and shallow ; ivory markings rare ; bud groove indicated, sometimes absent ; bloom heavy throughout the joint. (ii) *Wax band*. Not clearly distinguishable, medium, constricted. (iii) *Growth ring*. Medium, even or slightly swollen. (iv) *Root zone*. Medium, even having three rows of staggered root eyes.

4. NODE—Even ; leaf scar not prominent, straight.

5. BUD—(i) *Size, shape and position*. Big, plump; obovate, reaching top of growth ring ; inserted at leaf scar ; hairs present on top. (ii) *Flange*. Prominent, fairly wide, uniform width throughout, arising from middle of bud. (iii) *Venation and gempore*. Nerves numerous, parallel, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots oblique soon after germination but stand upright at two months ; spread out again at six months and finally lodge at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thicker than those of Hemja and Chunnee and thinner than those of Co.205 and Co.213 ; at thirty days from planting, sett roots longer than those of Hemja, Chunnee and Co.205 and as long as those of Co.213; development of shoot roots at the same time as those of Co.213.

G. ADULT ROOT SYSTEM

Well adapted for tapping deep layers of soil ; roots extend to more than four feet and are much branched and spread out.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single or double pairs ; number of cork cells per unit area low ; solitary and pointed cork cells present but rare ; long cells medium in width ; walls of long cells slightly wavy.

2. VARIETAL POSITION

After Co.213, which it replaced in Western Uttar Pradesh, Co.312 is perhaps the most outstanding Co. cane for North India. It has obtained its peak popularity in Western Uttar Pradesh where it is particularly suited to the local climatic conditions. It is also grown in Punjab, in central parts of Uttar Pradesh and in Madhya Pradesh to a certain extent. Of late the variety has shown susceptibility to red rot and is being replaced. A good instance of a cane which is quite popular in spite of the drawback of a badly lodging habit at maturity.

The variety was sent from Coimbatore to the State Stations in the year 1928.

3. AGRICULTURAL

A good variety serving well the poor cultivator as also farmers on average land ; suitable both for the white sugar and gur industries ; heavy yielder and. good ratooner.

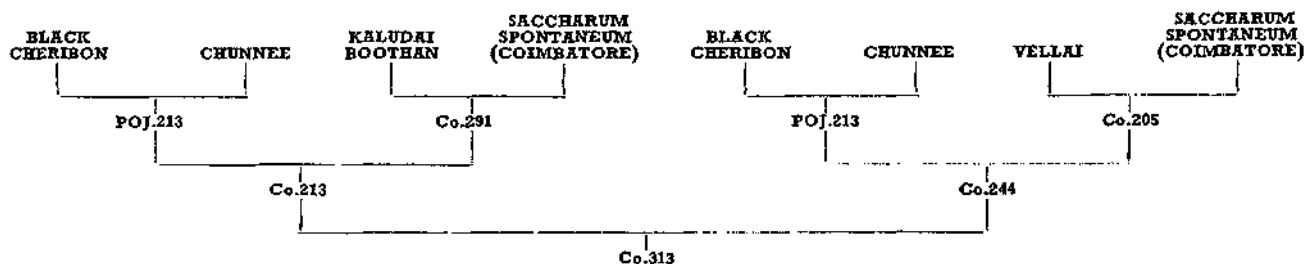
Though there is no vigorous early growth during the premonsoon period, it makes up after the rains ; suits all soil types, light as well as heavy ; is at its best in well drained soils ; does not like waterlogged conditions ; responds well to higher doses of manure but gives a fair yield even under poor conditions ; thrives well under good conditions of irrigation ; resistant to drought and tolerant to frost ; good mid-season variety with moderate sucrose content, the juice quality reaching its peak in February ; fibre moderate ; gives good recover} /; gives gur of good quality, light yellow in colour, hard, crystalline and sweet to taste ; susceptible to borers and highly attacked by pyrilla ; in previous years upto 1941 it was fairly resistant to red rot and smut, but now highly susceptible to red rot, wilt, smut and mosaic.

The main defect with the variety is that it lodges under rich conditions and in loose soils. Susceptibility to red rot is causing anxiety.

5. Co. 313.

1. BOTANICAL

A. PARENTAGE



The chromosome number is the same as that of Co.312.

B. HABIT AND GENERAL APPEARANCE

A rather close mass of fairly erect, medium, slightly curved canes with greenish yellow colour and bulge opposite bud. Foliage medium-abundant. Leaves often yellowish green.

C. LEAF

1. LAMINA—(i) *Colour*. Light green, often turning yellowish green. (ii) *Length and width*. Long ; of medium width.

2. SHEATH—(i) *General*. Green with purplish blotches often on the inner surface only ; slight bloom ; scarious border not prominent. (ii) *Clasping*. Tight. (iii) *Spines*. Present on young sheaths, deciduous.

3. BLADE JOINT—(i) *Transverse mark*. Green, big and wide, slight bloom. (ii) *Ligule*. Of medium width, crescentiform the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Indicated on one side.

4. ARRANGEMENT—(i) *Number*. Medium-abundant. (ii) *Carriage*. Ascending, tips often drooping with a sharp curve. (iii) *Top*. Compact.

D. CANE

1. GENERAL—Medium-thin to medium, straight, slightly oval in cross section, internal tissue yellowish green ; rind fairly soft ; solid.

2. COLOUR—Green with yellow at the growth ring and root zone turning ivory yellow on exposure ; growth ring pale yellow ; root zone whitish yellow.

3. JOINT—(i) *Shape and markings*. Cylindrical with prominent bulge opposite bud, sides slightly flattened ; splits absent ; ivory markings absent ; bud groove common, narrow and shallow extending to half the length of joint ; bloom moderate throughout the joint. (ii) *Wax band*. Clearly distinguishable, narrow, constricted. (iii) *Growth ring*. Narrow, even or sometimes slightly depressed. (iv) *Root zone*. Medium, even or slightly depressed having two rows of staggered root eyes.

4. NODE—Depressed ; leaf scar not. prominent, straight.

5. BUD—(i) *Size, shape and position.* Small., flat ; elliptic reaching bottom of growth ring ; inserted at leaf scar. (ii) *Flange.* Not prominent, narrow, uniform width throughout, arising from middle of bud. (iii) *Venation and gempore.* Nerves few, semi-radial, converging to centre ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 50° at two months stage ; after five months become fairly erect and continue to be so till harvest.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Chunnee and Co.205 and less than in Hemja and Co.213 ; sett roots thicker than those of Hemja, Chunnee, Co.205 and Co.213 ; at thirty days from planting, sett roots as long as those of Co.213 ; development of shoot roots earlier than in Hernja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

Fairly well adapted ; fair number of surface feeding and deep feeding roots reaching three feet and more ; lateral spread satisfactory.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single or double pairs ; number of cork cells per unit area low ; solitary and pointed cork cells absent ; long cells broad ; walls of long cells fairly straight.

2. VARIETAL POSITION

After the replacement of Co.213, the variety occupied a dominant position in the white sugar belt of North Bihar. It now occupies only about 15,000 acres. It is also grown in Uttar Pradesh, Punjab and Bengal as an early cane.

It was released from Coimbatore to the State Stations in the year 1928.

3. AGRICULTURAL

A medium-thin variety, moderate in yield but with high sucrose content early in the season ; all-round cane from factory point of view ; gives gur of good quality.

Rapid and good germinator even under dry conditions ; growth quite good though early vigour is not marked ; tillering good with few late shoots ; presents a good stand at harvest time ; yield rather low due to the thinness of cane and low weight of individual canes ; best suited to light loamy soils ; growth and tillering restricted in heavy soils ; responds well to liberal doses of manure ; does well under good conditions of irrigation and is unable to withstand much shortage of water ; responds well to adequate and well distributed rainfall, but suffers when the monsoon fails ; tolerates usar (*i.e.*, alkaline) soils and waterlogging to some extent ; early ripener with high sucrose content early in the season ; can be milled from mid-December to early March with progressively good recoveries ; juice quality continues to improve for 6-8 weeks after flowering ; juice has low colloidal content and high gur/cane ratio ; clarification difficulties have been got over by fractional liming ; moderately resistant to stem borers and pyrilla but highly susceptible to top borers ; liable to damage by animals consequent on its possessing a soft rind ; shows field resistance to red rot in certain localities, otherwise fairly resistant to red rot, highly susceptible to smut and slightly susceptible to wilt.

PLATE VI



Co. 313
Pusa

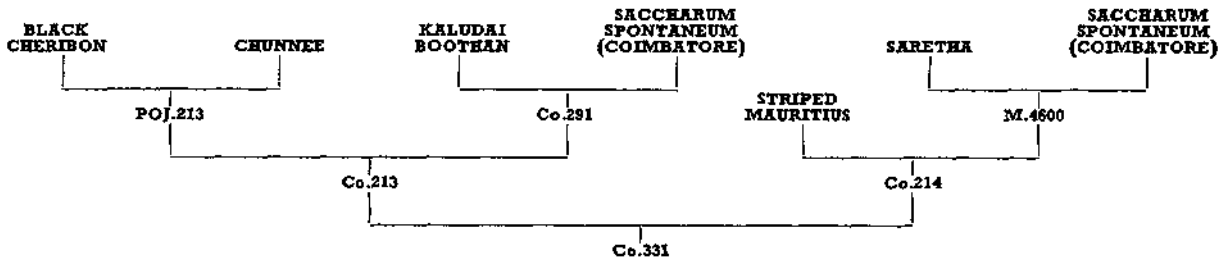


Co. 313
Karnal

6. Co. 331.

1. BOTANICAL

A. PARENTAGE



Co.213 X Co.214.—Unbagged cross. The pistil parent, Co.213, has sixty per cent. closed anthers. The pollen parent, Co.214, has ninety-seven per cent. open anthers. Co.331 has in it the complements of *Saccharum officinarum* (from Black Cheribon, Kaludai Boothan and Striped Mauritius), *Saccharum Barberi* (from Chunnee and Saretha) and *Saccharum spontaneum*.

B. HABIT AND GENERAL APPEARANCE

A tufted mass of uniform, erect, purplish canes with erect leaves ; foliage abundant ; leaves have a tendency to roll during hot weather.

C. LEAF

1. LAMINA—(i) *Colour*. Dark green. (ii) *Length and width*. Long; of medium width.

2. SHEATH—(i) *General*. Green with purplish blotches ; moderate bloom ; scarious border prominent in older leaves. (ii) *Clasping*. Tight. (iii) *Spines*. Absent.

3. BLADE JOINT—(i) *Transverse mark*. Green, big, glaucous. (ii) *Ligule*. Shallow, crescentiform the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Indicated on one side.

4. ARRANGEMENT—(i) *Number*. Abundant. (ii) *Carriage*. Erect, some leaves with drooping tips. (iii) *Top*. Compact.

D. CANE

1. GENERAL—Medium, staggered, slightly oval in cross section, internal tissue whitish ; rind hard ; pithy with central cavity.

2. COLOUR—Yellowish green with considerable purple even in unexposed canes, turning complete purple on exposure ; growth ring concolorous, darker than the joint when purple ; root zone concolorous.

3. JOINT—(i) *Shape and markings.* Conoidal, lateral diameter greater than the median ; splits occasional, when present long and deep ; ivory markings absent ; bud groove absent ; fair bloom throughout the joint. (ii) *Wax band.* Distinguishable, narrow, constricted. (iii) *Growth ring.* Medium, prominently swollen. (iv) *Root zone.* Narrowing towards the base resembling a truncated cone, even having 2-3 rows of staggered root eyes.

4. NODE—Even ; leaf scar prominent, straight, slightly protruding below bud in upper joints.

5. BUD—(i) *Size, shape and position.* Medium, rather flattened ; round often tending to be pentagonal reaching bottom of growth ring ; inserted at leaf scar ; presents a brown and dried up appearance. (ii) *Flange.* Prominent, broad, uniform width throughout, arising from middle of bud. (iii) *Venation and gempore.* Nerves numerous, parallel, converging to centre, prominent ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 70° at two months stage, become erect at four months and continue to be so till harvest.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thicker than those of Hemja and Chunnee and thinner than those of Co.205 and Co.213 ; at thirty days from planting, sett roots longer than those of Hemja and Chunnee, but shorter than those of Co.205 and Co.213 ; development of shoot roots at the same time as those of Co.213.

G. ADULT ROOT SYSTEM

Well adapted with a number of deep penetrating roots reaching to four feet or more ; surface roots many ; lateral spread fairly satisfactory.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single or double pairs ; number of cork cells per unit area high ; solitary cork cells absent ; pointed cork cells present ; long cells medium in width ; walls of long cells wavy.

2. VARIETAL POSITION

The variety was the main cane in South Bihar for a number of years, but has now been completely replaced in view of its high susceptibility to red-rot. It is grown in central and eastern Uttar Pradesh and occupies about 10,000 acres and is grown to a limited extent in West Bengal.

The variety was sent from Coimbatore to the State Stations in the year 1930.

3. AGRICULTURAL

A high tonnage cane of remarkable habit but low in sucrose and late in ripening.

Good germinator and catches the eye for its quick early growth ; cane formation early ; tillering good ; has a tendency to late shoot formation ; a high tonnage cane, the heavy tillering and medium weight of individual canes resulting in heavy yield ; good ratooner ; suited to a variety of soil and climatic conditions ; best suited to heavy black cotton soil and also low lying and flooded lands ; shows good response to heavy closes of manure and particularly suited to the same ; responds well to irrigation and not very well suited to dry climate and inadequate facilities

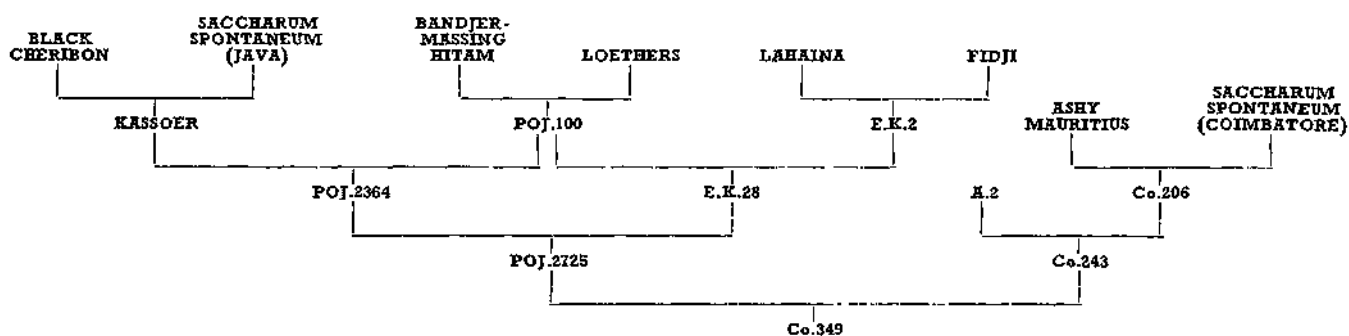
of irrigation ; tolerates usar (*i.e.*, alkaline) soils and waterlogging to an appreciable, extent ; gives high yield under low as well as high fertility conditions ; a late ripening variety with comparatively low sugar content ; mid-season late variety in South Bihar where it is fit for crushing from January to March ; in Uttar Pradesh serves as a late variety for the mills from middle of February to end of April ; sugar potential low and hence low recoveries in factories ; fibre content high but calorific value of bagasse rather low ; gur not satisfactory being brownish in colour, not quite crystalline and with a saltish taste ; susceptible to all borer pests and white fly and tolerant to pyrilla ; susceptible to red rot, smut, wilt, top rot ; tolerant to mosaic ; hard rind ensures resistance to jackals and wild animals.

The main defect with this variety is that it develops pith giving rise to a hollow cavity late in the season and this causes reduction in tonnage ; is being discarded because of high susceptibility to red rot.

2. Co. 349.

1. BOTANICAL

A. PARENTAGE



POJ.2725 X Co.243.—Unbagged cross ; the pistil parent, POJ.2725, has cent per cent closed anthers ; the pollen parent, Co.243, has ninety-six per cent, open anthers. Co.349 has in its composition the complements of *Saccharum officinarum* (from Black Cheribon, Bandjer-messing Hitam, Loethers, Lahaina, Fidji and Ashy Mauritius), and *Saccharum spontaneum* (from Coimbatore and Java forms).

The chromosome number is $2n = 116$.

B. HABIT AND GENERAL APPEARANCE

A good stand of erect medium-thick to thickish canes with short joints and broad dark green leaves, the purplish sheaths with, heavy bloom and profuse spines showing out prominently ; foliage abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Dark green. (ii) *Length and width*. Medium-long ; broad.
2. SHEATH—(i) *General*. Green with purple ; heavy bloom ; scarious border prominent. (ii) *Clasping*. Loose. (iii) *Spines*. Profuse throughout the back of sheath.

3. BLADE JOINT—(f) *Transverse mark.* Green with purple hue; broad; glaucous. (ii) *Ligule.* Shallow, crescentiform, the width decreasing gradually towards the edges; symmetrical; slightly sloping. (iii) *Ligular process.* Present on both sides, one dentoid and the other indicated.

4. ARRANGEMENT—(i) *Number.* Abundant. (ii) *Carriage.* Young leaves erect; slightly older ones with sharp bend near tips; oldest leaves broadly curved. (Hi) *Top.* Compact.

D. CANE

1. GENERAL—Medium-thick to thickish, slightly staggered, round in cross section, internal tissue greenish; rind soft; pithy with central cavity.

2. COLOUR—Green with tinge of yellow turning purple on exposure; growth ring yellow with brownish tinge; root zone yellowish green.

3. JOINT—(i) *Shape and markings.* Cylindrical, rarely conoidal; splits absent; ivory markings common as sharp lines confined to the upper portion of joint; bud groove common, long, shallow, reaching $\frac{3}{4}$ length of joint; moderate bloom throughout the joint. (ii) *Wax band.* Distinguishable, narrow, even. (iii) *Growth ring.* Narrow, swollen. (iv) *Root zone.* Medium, even having three rows of staggered root eyes.

4. NODE—Even; leaf scar prominent, straight, slightly protruding below bud.

5. BUD—(i) *Size, shape and position.* Big, plump; broadly ovate reaching the growth ring or slightly above; inserted at leaf scar; hairs on top of bud prominent. (ii) *Flange.* Prominent, broad, wider at base, arising from middle of bud. (iii) *Venation and gerpore.* Nerves numerous, parallel converging to top; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination satisfactory and fairly rapid; shoots make an angle of 80° at two months stage and continue to be erect till harvest.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in E.K.28, Purple Mauritius, 247 B and POJ.2878 and less than in Pundia; sett roots thicker than those of E.K.28, Purple Mauritius, 247 B and Pundia and thinner than those of POJ.2878; at thirty days from planting, sett roots longer than those of E.K.28, Purple Mauritius, 247 B and Pundia, but shorter than those of POJ.2878.

G. ADULT ROOT SYSTEM

Poor to moderate; few number of roots penetrate deep down; surface feeding fibrous roots fairly numerous; lateral spread not satisfactory.

H. STEM EPIDERMAL PATTERN

Cork and silica cells in single pairs; number of cork cells per unit area low; solitary and pointed cork cells present; long cells narrow; walls of long cells fairly wavy.

2. VARIETAL POSITION

The cultivation of this variety is restricted to the Nellikuppam factory area in Madras State.

The variety was sent from Coimbatore to the State Stations in the year 1931.

3. AGRICULTURAL

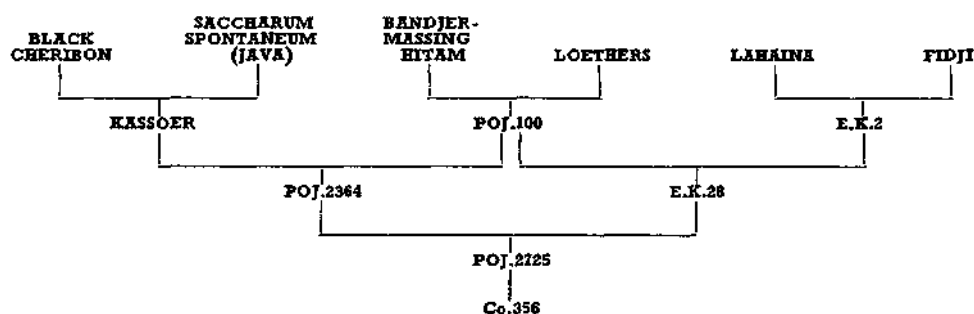
A very satisfactory yielder with moderate to good tillering capacity; mid-season in ripening.

Early vigour poor but improves later on ; cane formation early ; few late shoots observed ; fairly heavy yielder ; comes up well in fertile soils ; does better on rich clayey soils than on moderate fertile loamy soils ; responds very well to higher doses of manuring and irrigation ; with regard to manufacturing qualities, the variety comes intermediate between Co.281 and POJ.2878 (the other two canes which are crushed by the Nellikuppam factory) so far as clarification and the refractory nature is concerned ; quality of the cane rather poor ; there is sharp and sudden deterioration after peak maturity is reached ; dryage and deterioration after harvest more as compared to the other varieties ; even a delay of 24 hours is serious with this variety ; not quite a good cane from factory point of view, but popular with cultivators because of fairly high yield ; fibre content moderate ; gur of reddish brown colour, sets well and is hard and crystalline ; highly susceptible to borers ; fairly resistant to red rot, susceptible to smut and tolerant to mosaic.

8. Co. 356.

1. BOTANICAL

A. PARENTAGE



POJ.2725 (Parthenogenetic derivative). Unbagged cross.

The pistil parent, POJ.2725 has cent per cent closed anthers.

In the previous publications from Coimbatore, the parentage of Co.356 was given as POJ.2725 x *Sorghum durra* Stapf. There was some doubt in its being a genuine *Sorghum* seedling. The chromosome number has now been determined and is $2n = 106-108$. The chromosome numbers of POJ.2725 and *Sorghum durra* Stapf. are respectively $2n = 106$ and $2n = 20$. Since the chromosome number of Co.356 is $2n = 106-108$, it must have resulted as a parthenogenetic derivative.

B. HABIT AND GENERAL APPEARANCE

A loose gappy mass of fairly erect medium canes with scanty leaves.

C. LEAF

1. LAMINA—(i) *Colour*. Dark green. (ii) *Length and width*. Medium-long; of medium width.

2. SHEATH—(i) *General*. Light green with purple ; fair bloom ; scarious border narrow. (ii) *Clasping*. Rather tight. (iii) *Spines*. Sparse on middle of sheath.

>. I)i.ADE JOINT—(i) *Transverse mark.* Purple, big, fair bloom. (ii) *Ligule.* Shallow, crescentiform the width decreasing sharply at the sides ; symmetrical ; horizontal. (iii) *Ligular process.* Present on both sides, one dentoid and the other indicated.

4. ARRANGEMENT (i) *Number.* Scanty. (ii) *Carriage.* Erect with tips drooping. (iii) *Top.* Compact.

D. CANE

1. GENERAL—Medium, straight, oval in cross section, internal tissue greenish white; rind hard ; solid.

2. COLOUR—Yellow with greenish tinge ; growth ring yellowish ; root zone yellowish.

3. JOINT—(i) *Shape and markings.* Cylindrical ; splits absent ; ivory markings absent ; bud groove common, short, shallow ; heavy bloom throughout the joint. (ii) *Wax baud.* Not distinguishable, medium, even. (iii) *Growth ring.* Medium-broad, even. (iv) *Root zone.* Medium-broad, even having three rows of staggered root eyes.

4. NODE—Even ; leaf scar not prominent, inclined, protruding below bud.

5. BUD—(i) *Size, shape and position.* Big, plump ; ovate reaching top of growth ring ; inserted at leaf scar ; hairs on top of bud prominent. (ii) *Flange.* Prominent, medium-broad, width equal throughout, arising from middle of bud. (iii) *Venation and gempore.* Nerves fairly numerous, semi-radial, converging to centre ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination not satisfactory ; shoots make an angle of 20° at two-month stage ; become fairly erect at about six months and continue to be so till harvest.

E. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thicker than those of Hemja and Chunnee but thinner than those of Co.205 and Co.213 ; at thirty days from planting, sett roots longer than those of Hemja and Chunnee but shorter than those of Co.205 and Co.213; development of shoot roots later than in Hemja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

Fairly satisfactory ; made up of numerous, long, branched roots reaching more than four feet depth ; surface roots not many ; lateral spread not much.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single and double pairs ; number of cork cells per unit area low ; solitary and pointed cork cells present ; long cells very narrow ; walls of long cells slightly wavy.

2. VARIETAL POSITION

The variety has proved suitable to the terai areas of Uttar Pradesh where the humid conditions are congenial for its growth ; was released for cultivation in Bihar also, but its erratic performance stood in the way of its becoming popular.

The variety was sent from Coimbatore to the State Stations in the year .1931.

3. AGRICULTURAL

A mid-season variety, poor in germination and tillering, but fairly heavy yielder and good in sucrose and purity.

PLATE VII



Co. 331
Patna



Co. 349
Palur



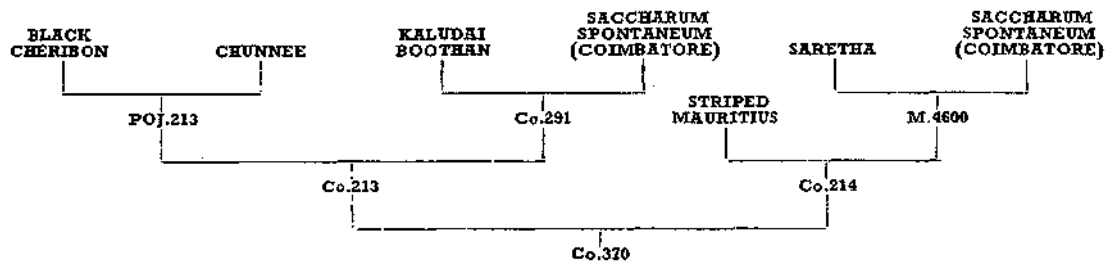
Co. 356
Sardarnagar

Early growth not marked ; fairly heavy yielder, the individual weight of canes making up the yield in spite of low tillering ; shows a set back in tillering in the absence of early earthing ; poor ratooner ; suited to heavy soil particularly the *Bhat* soil of Eastern Uttar Pradesh where the calcium in the upper strata retains moisture ; requires good conditions of manuring and irrigation for heavy yield ; gur of satisfactory quality ; shows high resistance to borers ; hard rind affords protection against animals ; fairly resistant to red rot, wilt, smut during normal years, tolerant to mosaic.

9. Co. 310.

1. BOTANICAL

A. PARENTAGE



Co.213 X Co.214.—Unbagged cross. The pistil parent, Co.213, has sixty per cent. closed anthers. The pollen parent, Co.214, has ninety-seven per cent. open anthers. Co.310 has in it the complements of *Saccharum officinarum* (from Black Cheribon, Kaludai Boothan and Striped Mauritius), *Saccharum Barberi* (from Chunnee and Saretha) and *Saccharum spontaneum*.

The chromosome number is $2n = 120-122$.

B. HABIT AND GENERAL APPEARANCE

A good stand of erect, medium canes with the barrel shaped joints and constricted wax band showing out through the easily stripping leaf sheaths ; foliage abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Dark green. (ii) *Length and width*. Long; of medium width.

2. SHEATH—(i) *General*. Green with purplish blotches and longitudinal splits ; slight bloom ; scarious border prominent. (ii) *Clasping*. Loose. (iii) *Spines*. Absent.

3. BLADE JOINT—(i) *Transverse mark*. Light green, wide, slight bloom. (ii) *Ligule*. Shallow, crescentiform the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Present on both sides, one dentoid and the other indicated.

4. ARRANGEMENT—(i) *Number*. Abundant. (ii) *Carriage*. Erect. (iii) *Top*. Compact.

D. CANE

1. GENERAL—Medium, slightly staggered, round in cross section, internal tissue yellowish green : rind rather soft ; solid.

2. COLOUR—Ochre yellow with greenish tinge ; growth ring concolorous ; root zone concolorous.

3. JOINT—(i) *Shape and markings*. Tumescence ; splits occasional, when present short and deep ; ivory markings absent ; weather markings present ; bud groove common, short, shallow ; slight bloom throughout the joint. (ii) *Wax band*. Clearly distinguishable, narrow, constricted. (iii) *Growth ring*. Medium-broad, slightly swollen. (iv) *Root zone*. Broad, even having 2-3 rows of rather regular root eyes which are bulging.

4. NODE—Even ; leaf scar prominent, slightly inclined, slightly protruding below bud.

5. BUD—(i) *Size, shape and position*. Medium, rather flat ; ovate reaching top of growth ring ; inserted at leaf scar, (ii) *Flange*. Not prominent, medium-narrow, width equal throughout, arising from middle of bud. (iii) *Venation and gerpore*. Nerves numerous, parallel, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination fair ; shoots make an angle of 60° at two-month stage, become erect at seven months and are erect at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thicker than those of Hemja and Chunnee and as thick as those of Co.205 and Co.213 ; at thirty days from planting, sett roots longer than those of Hemja, Chunnee, Co.205 and Co.213 ; development of shoot roots earlier than all the four.

G. ADULT ROOT SYSTEM

Very well adapted for surface and deep feeding ; a large number of roots penetrate to four feet or more ; surface roots fairly numerous ; lateral spread good.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single and double pairs ; number of cork cells per unit area low ; solitary cork cells absent ; pointed cork cells present and long ; long cells narrow ; walls of long cells highly wavy.

2. VARIETAL POSITION

This variety was once the main cane in Eastern Uttar Pradesh, but now occupies only about 2,500 acres having been replaced by Co.513 which is becoming more popular in view of its capacity to grow well under conditions of waterlogging.

It was sent from Coimbatore to the State Stations in the year 1932.

3. AGRICULTURAL

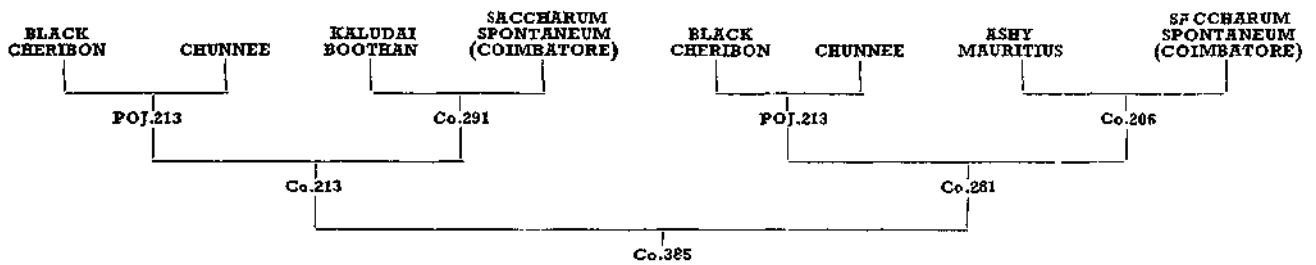
A heavy yielding general purpose cane of good field habit ; mid-season in ripening.

Early vigour good ; tillering good ; heavy yielder ; quite suited to the soil and climatic conditions of Eastern Uttar Pradesh ; responds satisfactorily to higher doses of manuring and irrigation ; susceptible to usar (*i.e.*, alkaline) soils ; mid-season cane with fair sucrose content, fit for crushing by the middle of January ; maintains purity till end of March ; fibre content moderate ; fairly resistant to red rot and wilt ; tolerant to smut and mosaic ; gur of satisfactory quality.

10. Co. 385.

1. BOTANICAL

A. PARENTAGE



Co.213 X Co.281.—Unbagged cross. The pistil parent, Co.213, has sixty per cent. closed anthers. The; pollen parent, Co.281, has ninety per cent open anthers. Co.385 has in it the complements of *Sacchayum officinarum* (from Black Cheribon, Kaludai Boothan and Ashy Mauritius), *Saccharim Barberi* (from Chunnee) and *Sacchayum spontaneum*.

The chromosome number of Co.385 is $2n = 118$ which represents the sum of the haploid number of the pistil parent, Co.213 ($n = 59$) and the pollen parent, Co.281 ($n = 59$).

B. HABIT AND GENERAL APPEARANCE

A gappy mass of semi-erect purplish canes with heavy bloom and weather markings ; foliage abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Dark green. (ii) *Length and width*. Long; of medium width.

2. SHEATH—(i) *General*. Younger sheaths greenish purple, older ones complete purple ; heavy bloom ; scarious border not prominent. (ii) *Clasping*. Tight. (iii) *Spines*. Absent.

3. BLADE JOINT—(i) *Transverse mark*. Green, big, slight bloom. (ii) *Ligule*. Shallow, crescentiform the width decreasing gradually towards the edges, symmetrical, slightly sloping. (iii) *Ligular process*. Absent.

4. ARRANGEMENT—(i) *Number*. Abundant. (ii) *Carriage*. Erect with tips drooping. (iii) *Top*. Compact.

D. CANE

1. GENERAL—Medium, straight, round in cross section, internal tissue greenish ; rind hard ; solid.

2. COLOUR—Purple ; growth ring purple ; root zone purplish yellow turning purple in bottom joints.

3. JOINT—(i) *Shape and markings.* Cylindrical ; splits common, long and deep ; ivory markings absent; weather markings common and characteristic ; bud groove common, long extending to half the length of joint, shallow ; fairly heavy bloom throughout the joint. (ii) *Wax band.* Clearly distinguishable, narrow, constricted. (iii) *Growth ring.* Medium, slightly swollen. (iv) *Root zone.* Broad, slightly swollen having two rows of staggered root eyes which are few.

4. NODE—Slightly swollen ; leaf scar not prominent, straight, slightly protruding below bud.

5. Bun (i) *Size, shape and position.* Big, plump ; ovate, sometimes tending to roundish shape, reaching growth ring ; inserted at leaf scar. (ii) *Flange.* Not prominent, medium, width equal throughout, arising from middle of bud. (iii) *Venation and gempore.* Nerves numerous, radial, converging to centre ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination tardy; shoots make an angle of 30° at two-month stage, become fairly erect at six months and continue to be so till harvest.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thinner than those of Co.205 and Co.2.13 and as thick as that of Chunnee ; at thirty days from planting, sett roots longer than those of Chunnee, but shorter than those of Co.205 and Co.213 ; development of shoot roots later than in Hemja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

Fairly good from the point of view of tapping surface as well as deeper layers of soil; many strong thick roots penetrate upto a depth of four feet ; surface roots fairly numerous ; lateral spread fairly satisfactory.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single pairs; number of cork cells per unit area low; solitary and pointed cork cells present ; long cells medium in width ; walls of long cells fairly straight.

2. VARIETAL POSITION

This variety showed some promise in Central Uttar Pradesh as an early cane giving better yield than Co.313. But its germination is poor and the stand gappy and as such it is not now in favour on account of this as also due to its high susceptibility to wilt. It occupies only about 000 acres in Deoria district in Eastern Uttar Pradesh.

It was sent from Coimbatore to the State Stations in the year 1932.

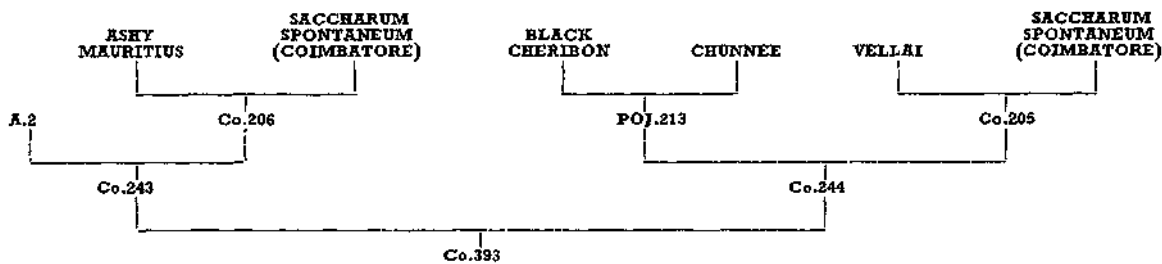
3. AGRICULTURAL

A fairly vigorous cane of gappy stand ; suffers much by late planting ; does not respond to heavy doses of manure and irrigation ; withstands drought and frost ; sucrose content good, the cane being ready for crushing in January ; tolerant to all the three borers ; fairly resistant to red rot and smut, highly susceptible to wilt and tolerant to mosaic.

11. Co. 393.

1. BOTANICAL

A. PARENTAGE



Co.243 x Co.244.—Unbagged cross. The pistil parent, Co.243 has sixty per cent. open anthers, but Co.244 pollen was dusted immediately after flower opening. The pollen parent, Co.244, has ninety-eight per cent. open anthers. Co.393 has in it the complements of *Saccharum officinarum* (from Ashy Mauritius, Black Chcribon and Vellai), *Saccharum Barberi* (from Chiinnee) and *Saccharum spontanem*.

B. HABIT AND GENERAL APPEARANCE

A fairly good stand of erect canes with swollen nodes and fairly abundant foliage.

C. LEAF

1. LAMINA—(i) *Colour*. Light green. (ii) *Length and width*. Long ; of medium width.

2. SHEATH—(i) *General*. Light green with purplish blotches ; fair bloom ; scarious border prominent. (ii) *Clasping*. Tight. (iii) *Spines*. Sparse in the middle of sheath.

3. BLADE JOINT—(i) *Transverse mark*. Green with pinkish tinge, medium, glaucous. (ii) *Ligule*. Shallow, crescentiform, the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Indicated on both sides.

4. ARRANGEMENT—(i) *Number*. Medium-abundant. (ii) *Carriage*. Younger leaves with tips drooping with a sharp curve ; older ones drooping with a broad curve. (iii) *Top*. Compact.

D. CANE

1. GENERAL—Medium, staggered, round in cross section, internal tissue greenish white ; rind fairly hard ; solid.

2. COLOUR—Green with yellowish tinge at the bottom of joint ; growth ring yellowish, sometimes with brownish tinge ; root zone yellowish.

3. JOINT—(i) *Shape and markings*. Cylindrical with swollen nodes ; splits common, long, deep ; ivory markings sparse ; bud groove common, short, shallow ; slight bloom throughout

the joint. (ii) *Wax band*. Clearly distinguishable, narrow, slightly swollen. (iii) *Growth ring*. Medium, slightly swollen. (iv) *Root zone*. Medium, even having 2-3 rows of staggered root eyes.

4. NODE—Swollen; leaf scar not prominent, slightly inclined.

5. BUD—(i) *Size, shape and position*. Medium, plump; ovate, reaching growth ring; inserted slightly above leaf scar. (ii) *Flange*. Fairly prominent, medium, width equal throughout, arising slightly above middle of bud. (iii) *Venation and gempore*. Nerves numerous, parallel, converging to top; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination fairly good; shoots make an angle of 50° at two-month stage, become fairly erect at seven months and remain so at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnee, Co.205 and Co.213; sett roots thicker than those of Hemja and Chunnee and as thick as those of Co.205 and Co.213; at thirty days from planting, sett roots longer than those of Hemja, Chunnee and Co.205 but shorter than those of Co.213; development of shoot roots later than in Hemja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

Characterised by deeply penetrating roots reaching four feet; superficial roots many; lateral spread satisfactory.

H. STEM EPIDERMAL PATTERN

A regular pattern of cork silica cells strictly in single pairs; number of cork cells per unit area low; solitary cork cells present; pointed cork cells absent; long cells fairly narrow; walls of long cells highly wavy.

2. VARIETAL POSITION

This is one of the secondary varieties in Eastern Uttar Pradesh where it suits the climatic conditions. It occupies about 30,000 acres.

It was sent from Coimbatore to the State Stations in the year 1932.

3. AGRICULTURAL

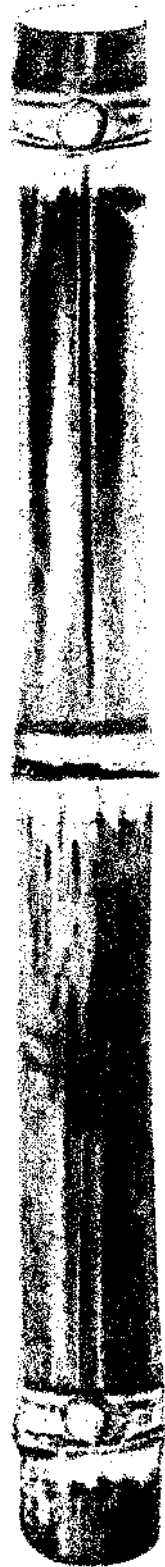
A fairly heavy yielding variety of good field and mill yard habit; mid-season in ripening.

Early vigour not marked; tillering fairly good; mid-season in ripening with good juice quality which is at its peak in January; gur of satisfactory quality; resistant to stem and root borers; very susceptible to top borer; resistant to red rot, susceptible to smut, fairly resistant to wilt and tolerant to mosaic.

PLATE VIII



Co. 370
Gorakhpur



Co. 385
Shahjahanpur

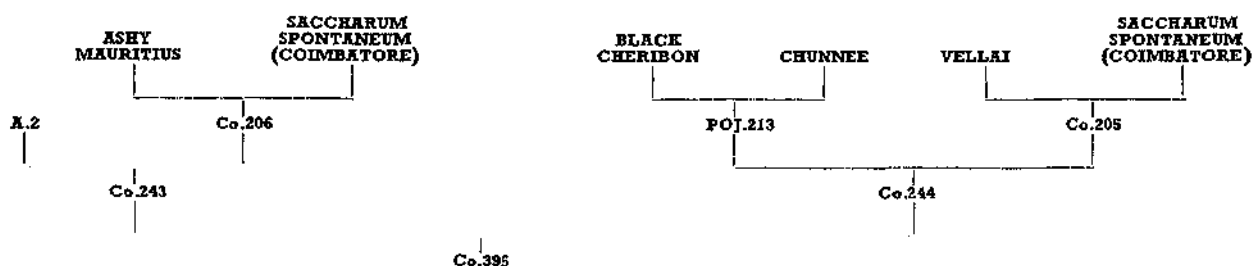


Co. 393
Gorakhpur

12. Co. 395.

1. BOTANICAL

A. PARENTAGE



B. HABIT AND GENERAL APPEARANCE

A loose mass of fairly erect, greenish yellow canes with the conical joints and profuse ivory markings visible at the lower joints ; foliage medium-abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Light green, (ii) *Length and -width*. Long; of medium width.

2. SHEATH—(i) *General*. Green and purple; fair bloom; scarious border prominent. (ii) *Clasping*. Loose. (iii) *Spines*. Profuse throughout the back of sheath.

3. BLADE JOINT—(i) *Transverse mark*. Purplish, big, fair bloom. (ii) *Ligule*. Shallow, crescentiform, the width decreasing abruptly at the sides, symmetrical, horizontal. (iii) *Ligular process*. Present on both sides, small.

4. ARRANGEMENT—(i) *Number*. Medium-abundant. (ii) *Carriage*. Young leaves erect with tips drooping ; older ones broadly curved. (iii) *Top*. Open.

I). CANE

1. GENERAL—Medium, straight, slightly oval in cross section, internal tissue yellowish green ; rind hard ; solid.

2. COLOUR—Greenish yellow ; growth ring yellowish ; root zone yellowish.

3. JOINT—(i) *Shape and markings*. Conoidal ; splits common, long, deep; ivory markings profuse as fairly long, thin, brownish lines ; bud groove absent ; very slight bloom throughout the joint. (ii) *Wax band*. Clearly distinguishable, narrow, even. (iii) *Growth ring*. Narrow, even. (iv) *Root zone*. Medium-broad, slightly depressed having 2-3 rows of staggered root eyes.

4. NODE—Even ; leaf scar not prominent, straight, slightly protruding below bud.

5. BUD—(i) *Size, shape and position*. Medium, plump ; broadly ovate reaching growth ring; inserted at leaf scar. (ii) *Flange*. Not prominent, rather narrow, width equal

throughout, arising slightly below middle of bud. (iii) *Venation and germ-pore.* Nerves numerous, parallel, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination fairly good ; shoots make an angle of 60° at two-month stage, become fairly erect at seven months and continue to be so till maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots as thick as those of Chunnee and thinner than those of Co.205 and Co.213 ; at thirty days from planting, sett roots longer than those of Hemja, Chunnee and Co.205 and as long as those of Co.213; development of shoot roots later than in Co.213 but earlier than in Hemja, Chunnee and Co.205.

G. ADULT ROOT SYSTEM

Well adapted for tapping deeper layers of soil having long thick roots reaching three feet or more ; superficial roots not many ; lateral spread good.

H. STEM EPIDERMAL PATTERN

Characterised by the presence of a large number of solitary cork cells ; number of cork cells per unit area high ; solitary and pointed cork cells present ; long cells narrow ; walls of long cells straight.

2. VARIETAL POSITION

This variety was occupying a fair acreage in Eastern Uttar Pradesh and North Bihar but has now been relegated to a minor position. It has been completely replaced by Co.513 in Saran district of North Bihar and occupies only about 20,000 acres in Eastern Uttar Pradesh. It was preferred to Co.313 in view of its better yield and suitability to waterlogged conditions.

It was sent from Coimbatore to the State Stations in the year 1932.

3. AGRICULTURAL

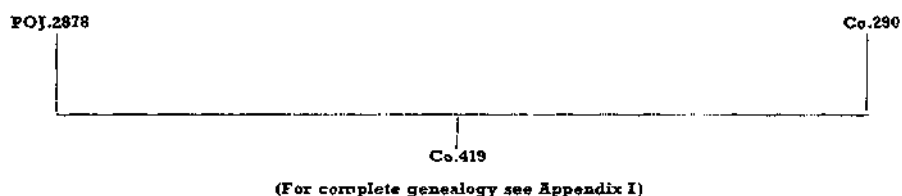
A medium-early variety giving fairly good yield and showing high resistance to borers.

Early stand tardy and tillering restricted but shows good response after the monsoon when heavy tillering results ; fairly good yield ; satisfactory ratooner ; prefers light soils and does well under usar (*i.e.*, alkaline) soils and waterlogged conditions ; comes up well under good conditions of manuring and irrigation and falls in yield when these are not optimum ; phosphate manuring has been found to be beneficial ; moderate in sucrose content and can be crushed from early January onwards ; juice quality at its best in March and maintained till early April ; fibre content high with high calorific value ; suited both to white sugar and gur manufacture ; as good as Co.313 from factory point of view ; gur of fairly good quality being light reddish, hard, crystalline and sweet in taste ; resistant to stem and top borers ; little damage by jackals and wild animals due to hard rind ; fairly resistant to red rot. and wilt, susceptible to smut and tolerant to mosaic.

13. Co. 419.

1. BOTANICAL

A. PARENTAGE



POJ.2878 X Co.290.—Unbagged cross. The pistil parent, POJ.2878 has ninety per cent, open anthers. The (lowers open late and pollen of Co.290 was dusted immediately after flower opening. The pollen parent, Co.290, has eighty-live per cent. open anthers. Co.419 has in its composition the complements of *Sacchanim officinarum* (from Black Cheribon, Bandjer-massing Hitam, Loethers, Lahaina, Fidji, Kaludai Boothan and White Transparent), *Saccliarum Barberi* (from Clumnee) and *Saccliarum spontaneum* (from Coimbatore and Java forms).

The chromosome number is $2n = 118$.

B. HABIT AND GENERAL APPEARANCE

A very good stand of slightly spreading, thickish canes with the purplish colour and weather markings showing out of the easily separating, purplish, heavily spiny leaf sheaths ; foliage abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Dark green. (ii) *Length and width*. Long ; broad.
2. SHEATH—(i) *General*. Greenish purple ; heavy bloom ; scarious border narrow. (ii) *Clasping*. Loose. (iii) *Spines*. Profuse throughout the back of sheath.
3. BLADE JOINT—(i) *Transverse mark*. Purple, big, slight bloom. (ii) *Ligule*. Shallow, crescentiform, the width decreasing gradually towards the edges, symmetrical, slightly sloping. (iii) *Ligular process*. Present on one side, dentoid.
4. ARRANGEMENT—(i) *Number*. Abundant. (ii) *Carriage*. Younger leaves with sharp curve at tips ; older ones broadly curved. (iii) *Top*. Open.

D. CANE

1. GENERAL—Medium-thick to thickish, slightly staggered, slightly oval in cross section, internal tissue light green ; rind soft ; solid.
2. COLOUR—Green with purple tinge turning complete purple on exposure ; growth ring concolorous ; root zone yellowish tending to become concolorous in bottom joints.
3. JOINT—(i) *Shape and markings*. Cylindrical, often obconoidal ; splits absent ; ivory markings absent ; weather markings common and characteristic ; bud groove indicated, short,

shallow ; heavy bloom throughout the joint. (ii) *Wax band*. Not distinguishable, often merging with general bloom, medium, constricted. (iii) *Growth ring*. Medium, even. (iv) *Root zone*. Medium, even or slightly swollen having 2-3 rows of rather regular root eyes.

4. NODE—Depressed; leaf scar not prominent, straight sometimes slightly inclined, slightly protruding below bud.

5. BUD—(i) *Size, shape and position*. Medium, fairly plump ; ovate reaching the growth ring ; inserted at leaf scar ; hairs present at base. (ii) *Flange*. Not prominent, narrow, width equal throughout, arising from middle of bud. (iii) *Venation and gerpore*. Nerves rather few, parallel, converging to top ; germination apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 75° at two-month stage ; tend to spread out at seven months and lodge at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in E.K.28, 247 B and POJ.2878 and less than in Purple Mauritius and Pundia. Sett roots thicker than all the above varieties ; at thirty days from planting, sett roots longer than those of E.K.28, 247 B, POJ.2878, Purple Mauritius and Pundia. Development of shoot roots earlier than all the five.

G. ADEPT ROOT SYSTEM

A very satisfactory root system, well suited for tapping surface and deeper layers of soil ; deep roots, extending upto three feet and more, are numerous as also surface feeding ones ; lateral spread good.

H. STEM EPIDERMAE PATTERN

Characterised by the presence of a combination of two cork and one silica cell as one unit ; number of cork cells per unit area high ; solitary cork cells per unit area high ; solitary cork cells absent ; pointed cork cells present ; long cells narrow ; walls of long cells fairly wavy.

2. VARIETAL POSITION

This cane enjoys an almost universal popularity in tropical India, a position which has not been attained by any local or introduced varieties previously. It is now the dominant cane both for gur and factory areas in the States of Bombay and Madras and is also the main cane in the factory areas of Hyderabad and Mysore. It is also grown to a certain extent in Orissa, Assam, Madhya Pradesh and West Bengal as also in Eastern Uttar Pradesh where it occupies about 22,000 acres. It is also getting into cultivation in North Bihar in gur areas where tube well irrigation facilities are available.

The variety was released from Coimbatore to the State Stations in the year 1933.

3. AGRICULTURAL

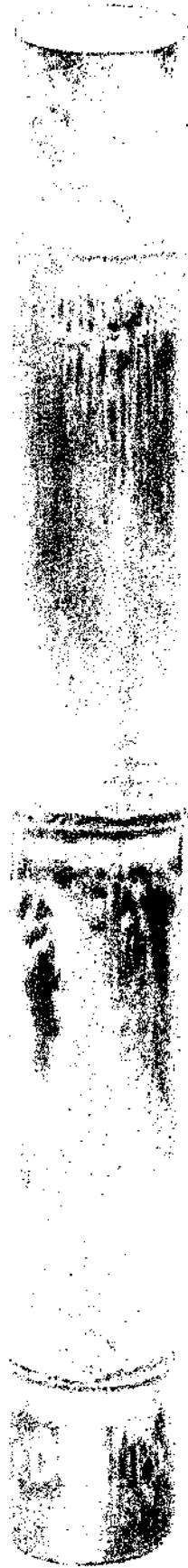
A vigorous, heavy yielding, thickish variety, fairly good in tillering and with fairly good sucrose.

Good germinator with marked early vigour, cane formation being noticeable very early in the age of the crop ; moderate tillering and has a tendency to formation of late shoots ; heavy yielding variety, the high weight of individual canes making up the tonnage ; in Madras State gives an average yield of 900-1,000 maunds (about 37 tons) of cane per acre and in favourable

PLATE IX



Co. 395
Pusa



Co. 419
Palur



Co. 419
Anakapalle

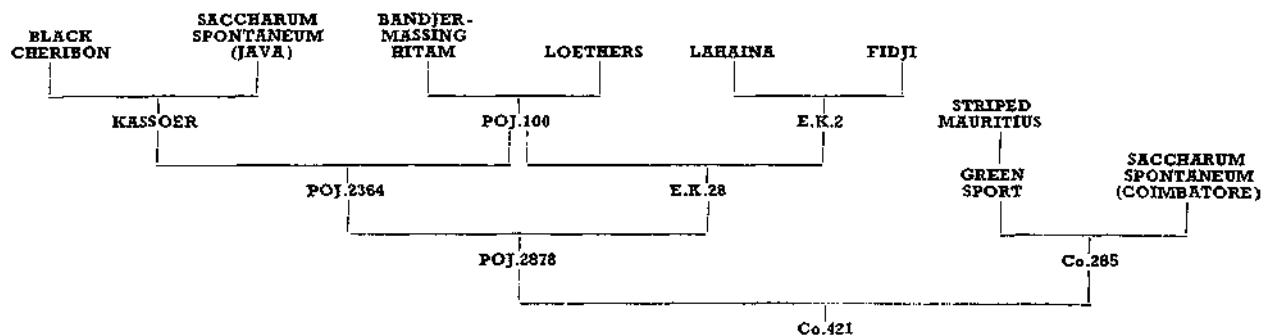
situations yields of over 1,500 maunds (about 55 tons) are not uncommon. In Bombay, the plant crop (12 months) yields 900-1,200 maunds of cane per acre, the *adsali* crop (18 months) 1,200-1,500 maunds and the ratoon crop 600-700 maunds ; a good ratooner ; grows well in all kinds of soils, light as well as heavy ; is at its best in soils of medium depth and in soils with a fairly high pH ; has proved good for chopan or alkaline soils ; responds well to intensive cultivation and to manuring ; very suitable for factory supply where it could be liberally manured as also to farmers who can afford a liberal supply of manure ; early manuring particularly helpful both for tiller formation and good development of cane ; also capable of growing under somewhat restricted conditions of irrigation ; withstands waterlogging and suitable to lands liable to submersion during monsoon months ; good variety as regards sucrose content (18 to 19 per cent. in juice); in Madras State matures in 11 1/2 months when planted in February ; quality of juice maintained till April after which it deteriorates rapidly ; in Bombay, *adsali* crop matures by mid-December, though the crushing is started by end of October ; the Bombay factories mix Co.419 and POJ.2878 and crush them together, the proportion varying in different factories ; low fibre content ; juice works normally in clarification process ; good variety from the factory point of view ; gives high recovery and has given *is* -8 tons of sugar per acre in the Bombay area ; jaggery yellowish brown in colour, fairly hard, crystalline, saltish to taste and keeps well ; in Madras has given 5-6 tons of jaggery per acre, the recovery being 12-13 per cent. on cane weight ; susceptible to stem and top borer, pyrilla and mealy bugs ; susceptible to animal attack due to soft rind ; resistant to red rot, susceptible to wilt, mosaic and smut.

The only defect with this otherwise good variety is its lodging habit and tendency to snap consequent on its being brittle.

14 Co.421.

1. BOTANICAL

A. PARENTAGE



POJ.2878 x Co.285.—Unbagged cross. In the previous publications from this Station, the parentage of this cane has been shown as POJ.2878 x B.3412 as in the open pollinated cross, the pollen of B.3412 was dusted. The chromosome number of Co.421 is $2n = 118$ and if POJ.2878 has contributed $n = 62$ then, it is very improbable that B.3412 would have been the pollen parent. The plan of crosses in the year in which the cross was effected has therefore been looked into once again, and the records show that in one and the same row of POJ.2878

from which the seed was collected, two crosses were effected but "with different arrows, viz., POJ.2878 .- B.:U12 and POJ.2878 \ Co.285. If Co.285 is taken as the pollen parent, the chromosome number would tally, POJ.2878 (pistil parent, $n = 62$) and Co.285 (pollen parent, $n = 56$) giving $2n = 118$ of Co.421. Since Co.285 was also used as pollen parent in the same row, it is likely that Co.421 may have resulted from chance pollinating by Co.285 though actually only B.3412 pollen was dusted on that arrow. There is no knowledge at present, whether POJ.2878 is capable of contributing gametes other than the reduced or unreduced gametes and unless further study reveals that POJ.2878 is capable of contributing gametes with $n = 78$, it may be assumed that the parentage of Co.421 is POJ.2878 x Co.285.

Co.421 has in it the complements of *Saccharum officinarum* (from Black Cheribon, Bandjermassing Hitam, Loethers, Lahaina, Fidji and Striped Mauritius) and *Saccharum spontaneum* (from Coimbatore and Java, forms).

B. HABIT AND GENERAL APPEARANCE

Quite an imposing stand of erect canes with the lower joints exposed due to the easily separating leaf sheaths ; foliage medium-abundant.

C. LEAF

1. LAMINA - (i) *Colour*. Light green. (ii) *Length and width*. Long; broad.
2. SHEATH (i) *General*. Green with purplish blotches; slight bloom; scarious border narrow. (ii) *Clasping*. Loose. (iii) *Spines*. Sparse throughout the sheath.
3. BLADE JOINT (i) *Transverse mark*. Light green, big, slight bloom. (ii) *Ligule*. Medium, deltoid the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Present on both sides, one prominent and lanceolate and the other dentoid.
4. ARRANGEMENT (i) *Number*. Medium-abundant. (ii) *Carriage*. Young leaves erect with sharp curve near the tips ; older ones broadly curved. (iii) *Top*. Open.

D. CANE

1. GENERAL.....Medium, straight, round in cross section, internal tissue yellowish green ; rind hard ; pith with central cavity.
2. COLOUR- -Greenish yellow turning ivory yellow on exposure ; growth ring yellow or yellowish brown ; root zone whitish yellow.
3. JOINT.....(i) *Shape and markings*. Cylindrical ; splits occasional, when present long and deep ; ivory markings absent ; bud groove occasional, short, shallow ; fair bloom throughout the joint. (ii) *Wax band*. Distinguishable, medium, constricted. (iii) *Growth ring*. Medium-broad, slightly swollen, (iv) *Root zone*. Broad, even having 2-3 rows of staggered root eyes which are somewhat prominent.
4. NODE...Slightly swollen, leaf scar prominent, slightly inclined, slightly protruding below bud.
5. BUD—(i) *Size, shape and position*. Fairly big, plump ; obovate or rhomboid, reaching bottom of growth ring, rarely extending beyond ; inserted at leaf scar. (ii) *Flange*. Fairly prominent ; medium, broader at base, arising from middle of bud, hairs present on top. (iii) *Venation and gempore*. Nerves few, parallel, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 75° at two-month stage. This erect habit is maintained until harvest.

F. SETT AND SHOOT ROOTS

Total number of root eyes greater than in Hemja, Chunnee, Co.205 and Co.213 sett roots thicker than those of all the four ; at thirty days from planting, sett roots longer than those of Hemja, Clumnee, Co.205 and Co.213 ; development of shoot roots earlier than all the four.

G. ADULT ROOT SYSTEM

A good root system, well suited for tapping surface and deeper layers of soil ; deep roots extending upto three feet and more are numerous as also surface feeding roots ; lateral spread good.

H. STEM EPIDERMAL PATTERN

Regular pattern of cork silica cells in single pairs ; number of cork cells per unit area, high ; solitary and pointed cork cells present ; long cells narrow ; walls of long cells highly wavy.

2. VARIETAL POSITION

The variety occupies extensive areas in Central Uttar Pradesh and is one of the main canes in Orissa and West Bengal. It is also grown to a limited extent in Madras, Andhra, Bombay and East Punjab. In Orissa it has been found very suitable to areas liable to attack by wild boars.

The variety was sent from Coimbatore to the State Stations in the year 1934.

3. AGRICULTURAL

A vigorous cane with good field and mill yard habit ; heavy yielder with fairly good sucrose.

All round cane with good germination, growth and stand ; vigorous early growth and cane formation noticeable fairly early ; upright erect habit till harvest time ; good tillering with a tendency to formation of shoots late in the season ; heavy yielder, the fair number of tillers and moderate weight of individual canes making up the yield ; suited to all types of soil, both light and heavy and comes up well in partially drained soils ; is at its best in sandy loam.; shows very good response to manuring at the same time coming up fairly well with less of manure ; does well among medium varieties under poor conditions ; responds well to liberal irrigation ; is found quite cheerful in growth during the dry weather ; withstands drought and frost ; a mid-season cane with fairly good sucrose content ; ripens in January and maintains its juice quality till March ; has high fibre content ; gur of fair quality being light brown, hard, crystalline and sweet to taste ; fairly resistant to all the three borers and pyrilla ; resists the attack of jackals and wild animals due to the hard rind ; resistant to red rot, susceptible to wilt, smut and mosaic.

The defect with this variety is that it develops pith late in the season, especially after arrowing, which causes reduction in tonnage.

15. Co. 449.

1. BOTANICAL

A. PARENTAGE

POJ.2878

Co.331

Co.449

(For complete genealogy see Appendix I)

POJ.2878 x Co.331. -Unbagged cross. The pistil parent, POJ.2878, has ninety per cent, open anthers. The flowers open late and pollen of Co.331 was dusted immediately after flower opening ; the pollen parent, Co.331, has cent, per cent, open anthers. Co.449 has in it the complements of *Saccharum officinarum* (from Black Cheribon, Bandjerniassing Hitam, Loethers, Lahaina, Fidji, Kaludai Boothan and Striped Mauritius), *Saccharum Barberi* (from Chunnee and Saretha) and *Saccharum spontaneitm* (from Coimbatore and Java forms).

The chromosome number is $2n = 118$.

B. HABIT AND GENERAL APPEARANCE

A good stand of erect, medium canes with slightly swollen nodes ; foliage medium-abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Light green, (ii) *Length and width*. Long; broad.
2. SHEATH—(i) *General*. Light green ; fair bloom ; scarious border prominent, (ii) *Clasping*. Loose, (iii) *Spines*. Sparse.
3. BLADE JOINT—(i) *Transverse mark*. Light green with purplish tinge, big, glaucous. (ii) *Ligule*. Shallow, crescentiform, the width decreasing gradually towards the edges, symmetrical, slightly sloping. (iii) *Ligular process*. Indicated on both sides.
4. ARRANGEMENT—(i) *Number*. Medium-abundant, (ii) *Carriage*. Erect with tips drooping. (iii) *Top*. Compact.

D. CANE

1. GENERAL—Medium to medium-thick, straight, slightly oval in cross section, internal tissue yellowish ; rind hard ; solid.
2. COLOUR—Greenish yellow, the later colour mostly confined to the bottom portion of joint ; growth ring yellow ; root zone yellow.
3. JOINT—(i) *Shape and markings*. Cylindrical, rarely obconoidal, slightly flattened on side with bud ; splits absent ; ivory markings absent; bud groove common, short, shallow; fair bloom throughout the joint, (ii) *Wax band*. Distinguishable, wide, slightly constricted.

(iii) *Growth ring*. Medium, swollen, (iv) *Root zone*. Medium, even having two rows of regular root eyes.

4. NODE—Even ; leaf scar not prominent, straight.

5. BUD—(i) *Size, shape and position*. Rather small, flat ; ovate reaching bottom of growth ring ; inserted at leaf scar ; hairs present on top of bud. (ii) *Flange*. Fairly prominent, medium, width equal throughout, arising from middle of bud. (iii) *Venation and germpore*. Nerves numerous, parallel, converging to top ; germination apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 75° at two month stage and are fairly erect at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes less than in E.K.28, 247 B, POJ.2878, Purple Mauritius and Pundia ; sett roots thicker than those of E.K.28, 247 B, Purple Mauritius and Pundia, but thinner than those of POJ.2878 ; at thirty days from planting, sett roots longer than those of E.K. 28,247 B, Purple Mauritius and Pundia and less than those of POJ.2878 ; development of shoot roots later than in POJ.2878.

G. ADULT ROOT SYSTEM

Fairly satisfactory; roots do not penetrate deep, but lateral spread good ; a fair number of surface roots present.

H. STEM EPIDERMAL PATTERN

Regular pattern of cork silica cells in single pairs ; number of cork cells per unit area low ; solitary cork cells absent ; pointed cork cells present ; long cells broad ; walls of long cells highly wavy.

2. VARIETAL POSITION

This variety is coming up well in Madras State in North Arcot and South Arcot districts where it is popular in view of its earliness and superior keeping quality of jaggery. About 2,000 acres are in cultivation under this variety in Krishna district of Andhra State.

It was sent from Coimbatore to the State Stations in the year 1938.

3. AGRICULTURAL

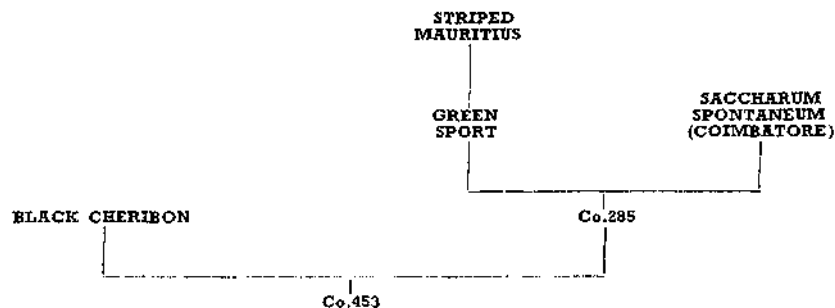
A tall variety with late vigour and good tillering ; fairly heavy yielder with good sucrose content early in the season.

Early vigour not marked upto August, but gives good stand after monsoon ; cane formation not early ; few late shoots ; fairly heavy yielder, the large number of tillers and the weight of individual canes making up the yield ; not a good ratooner ; more suitable to heavy soils than to light ones ; comes up well in swampy lands and rice fields ; responds well to higher doses of manuring; fairly early in ripening attaining a sucrose content of 18 per cent, in juice in January ; quality of juice maintained at almost the same level till April, enabling its being crushed in the early, mid as well as late seasons ; fairly resistant to red rot and smut, susceptible to mosaic.

16. Co. 453.

1. BOTANICAL

A. PARENTAGE



BLACK CHERIBON • Co.285. Unbagged cross. The pistil parent, Black Cheribon, has sixty per cent, closed anthers. The pollen parent, Co.285, has ninety eight per cent, open anthers. Co.453 has in it the complements of *Saccharum officinarum* (from Black Cheribon and Striped Mauritius) and *Saccliaranni spontaneitm*.

The chromosome number is $2n - 124$.

B. HABIT AND GENERAL APPEARANCE

An imposing mass of erect, closely packed, dark green canes with the yellowish root zone and swollen nodes showing" out prominently on the self trashed lower joints ; foliage medium-abundant.

C. LEAF

1. LAMINA- (i) *Colour*. Dark green, (ii) *Length and width*. Long ; broad.
2. SHEATH- (i) *General*. Green ; heavy bloom ; scarious border broad and prominent. (ii) *Clasping*. Loose. (Hi) *Spines*. Profuse throughout the back of sheath.
3. BLADE JOINT.....(i) *Transverse mark*. Green with pinkish tinge, big, fair bloom. (ii) *Ligule*. Shallow, crescentiform the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligitlar process*. Present on both sides, one long and lanceolate, the other dentoid.
4. ARRANGEMENT.....(i) *Number*. Medium-abundant, (ii) *Carriage*. Young leaves erect with drooping tips ; older ones broadly curved. (Hi) *Top*. Compact.

D. CANE

1. GENERAL -Medium, staggered, round in cross section, internal tissue light green; rind very hard ; pith with central cavity.
2. COLOUR.....Dark green with tinge of pale yellow; growth ring pale yellow turning concolorous in bottom joints ; root zone whitish yellow.
3. JOINT—(i) *Shape and markings*. Cylindrical ; splits rare, when present long and deep ; ivory markings absent ; bud groove generally absent ; heavy bloom throughout the joint. (ii) *Wax hand*. Not clearly distinguishable, broad, even. (Hi) *Growth ring*. Medium.

swollen, (iv) *Root zone*. Broad, even having three rows of staggered root eyes which are not clearly discernible.

4. NODE 'Swollen ; leaf scar prominent, mostly straight, protruding below bud.

5. Bun-- (i) *Size, shape and position*. Medium, plump; ovate sometimes tending to become roundish, reaching bottom of growth ring ; inserted above leaf scar. (ii) *Flange*. Not prominent, narrow, wider at base, arising from middle of bud, sometimes one side better developed than the other. (iii) *Venation and gempore*. Nerves few, parallel, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 80° at two-month stage and maintain the erect stand till harvest.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Chunnee and Co.205 but less than in Hemja and Co.213 ; sett roots thicker than those of Hemja, Chunnee, Co.205 and Co.213 ; at thirty days from planting, sett roots longer than those of Hemja., Chunnee, Co.205 and Co.213 ; development of shoot roots earlier than all the four.

G. ADUET ROOT SYSTEM

An efficient root system, well adapted for surface and deep feeding ; a large number of thick roots penetrate to three feet and more. ; lateral spread good.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single pairs ; number of cork cells per unit area high ; solitary cork cells present and of rather frequent occurrence ; pointed, cork cells absent ; long cells broad ; walls of long cells medium wavy.

2. VARIETAL POSITION

Along with Co.421, the variety is now the main cane in Eastern and Central Uttar Pradesh. It was being grown in large areas in North and South Bihar but is being replaced in view of its high susceptibility to red-rot. In Western Uttar Pradesh it has not found favour with the cultivators as the gur which is of chocolate brown colour is not considered to be good in quality. Moreover, the canes are hard and difficult to crush in bullock driven mills. It is grown in about 8,000 acres in Punjab.

The variety was released from Coimbatore to the State Stations in the year 1938.

3. AGRICULTURAL

A vigorous, erect cane of good field and mill yard habit ; easy in stripping and harvesting.

Good germinator and very early grower ; cane formation early ; tillering moderate ; heavy yielder in spite of the shy tillering, this being due to the heavy weight of individual canes ; under average good conditions yields about 800 maunds (about 30 tons) of cane per acre and a maximum of 1,200 maunds per acre has been recorded under good conditions ; responds very well to intensive cultivation ; in Bihar average yield about 600 to 700 maunds per acre ; satisfactory ratooner ; in ripening mid-season to mid-season late ; moderate as regards sucrose content; serves as a mid-late cane in Western Uttar Pradesh and Central Uttar Pradesh and mid-season cant; in Eastern tracts ; in Bihar ripens about the end of December and affords economic

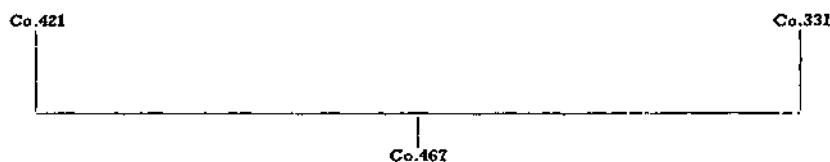
recoveries from the middle of January onwards, giving the maximum sucrose in March ; gur not good in quality ; has high fibre content ; suited to a variety of soil and climatic conditions, coming up well both in heavy as well as light soil types, but with best performance in heavy soils ; responds very well to heavy dosage of manuring ; is capable of growing under restricted water supply, but is at its best with adequate irrigation ; responds to well distributed rainfall ; withstands waterlogging but susceptible to usar (*i.e.*, alkaline) soils ; resistant to stem borer and tolerant to top borer and pyrilla ; resistant to red rot but highly susceptible to smut ; resists drought and frost ; not damaged by jackals and wild animals owing to hard rind.

The main defect with this variety is its tendency to profuse pith formation which develops into a pronounced central hollow cavity in the stalk. The buds are very delicate and get injured easily in loading and transport.

17. Co. 467.

1. BOTANICAL

A. PARENTAGE



(For complete genealogy see Appendix II)

Co.421 x Co.331.—Unbagged cross. The pistil parent, Co.421, has cent, per cent, closed anthers. The pollen parent, Co.331, has cent, per cent, open anthers. Co.467 has in it the complements of *Saccharum officinarum* (from Black Cheribon, Bandjermassing Hitam, Loethers, Lahaina, Fidji, Kaludai Boothan and Striped Mauritius), *Saccharum Barberi* (from Chunnee and Saretha) and *Saccharum spontaneum* (from Coimbatore and Java forms).

The chromosome number is $2n = 118$.

B. HABIT AND GENERAL APPEARANCE

A good stand of slightly spreading, thickish canes with the swollen nodes showing out of the separating leaf sheaths ; foliage medium-abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Light green, (ii) *Length and width*. Long ; broad.
2. SHEATH—(i) *General*. Light green ; slight bloom ; scarious border prominent in older leaves, (ii) *Clasping*. Fairly loose, (iii) *Spines*. Sparse.
3. BLADE JOINT—(i) *Transverse mark*. Light green, small, glaucous, (ii) *Ligule*. Shallow, dentoid the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Indicated on one side.
4. ARRANGEMENT—(i) *Number*. Medium-abundant. (ii) *Carriage*. Erect with drooping tips. (iii) *Top*. Fairly compact.

D. CANE

1. GENERAL—Medium-thick, sometimes thickish, staggered, round in cross section, internal tissue light green ; rind fairly soft ; solid.

2. COLOUR—Greenish yellow, yellow more pronounced in the lower half of joint; growth ring yellow with brownish tinge ; root zone yellow.

3. JOINT—(i) *Shape and markings.* Cylindrical ; splits absent ; ivory markings absent ; bud groove indicated, short, shallow ; heavy bloom throughout the joint, (ii) *Wax band.* Not distinguishable, narrow, even. (iii) *Growth ring.* Medium, even, (iv) *Root zone.* Medium, prominently swollen having two rows of sparse root eyes.

4. NODE — Swollen ; leaf scar fairly prominent, straight.

5. BUD—(i) *Size, shape and -position.* Big, plump ; broadly ovate reaching growth ring ; inserted at leaf scar, (ii) *Flange.* Prominent, wide, wider at base, arising from below middle of bud. (iii) *Venation and germ-pore.* Nerves rather few, semi-radial, converging to centre ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; at two months shoots make an angle of 75° ; at seven months tend to become spreading and at maturity are spread out.

F. SETT AND SHOOT ROOTS

Total number of root eyes less than in E.K.28, 247 B, POJ.2878, Purple Mauritius and Pundia ; sett roots thicker than those of E.K.28, 247 B, Purple Mauritius and Pundia. but thinner than those of POJ.2878 ; at thirty days from planting, sett roots longer than those of E.K.28, 247 B, Purple Mauritius and Pundia and as long as those of POJ.2878 ; development of shoot roots earlier than all the varieties.

G. ADULT ROOT SYSTEM

Quite good for tapping surface and deeper layers ; a large number of long, thick roots penetrate to four feet depth ; surface roots many ; lateral spread good with number of roots going upto three feet.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single and double pairs; number of cork cells per unit area low; solitary cork cells rare; pointed cork cells very rare; long cells broad; walls of long cells very wavy.

2. VARIETAL POSITION

This variety was found good at the testing station at Anakapalle, Andhra State and was given out for trial. It has not found favour with cultivators in view of its lesser yield than Co.419 and is now grown in a very restricted area in Salem district in Madras State.

The variety was sent from Coimbatore to the State Stations in the year 1941.

3. AGRICULTURAL

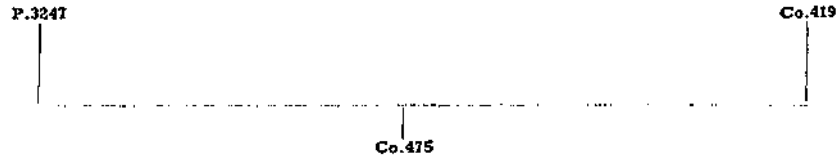
A vigorous grower with good tillering, high tonnage and fairly good sucrose.

Fairly good initial vigour and early cane, formation ; tillers well and yields high ; suited to well drained loamy soils; responds well to manuring and irrigation; resists drought and water-logging to a moderate extent ; mid-season variety with fair sucrose: content attaining 17.5 per cent sucrose and 85 per cent purity in February when it is fit for harvest ; keeps up its juice quality till April after which it deteriorates ; jaggery of reddish colour with small grains, hard ; susceptible to red rot and smut.

18. Co. 475.

1. BOTANICAL

A. PARENTAGE



(For complete genealogy see Appendix II)

P.3247 x Co.419.- Unbagged cross. The pistil parent, P.5247, has eighty per cent, closed anthers. The pollen parent, Co.419, has eighty-eight per cent, open anthers. Co.475 has in it the complements of *Saccharum officinarum* (from Black Cheribon, Bandjermassing Hitam, Loethers, Lahaina, Fidji, Kaludai Boothan, White Transparent and Striped Mauritius), *Saccharum Barberi* (from Chunnee) and *Saccharum spontaneum* (from Coimbatore and Java forms).

The chromosome number is $2n = 118$.

B. HABIT AND GENERAL APPEARANCE

A somewhat loose mass of thickish canes, slightly spread out with abundant foliage and spiny leaf sheaths.

C. LEAF

1. LAMINA—(i) *Colour*. Dark green, (ii) *Length and width*. Long; broad.
2. SHEATH— (i) *General*. Green with purplish blotches ; very slight bloom ; scarious border absent, (ii) *Clasping*. Tight, (iii) *Spines*. Present mostly in the middle of sheath.
3. BLADE JOINT—(i) *Transverse mark*. Green, big, fair bloom, (ii) *Ligule*. Shallow, crescentiform, width decreasing gradually towards the edges, symmetrical, slightly sloping, (iii) *Ligular process*. Present on one side, long, lanceolate.
4. ARRANGEMENT—(i) *Number*. Abundant, (ii) *Carriage*. Younger leaves with tips drooping with sharp curve ; older ones broadly drooping at middle of lamina, (iii) *Top*. Open.

D. CANE

1. GENERAL—Medium-thick to thickish, straight, round in cross section, internal tissue light green ; rind soft ; solid.
2. COLOUR—Yellowish green ; growth ring yellowish brown ; root zone yellow.
3. JOINT—(i) *Shape and markings*. Cylindrical with bulge opposite bud and depression just above growth ring well noticed in side view ; splits rare, when present long and deep ; ivory markings absent ; bud groove common, very prominent, shallow, long extending to f of joint ; moderate bloom throughout the joint, (ii) *Wax band*. Distinguishable, narrow, even.

PLATE XI



Co. 467
Anakapalle



Co. 475
Anakapalle

(ii) *Growth ring.* Medium, even, (iv) *Root zone.* Medium, slightly swollen having 2-3 rows of regular root eyes which are small.

4. **NODE**—Even or slightly swollen ; leaf scar straight, not prominent.

5. **BUD**—(i) *Size, shape and position.* Medium, flat ; ovate reaching growth ring ; inserted at leaf scar, (ii) *Flange.* Not prominent, narrow, width equal throughout, arising from middle of bud. (iii) *Venation and gempore.* Nerves numerous, parallel, converging to top ; germination apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots erect at two-month stage with an angle of 80°, but tend to become spread out at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes less than in F.K.28, 247 B, POJ.2878, Purple Mauritius and Pundia ; sett roots thicker than those of all the varieties except POJ.2878 ; at thirty days from planting, sett roots longer than all the five varieties ; development of shoot roots earlier than all the five.

G. ADULT ROOT SYSTEM

Good for tapping deeper layers of soil ; large number of thick roots penetrate to three feet depth ; surface roots numerous ; lateral spread satisfactory.

H. STEM EPIDERMAL PATTERN

A regular pattern of cork silica cells in single or double pairs ; number of cork cells per unit area high ; solitary cork cells absent ; pointed cork cells present ; long cells very broad ; walls of long cells slightly wavy.

2. VARIETAL POSITION

The variety was released for general cultivation in Bombay State as being superior to Co.419 in yield and quality. It did well in certain areas but has shown high susceptibility to rust in view of which, the cultivation of the variety is being discouraged. It now occupies about 5,000 acres in Bombay State.

It was sent from Coimbatore to the State Stations in the year 1942.

3. AGRICULTURAL

A promising cane of satisfactory yield and sucrose.

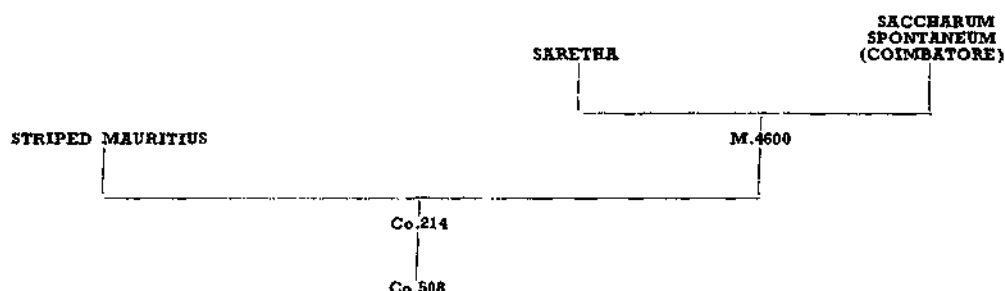
Rapid germinator with good early vigour ; cane formation early ; tillering fairly good ; heavy in yield, the large number of tillers and good weight of individual canes (heavier than Co.419) contribute to the yield ; satisfactory ratooner ; comes up very well in loamy soils ; responds well to manuring and irrigation ; mid-season in ripening with good sucrose content ; attains 18 per cent sucrose and about 90 per cent purity in February ; maintains its juice quality till April after which it deteriorates slowly ; fibre content moderate ; good variety from the factory and jaggery points of view ; gives good recovery—0.2 per cent more than Co.419 ; jaggery of good quality being light reddish in colour, hard with good grains ; shoot borer damage heavy ; fairly resistant to red rot, susceptible to smut.

The variety is good as plant cane. As *adsali* crop it may not be so suitable since it lodges after twelve months.

19. Co. 508.

1. BOTANICAL

A. PARENTAGE



Co.214 SELF.-- Unbagged self ; Co.214 has ninety-seven per cent, open anthers. Co.508 has in it the complements of *Saccharum officinarum* (from Striped Mauritius), *Saccharum Barberi* (from Chunnec) and *Saccharum spontaneum*.

The chromosome number is $2n = 124$.

B. HABIT AND GENERAL APPEARANCE

A gappy mass of short, erect canes with a terminal tuft of scanty, closely packed, fan shaped leaves ; foliage erect, the dry leaves remain sticking to the lower joints ; general appearance reminds one of the Mungo group of indigenous canes.

C. LEAF

1. LAMINA—(i) *Colony*. Light green. (ii) *Length and width*. Of medium length and width.

2. SHEATH- (i) *General*. Light green with purplish blotches especially below blade joint ; fairly heavy bloom ; scarious border narrow, (ii) *Clasping*. Tight. (iii) *Spines*. Absent.

3. BLADE JOINT—(i) *Transverse mark*. Light green with purple, big, glaucous. (ii) *Ligule*. Shallow, crescentiform, the width decreasing gradually at the sides, symmetrical, horizontal, upper margin curved. (iii) *Ligular process*. Indicated on one side.

4. ARRANGEMENT—(i) *Number*. Scanty, (ii) *Carriage*. Young leaves erect; older ones broadly curved. (iii) *Top*. Compact, fan shaped.

D. CANE

1. GENERAL—Medium, straight, oval in cross section, internal tissue yellowish green; rind hard ; solid.

2. COLOUR—Yellowish green, appearing ash coloured due to heavy bloom, turning purple on exposure ; growth ring light yellow; root zone yellowish brown.

3. JOINT—(i) *Shape and markings.* Typically straight and cylindrical ; splits absent ; ivory markings absent; bud groove common, short, shallow; heavy bloom throughout the joint, (ii) *Wax band.* Distinguishable, broad, even, (iii) *Growth ring.* Narrow, even. (iv) *Root zone.* Medium, swollen having three rows of staggered root eyes.

4. NODE—Even ; leaf scar prominent, straight, protruding below bud.

5. Bud—(i) *Size, shape and position.* Medium, plump; ovate, reaching top of growth ring ; inserted at leaf scar, (ii) *Flange.* Fairly prominent, medium, width equal throughout, arising from middle of bud. (iii) *Venation and germ-pore.* Nerves numerous, parallel, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination satisfactory; shoots erect at two-month stage and at final stand.

E. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Ghunnee, 0o.205 and Co.213 ; sett roots thicker than those of Hemja, Chunnee, Co.205 and Co.213 ; at thirty days from planting, sett roots longer than those of Hemja, Chunnee and Co.205 and as long as those of Co.213 ; development of shoot roots at the same time as those of Co.213.

G. ADULT ROOT SYSTEM

Poor with few surface feeding and deep penetrating roots ; lateral spread also poor.

H. STEM EPIDERMAL PATTERN

The pattern is a mixture of single and double pairs of cork silica cells and the occurrence of two cork cells together ; number of cork cells per unit area low ; solitary cork cells absent ; pointed cork cells present ; long cells broad ; walls of long cells fairly wavy.

2. VARIETAL POSITION

This variety is on the recommended list for North Bihar. In view of its low yield, it has never been very popular and is now completely replaced.

It was sent from Coimbatore to the State Stations in the year 1934.

3. AGRICULTURAL

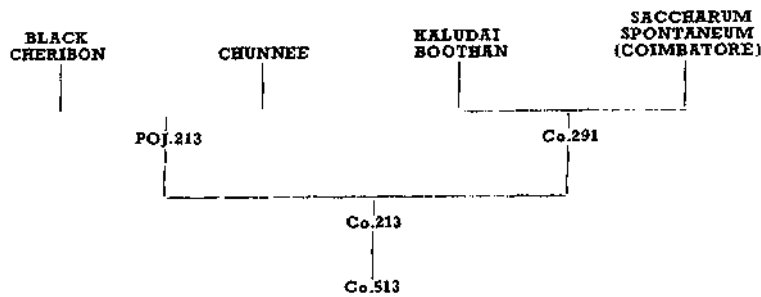
A short cane of good field habit ; rich and early in sucrose but low in yield.

Early vigour not marked ; very few late shoots ; low yielder due to poor tillering and low weight of individual canes ; yields tolerably well when planted early in the season with good manuring ; does better in heavy loam and clayey soils than in light ones ; responds well to balanced manuring and irrigation ; susceptible to usar (*i.e.*, alkaline) soils, waterlogging and bad drainage ; very early cane with rich sucrose content ; earliest to mature, enabling crushing in November ; purity increases gradually till after March after which it drops off ; deterioration slow after harvest ; fibre content high, but calorific value low ; gur of good quality, golden yellow in colour, hard, crystalline and good to taste ; highly susceptible to top borer and mealybugs ; tolerant to stem borer and pyrilla ; resistant to damage by animals due to hard rind ; fairly resistant to red rot, susceptible to smut.

20. Co. 513.

1. BOTANICAL

A. PARENTAGE



Co.213 G. C.—A seedling raised from an unbagged arrow of Co.213. The pistil parent, Co.213, has sixty per cent, closed anthers. Co.513 has in it the complements of *Saccharum crfficinarinn* (from Black Cheribon and Kaludai Boothan), *Saccharum Barberi* (from Chunnee) and *Saccharum spontaneum*.

The chromosome number is $2n = 106$.

The breeding plan relating to the year in which the cross was made has been looked into for an indication of the likely pollen parent. It was thought probable that Co.244, which was flowering at that time quite close to the arrows of Co.213 may be the likely pollen parent. The chromosome number now determined *viz.* $2n = 106$ shows that Co.244 is not likely to be the pollen parent. The chromosome numbers of Co.213 and Co.244 are $2n = 118$ and $2n = 118$ respectively.

B. HABIT AND GENERAL APPEARANCE

A good stand of clean canes with ivory markings and splits visible in the bottom joints ; foliage abundant with a pronounced leafy tuft.

C. LEAF

1. LAMINA—(i) *Colour*. Light green. (ii) *Length and width*. Long; of medium width.

2. SHEATH—(i) *General*. Green ; very slight bloom; scarious border absent. (ii) *Clasping*. Loosely. (iii) *Spines*. Sparse throughout the back of sheath.

3. BLADE JOINT—(i) *Transverse mark*. Light green, small, fair bloom. (ii) *Ligule*. Shallow, crescentiform, the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligidar process*. Indicated on both sides.

4. ARRANGEMENT— (i) *Number*. Abundant. (7) *Carriage*. Erect with drooping tips. (iii) *Top*. Open.

PLATE XII



Co. 508
Pusa



Co. 513
Pusa

D. CANE

1. GENERAL--Medium, sometimes medium-thin, straight, oval in cross section, internal tissue greenish ; rind hard ; solid.

2. COLOUR—Greenish yellow with brick red blotches ; growth ring light yellow ; root zone light yellow.

3. JOINT—(i) *Shape and markings.* Cylindrical with prominent constriction at the wax band region giving the appearance of a bottle-neck ; splits common, short, shallow ; ivory markings profuse as short, thin, straight lines ; bud groove absent ; fairly heavy bloom throughout the joint. (ii) *Wax band.* Not clearly distinguishable, narrow, constricted. (iii) *Growth ring.* Medium, even, (iv) *Root, zone.* Medium, even having two rows of regular root eyes.

4. NODE- Even ; leaf scar prominent, inclined, protruding below bud.

5. BUD—(i) *Size, shape and position.* Medium., fairly plumpy ; ovate reaching top of growth ring ; inserted at leaf scar, (ii) *Flange.* Fairly prominent, medium-narrow, width equal throughout, arising from middle of bud. (iii) *Venation and germ-pore.* Nerves numerous, radial, converging to centre ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination tardy ; shoots make an angle of 15° at two-month stage ; become erect at five months and present an erect stand at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Chunnee and Co.205 but less than in Hemja and Co.213 ; sett roots thicker than those of Hemja and Chunnee but thinner than those of Co.205 and Co.213 ; at thirty days from planting, sett roots longer than those of all the four ; development of shoot roots earlier than in Hemja, Chunnee and Co.205 but later than in Co.213.

G. ADULT ROOT SYSTEM

Fairly good ; surface roots sparse ; though the depth is not much, lateral spread good.

H. STEM EPIDERMAL PATTERN

The pattern is a mixture of single and double pairs of cork silica cells and the occurrence of two cork cells together ; number of cork cells per unit area high ; solitary cork cells absent ; pointed cork cells present ; long cells narrow ; walls of long cells fairly straight.

2. VARIETAL POSITION

The variety is on the approved list for North and South Bihar and Eastern Uttar Pradesh. It is replacing Co.313 as an early cane. It is superior to Co.313 in yield though less in sugar by 0.38 per cent. An advantage which this variety has over Co.313 is that it comes up well in low lying areas where Co.313 will not thrive. It is replacing other varieties in Eastern Uttar Pradesh and occupies about 37,000 acres.

The variety was released from Coimbatore to the State Stations in the year 1934.

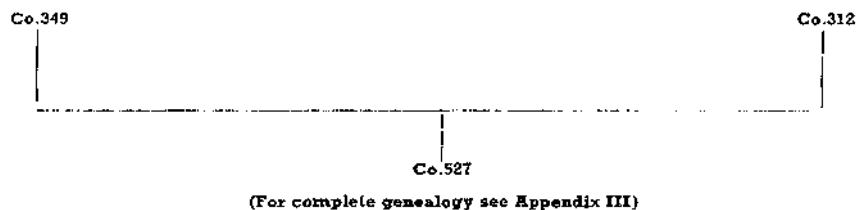
3. AGRICULTURAL

A cane of good agricultural habit, easy of stripping, loading and transport ; fair yielder ; sucrose content high, fairly early in the season.

Germination tardy, but due to profuse tillering early stand good ; good tillerer giving fair tonnage, the large number of tillers making up for the light weight of individual canes ; comes up successfully both in light and heavy soils ; best suited to low lying areas subject to flooding ; stands waterlogging admirably, but suffers in usar (*i.e.*, alkaline) soils ; stands adverse conditions well with outstanding capacity for drought resistance ; rather thrifty on manures and irrigation ; has high sucrose content from early January onwards ; juice quality reaches its peak in February and drops down by middle of Marcli. ; fibre content high ; a suitable cane for starting the factories ; recovery good ; quite suited to gur manufacture ; gur as good as that of Co.313 being golden yellow in colour, hard, crystalline and sweet to taste; resistant to stem and top borers ; resistant to red rot and susceptible to mosaic.

1. BOTANICAL

A. PARENTAGE



Co.349 x Co.312.—Unbagged cross. The pistil parent, Co.340, has ninety-five per cent, closed anthers. The pollen parent, Co.312, has ninety-eight per cent, open anthers. Co.527 has in it the complements of *Saccharum officinarum* (from Black Cheribon, Bandjermassing Hitam, Loethers, Lahaina, Fidji, Ashy Mauritius, Kaludai Boothan and Vellai), *Saccliarum Barberi* (from Chunnee) and *Saccliarum spontaneum*.

The chromosome number is $2n = 116-117$.

B. HABIT AND GENERAL APPEARANCE

A compact mass of erect, medium-thick canes with characteristic swollen nodes and big buds ; foliage medium-abundant ; leaf sheath highly spiny.

C. LEAF

1. LAMINA—(i) *Colour*. Pale green, (ii) *Length and width*. Long, broad.

2. SHEATH—(i) *General*. Light green with purplish blotches ; slight bloom ; scarious border broad and prominent. (ii) *Clasping*. Loose. (iii) *Spines*. Profuse throughout the back of sheath.

3. BLADE JOINT—(i) *Transverse mark*, Green, big, glaucous. (ii) *Ligule*. Medium, crescentiform the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligidar process*. Present on one side, dentoid.

4. ARRANGEMENT—(i) *Number*. Medium-abundant. (ii) *Carriage*. Young leaves with drooping tips ; older ones broadly curved. (iii) *Top*. Open.

I). CANE

1. GENERAL—Medium-thick, slightly staggered, round in cross section, internal tissue light green ; rind fairly soft ; pith with central cavity.

2. COLOUR—Ashy green with yellow ; growth ring yellow ; root zone yellowish.

3. JOINT—(i) *Shape and markings.* Conoidal; splits absent ; ivory markings common as small lines ; bud groove absent ; fairly heavy bloom throughout the joint, (ii) *Wax band.* Distinguishable, narrow, even, (iii) *Growth ring.* Medium; swollen, (iv) *Root zone.* Broad ; even having 3-4 rows of staggered root eyes which are prominent.

4. NODE—Swollen ; leaf scar prominent, slightly slanting, protruding below bud.

5. BUD—(i) *Size, shape and position.* Big, plump ; broadly ovate reaching the growth ring, sometimes above ; inserted at leaf scar, (ii) *Flange.* Prominent, broad, width equal throughout, arising from slightly below middle of bud. (iii) *Venation and gerpore.* Nerves few, parallel, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 80° at two-month stage and are erect at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thicker than those of Hemja, Chunnee and Co.205 but thinner than those of Co.213 ; at thirty days from planting, sett roots longer than those of Hemja, Chunnee and Co.205 but shorter than those of Co.213 ; development of shoot roots later than in Hemja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

Not well adapted for tapping deeper layers of soil ; only a few long roots penetrate to three feet and more and the number of roots few ; surface feeding roots many ; lateral spread satisfactory.

H. STEM EPIDERMAL PATTERN

The pattern is characterised by the preponderance of solitary silica cells ; cork silica cells in single pairs ; number of cork cells per unit area high ; solitary and pointed cork cells absent ; long cells narrow ; walls of long cells fairly wavy.

2. VARIETAL POSITION

The variety is grown in Central Uttar Pradesh as a substitute for Co.313 and occupies about 37,000 acres. It is being grown in the Vuyyur factory area in Andhra State and is one of the main canes in the Nellikuppam factory area in Madras State. It is one of the main varieties in West Bengal.

The variety was released from Coimbatore to the State Stations in the year 1936.

3. AGRICULTURAL

A quick growing erect cane, moderately heavy in yield and early in ripening ; leaf sheaths profusely spiny.

Early vigour marked ; tillering fairly good, the individual canes being of medium weight ; not a good ratooner ; suits light soils better and comes up well in well drained rich loam ; not

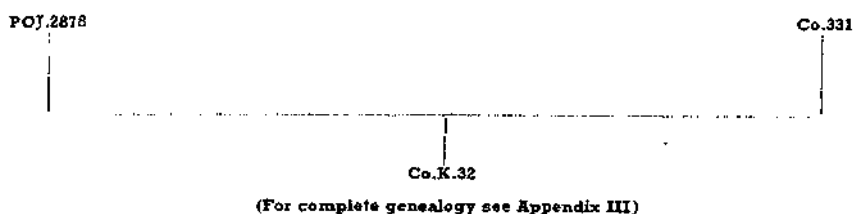
suited to waterlogged conditions ; responds well to manuring and irrigation ; does not withstand drought ; has rich juice and the quality is maintained upto April; its chief merit is its quality ; attains about 16 per cent sucrose in its juice in December and is fit for crushing as an early cane ; is good both with regard to rab and sugar giving the most economic returns ; gur of golden yellow colour, highly crystalline and hard ; susceptible to stem and root borers, fairly resistant to top borer, susceptible to pyrilla attack ; liable to attack by jackals due to soft rind ; susceptible to red rot but resistant to smut.

The drawback with this variety is that its highly spiny leaf sheaths are troublesome while harvesting.

22. Co. K. 32.

1. BOTANICAL

A. PARENTAGE



POJ.2878 x Co.331.—Unbagged cross. The pistil parent, POJ.2878, has ninety per cent, open anthers, but the flowers open late and pollen of Co.331 was dusted immediately on flower opening. The pollen parent, Co.331, has cent per cent open anthers. Co.K.32 has in it the complements of *Saccharum officinarum* (from Black Cheribon, Bandjermassing Hitam, Loethers, Lahaina, Fidji, Kaludai Boothan and Striped Mauritius), *Saccharum Barberi* (from Chunnee and Saretha) and *Saccharum spontaneum* (from Coimbatore and Java forms).

This is a seedling bred at Coimbatore and tried at the Karnal Sugarcane Sub-Station from where it was released for trial in the Provincial Farms under the name Co.K.32, the letter *K* in its name standing for Karnal.

The chromosome number is $2n = 112$.

B. HABIT AND GENERAL APPEARANCE

A good stand of erect, medium-thin canes with characteristic bobbin-shaped joints ; foliage medium-abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Light green, (ii) *Length and width*. Long, narrow.
2. SHEATH... (i) *General*. Green with purple in older leaves; slight bloom, scarious border narrow, (ii) *Clasping*. Tight. (iii) *Spines*. Sparse, mostly in the middle of sheath.
3. BLADE JOINT—(i) *Transverse mark*. Purplish, small, slight bloom, (ii) *Lignle*. Shallow, deltoid the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Indicated on both sides.

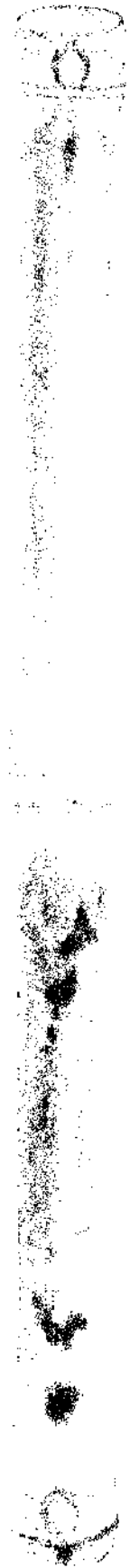
PLATE XIII



Co. 527
Chinsura



Co. 527
Anakapalle



Co. IC.32
Patna

4. ARRANGEMENT—(i) *Number*. Medium-abundant, (ii) *Carriage*. Erect with tips drooping with a sharp curve. (iii) *Top*. Compact.

I). CANE

1. GENERAL—Medium-thin, straight, round in cross section, internal tissue light green; rind hard ; solid.

2. COLOUR—Dirty green with yellow ; growth ring yellowish brown ; root zone yellowish green.

3. JOINT.....(i) *Shape and markings*. Bobbin shaped (biconcave) ; splits absent ; ivory-markings absent ; bud groove absent ; heavy bloom throughout the joint. (ii) *Wax band*. Clearly distinguishable, medium, even. (iii) *Growth ring*. Narrow, even, sometimes slightly swollen, (iv) *Root zone*. Broad, even or sometimes slightly depressed having three rows of staggered root eyes.

4. NODE—Swollen ; leaf scar not prominent, straight.

5. BUD—(i) *Size, shape and position*. Small, flat; oval reaching bottom of growth ring ; inserted at leaf scar, (ii) *Flange*. Prominent, medium, width equal throughout, arising from middle of bud, hairs present on top. (iii) *Venation and gempore*. Nerves few, parallel, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 80° at two-month stage and are of upright habit at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thicker than those of Hemja, Chunnee and Co.205, but thinner than those of Co.213 ; at thirty-days from planting, sett roots longer than those of Hemja, Chunnee and Co.205 and shorter than those of Co.213 ; development of shoot roots earlier than in Hemja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

Fairly satisfactory ; only a few roots penetrate down to three feet depth ; surface feeding roots not many ; lateral spread satisfactory.

H. STEM EPIDERMAL PATTERN

Regular pattern of cork silica cells in single pairs ; number of cork cells per unit area low ; solitary cork cells absent; pointed cork cells rare ; long cells medium in width ; walls of long cells highly- wavy.

2. VARIETAL POSITION

The variety was occupying fair acreage in South Bihar as a variety suitable for cultivation in paddy lands. Its low yield has resulted in its replacement and now occupies only about 2,000 acres in Arrah district in South Bihar.

The variety was released from Karnal to the State Stations in the year 1940.

3. AGRICULTURAL

A medium-thin variety with competitive tonnage and juice quality and well suited to heavy soil conditions and low lying areas.

Good germinator with vigorous early growth ; tillering heavy ; good yielder, the large number of tillers making up for the low weight of individual canes ; good ratooner ; suits heavy soil conditions and well suited to the low lying paddy lands of South Bihar ; withstands considerable waterlogging ; requires good manurial and irrigational conditions for normal yield ; early midseason cane with fairly good juice quality ; maximum recovery in February ; gur of moderate quality ; fibre content high ; resistant to top and stem borers ; fairly resistant to red rot and susceptible to smut.

23. Co. L. 9.

1. BOTANICAL

A. PARENTAGE



(For complete genealogy see Appendix IV)

Co.312 x Co.285.—Unbagged cross. The pistil parent, Co.312, has ninety-eight per cent, open anthers, but the flowers open late and Co.285 pollen was dusted immediately on flower opening. The pollen parent, Co.285, has ninety-eight per cent, open anthers. Co.L.9 has in it the complements of *Saccharum officinarum* (from Black Cheribon, Kaludai Boothan, Vellai and Striped Mauritius), *Saccharum Barberi* (from Chunnee) and *Saccharum spontaneum*.

The cross was effected at Coimbatore and the seeds sent to the Sugarcane Research Station at Lyallpur, Punjab, where the seedling has been raised from seed and after trial released to the cultivators in Punjab under the name Co.L.9, the letter *L* in its name standing for Lyallpur.

The Sugarcane Botanist, Lyallpur (now Sugarcane Botanist, Jullundur, P2ast Punjab), has kindly helped regarding the agricultural characteristics of this cane.

The chromosome number is $2n = 115-118$.

B. HABIT AND GENERAL APPEARANCE

A gappy stand of erect, medium canes with conoidal joints and swollen nodes ; foliage abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Light green. (ii) *Length and width*. Long; of medium width.

2. SHEATH—(i) *General*. Younger sheaths light green, older ones with purplish blotches ; heavy bloom ; scarious border prominent in older leaves. (ii) *Clasping*. Tightly. (iii) *Spines*. Absent.

3. BLADE JOINT—(i) *Transverse mark*. Light green, broad, slight bloom. (ii) *Ligule*. Shallow, crescentiform the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Present on one side, dentoid.

4. ARRANGEMENT—(i) *Number*. Abundant, (ii) *Carriage*. Erect with tips drooping. (iii) *Top*. Compact.

D. CANE

1. GENERAL—Medium, straight, round in cross section, internal tissue light green ; rind hard ; solid.

2. COLOUR—Greenish yellow, glaucous green in the upper half of joint and yellow in the lower half ; growth ring brownish yellow ; root zone bone yellow.

3. JOINT—(i) *Shape and markings*. Conoidal ; splits absent ; ivory markings absent ; bud groove absent ; moderate bloom throughout the joint, (ii) *Wax band*. Distinguishable, narrow, swollen. (iii) *Growth ring*. Medium, slightly swollen, (iv) *Root zone*. Broad, even or slightly swollen having 2-3 rows of staggered root eyes.

4. NODE—Swollen ; leaf scar not prominent, straight.

5. BUD—(i) *Size, shape and position*. Medium, flat ; ovate reaching bottom of growth ring ; inserted at leaf scar ; hairs present on top. (ii) *Flange*. Fairly prominent, medium, width equal throughout, arising from slightly below middle of bud. (iii) *Venation and germporc*. Nerves numerous, semi-radial, converging to centre ; germination dorsal.

E. GERMINATION AND HABIT AT DIFFERENT STACKS

Germination tardy ; habit fairly erect at maturity.

E. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thicker than those of all the four ; at thirty days from planting, sett roots longer than those of Hemja, Chunnee and Co.205, but shorter than those of Co.213 ; development of shoot roots later than in Co.213.

G. ADULT ROOT SYSTEM

Fairly satisfactory ; surface feeding roots many, but only few deep penetrating roots reach three feet level; lateral spread poor.

H. STEM EPIDERMAL PATTERN

Preponderance of solitary cork cells a characteristic feature of the epidermal pattern ; otherwise the cork silica cells are in single pairs only ; number of cork cells per unit area high ; pointed cork cells present ; long cells narrow ; walls of long cells wavy.

2. VARIETAL POSITION

This variety is grown in the districts of Jullundur and Ambala in East Punjab where it occupies a total of about 6,000 acres.

The variety was released from Lyallpur to the cultivators in the year 1945.

3. AGRICULTURAL

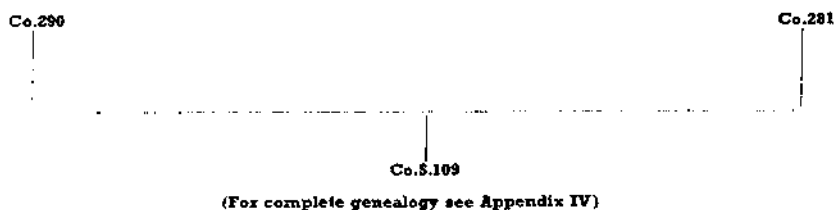
An early cane of fair yield and good ratooning capacity.

Shy germinator (soaking setts in water for 48 hours removes the tardy germination) ; early vigour not marked ; fairly good in yield ; good ratooner ; early cane with, fairly good sucrose content; fairly resistant to frost, but not very drought resistant; produces gur of good quality.

24 Co. S. 109.

1. BOTANICAL

A. PARENTAGE



Co.290 × Co.281. — Unbagged cross. The pistil parent, Co.290, has eighty-five per cent, open anthers, but the flowers open late and pollen of Co.281 was dusted immediately after flower opening. The pollen parent, Co.281, has ninety per cent, open anthers. Co.S.109 has in it the complements of *Saccharum officinarum* (from Black Cheribon, Kaludai Boothan, White Transparent and Ashy Mauritius), *Saccharum Barberi* (from Chunnee) and *Saccharum spontaneum*.

The cross was effected at Coimbatore and the seeds sent to the Director, Sugarcane Research, Shahjahanpur, Uttar Pradesh, where the seedling has been raised from seed and after trial released to the cultivators in Eastern Uttar Pradesh under the name Co.S. 109, the letter S in its name standing for Shahjahanpur.

B. HABIT AND GENERAL APPEARANCE

A fairly good stand of erect, medium canes with heavy bloom and conoidal joints ; foliage medium-abundant.

C. LEAF

1. LAMINA— (i) *Colour*. Light green, (ii) *Length and width*. Long; of medium width.

2. SHEATH—(i) *General*. Green with purplish blotches ; slight bloom ; scarious border not prominent, (ii) *Clasping*. Rather tight. (iii) *Spines*. Absent.

3. BLADE JOINT—(i) *Transverse mark*. Green, medium, slight bloom, (ii) *Ligule*. Shallow, crescentiform, the width decreasing gradually towards the edges ; symmetrical; horizontal. (iii) *Ligular process*. Present on one side, dentoid.

4. ARRANGEMENT—(i) *Number*. Medium-abundant. (ii) *Carriage*. Erect with drooping tips. (iii) *Top*. Compact.

D. CANE

1. GENERAL—Medium, straight, round in cross section, internal tissue yellowish green ; rind hard ; solid.

2. COLOUR—Green, turning purple on exposure; growth ring yellowish; root zone yellowish.

3. JOINT—(i) *Shape and markings.* Conoidal ; splits absent ; ivory markings absent ; bud groove absent ; heavy bloom, throughout the joint (ii) *Wax band.* Medium, even. (in) *Growth ring.* Medium, even, (iv) *Root zone.* Medium-broad, slightly swollen, having 2-3 rows of staggered root eyes.

4. NODE—Even ; leaf scar not prominent, straight, protruding below bud.

5. BUD - (i) *Size, shape and position.* Medium, rather flat ; ovate, and reaching growth ring ; inserted at leaf scar, (ii) *Flange.* Fairly prominent, medium, broader at base, arising from middle of bud. (in) *Venation and gempore.* Nerves rather few, semi-radial, converging to centre ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; fairly erect at maturity.

F. ADULT ROOT SYSTEM

Fairly satisfactory with fair number of surface feeding and deep roots ; lateral spread poor.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single or double pairs ; number of cork cells per unit area low ; solitary cork cells present ; pointed cork cells absent ; long cells of medium width ; walls of long cells wavy.

2. VARIETAL POSITION

This is one of the secondary varieties in Eastern Uttar Pradesh, where it has been found suitable in view of its resistance to wilt and red rot.

3. AGRICULTURAL

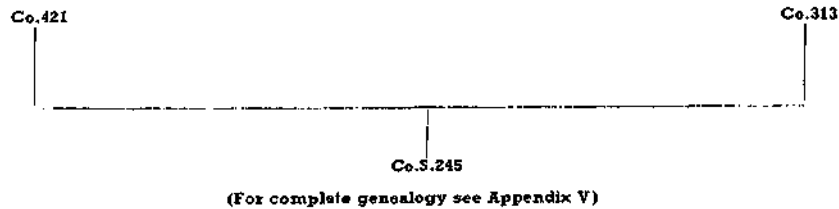
A cane of satisfactory yield and agricultural habit.

Good germinator ; early growth satisfactory ; profuse tillerer giving high yield ; satisfactory ratooner ; responds well to manuring and irrigation ; gives good tonnage even when the cultivation is not of a very high order and also under waterlogged conditions ; suits loamy soils with a comparatively high water table ; mid-season in ripening with fairly good juice quality, suitable for crushing by end of January ; resistant to red rot and wilt ; liable to attack by borers.

25. Co. S. 245.

1. BOTANICAL

A. PARENTAGE



Co.421 ♀, Co.313 ♂. Inbagg cross. The pistil parent, Co.421, has cent. per cent, closed anthers. The pollen parent, Co.313, has sixty per cent, open anthers. Co.S.245 has in it the complements of *Saccharum officinarum* (from Black Chcribon, Bandjermassing Hitam, Loethers, Lahaina, Fidji, Striped Mauritius, Kaludai Boothan and Vellai), *Saccharum Barberi* (from Chunnee) and *Saccharum spontaneum* (from Coimbatore and Java forms).

The cross was effected at Coimbatore and the seeds sent to the Director, Sugarcane Research., Sliahjahanpur, Uttar Pradesh, where the seedling has been raised from seed and after trial released to the cultivators in Western Uttar Pradesh under the name Co.S.245, the letter 5 in its name standing for Sliahjahanpur.

The chromosome number is $2n = 118$.

B. HABIT AND GENERAL APPEARANCE

A compact mass of fairly erect, medium canes ; foliage medium-abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Light green, (ii) *Length and width*. Long; of medium width.

2. SHEATH—(Z) *General*. Light green, fair bloom, scarious border not prominent. (ii) *Clasping*. Fairly tight. (Hi) *Spines*. Absent.

3. BLADE JOINT—(i) *Transverse mark*. Light green, small, glaucous, (ii) *Ligide*. Shallow, crescentiform the width decreasing gradually towards the edges, symmetrical, horizontal. (Hi) *Ligidar process*. Present on one side, dentoid.

4. ARRANGEMENT—(i) *Number*. Medium-abundant. (ii) *Carriage*. Ascending ; younger leaves with drooping tips, older ones broadly curved. (Hi) *Top*. Open.

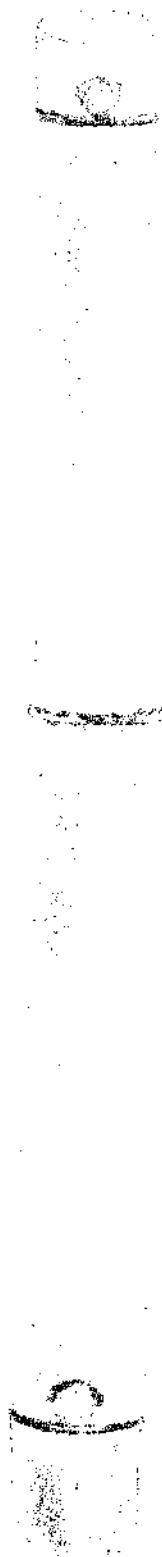
D. CANE

1. GENERAL—Medium, straight, round in cross section, internal tissue greenish; rind fairly hard ; solid.

2. COLOUR—Green with yellow the later colour more pronounced at the lower portion of joint; growth ring yellowish brown ; root zone bone yellow.



Co.L. 9
Jullundur



Co. S. 109
Coimbatore



Co. S. 245
Muzaffarnagar

3. JOINT- (i) *Shape and markings.* Cylindrical generally long ; splits absent ; ivory markings absent ; bud groove common, short, shallow ; fair bloom throughout the joint. (ii) *Wax hand.* Not distinguishable, narrow, slightly constricted. (iii) *Growth ring.* Medium, slightly swollen, (iv) *Root zone.* Broad, even having two rows of staggered root eyes.

4. NODE Even ; leaf scar prominent, straight.

5. Bud - (i) *Size, shape and position.* Medium, plump ; ovate reaching growth ring ; inserted at leaf scar. (ii) *Flange.* Not very prominent, medium, wider at base, arising from middle of bud. (iii) *Venation and gerpore.* Nerves numerous, semi-radial, converging to centre ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; habit erect at maturity.

II. STEM EPIDERMAL PATTERN

Cork silica cells mostly in single pairs and some in double pairs ; number of cork cells per unit area, high; solitary and pointed cork cells present; long cells medium in width; walls of long cells highly wavy.

2. VARIETAL POSITION

The variety is grown in Western Uttar Pradesh, mostly in the districts of Meerut and Muzarffarnagar and is intended to replace Co.312 which has become affected with red rot.

This variety was released two years ago (in the year 1947-48) for the Western tracts of United Provinces.

3. AGRICULTURAL

A high yielding cane of good habit ; compares favourably with Co.312 in yield and sucrose content.

Good germinator ; early growth fairly good ; fairly heavy yielder with good sucrose content ; mid-season early in ripening ; gur of good quality ; responds favourably to manuring and irrigation ; good ratooner ; susceptible to red rot, but resistant to wilt.

26. Co. 622.

1. BOTANICAL

A. PARENTAGE



(For complete genealogy see Appendix VI)

Co.421 x Co.331.—Unbagged cross. The pistil parent, Co.42.1 has cent, per cent, closed anthers. The pollen parent, Co.331 has cent, per cent, open anthers. Co.622 has in it the complements of *Saccharuni officinarum* (from Black cheribon, Bandjermassing Hitam, Loethers, Lahaina, Fidji, Striped Mauritius and Kaludai Bootlian), *Saccharuni Barberi* (from Chunnee and Saretha) and *Saccharuni spontaneum* (from Coimbatore and Java forms). The chromosome number is $2n = 118$.

B. HABIT AND GENERAL APPEARANCE

A fairly good stand of erect, medium-thin canes with swollen nodes and characteristic purple hue at the throat and edges of young leaf sheaths ; foliage medium-abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Light green, (ii) *Length and width*. Long; of medium width.

2. SHEATH—(i) *General*. Younger sheaths light green with characteristic purple at the throat and edges ; older ones with purplish blotches and streaks ; scarious border prominent. (ii) *Clasping*. Tight. (Hi) *Spines*. Absent.

3. BLADE JOINT--(i) *Transverse mark*. Light green, big, covered with heavy bloom; (ii) *Ligule*. Medium, deltoid, symmetrical, horizontal. (Hi) *Ligular process*. Indicated on one side.

4. ARRANGEMENT—(i) *Number*. Medium-abundant, (ii) *Carriage*. Younger leaves with erect tips ; older ones with curving tips, (in) *Top*. Fairly compact.

D. CANE

1. GENERAL—Medium-thin, straight, round in cross section, internal tissue light green ; rind fairly hard ; pith with small central cavity.

2. COLOUR—Greenish yellow turning purple on exposure ; growth ring light brown ; root zone whitish yellow.

3. JOINT—(i) *Shape and markings*. Cylindrical ; splits very rare; ivory markings absent; bud groove absent; weather markings present but rare ; heavy bloom throughout the

joint, (ii) *Wax band*. Slightly distinguishable, medium, constricted, (Hi) *Growth ring*. Medium, swollen ; (iv) *Root Zone*. Broad, slightly swollen with 2-3 rows of regular, prominent and slightly bulging root eyes.

4. NODE—Even ; leaf scar slightly inclined, not prominent, protruding below bud.

5. BUD—(i) *Size, shape and position*. Big, plump ; ovate reaching middle of growth, ring ; inserted at leaf scar ; hairs present on top of bud. (ii) *Flange*. Not prominent, narrow, width equal throughout, arising from top half of bud. (Hi) *Venation and germporc*. Nerves not many, parallel, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 80° at two-month stage and are erect at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Chunnee and Co.205 but less than in Hcmja and Co.213 ; sett roots thicker than those of Hcmja, Chunnee and Co.205 but thinner than those of Co.213 ; at thirty days from planting, sett roots longer than those of Hemja. but shorter than those of Chunnee, Co.205 and Co.213 ; development of shoot roots later than in I Hemja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

A good root system adapted for surface and deep feeding ; roots penetrate upto four feet and more ; surface roots fairly numerous ; lateral spread good.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single pairs with 50 per cent, of the cork cells occurring solitary; number of cork cells per unit area high ; pointed cork cells present ; long cells of medium width ; walls of long cells highly wavy.

2. VARIETAL POSITION

The variety is grown in South Bihar particularly in the districts of Gaya and Arrah, mostly as a substitute for Co.313 in places where the latter has not been a success. The variety was released from Coimbatore to the State Research Stations in the year 1944.

3. AGRICULTURAL

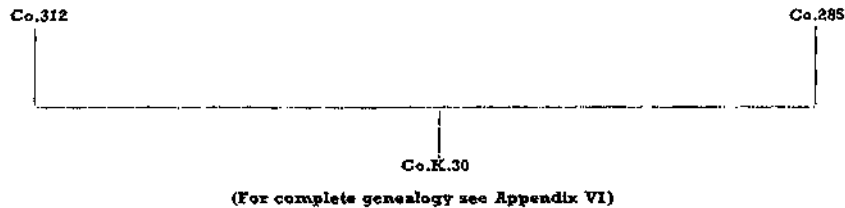
An early cane giving yield on par with or even better than Co.313 and with a superior juice quality.

Fairly good and early germinator ; early vigour not marked ; tillering good ; fairly good yielder ; fair ratooner ; suitable for lighter and loamy soils ; does well under irrigated conditions but suffers when irrigation is withheld ; high sugared early cane with juice quality superior to that of Co.313 ; under Bihar conditions reaches peak sucrose content in January and carries on till March ; fibre content high ; cane fairly hard rinded ; rather susceptible to borers ; stray cases of red rot susceptibility reported from certain areas in Uttar Pradesh..

27. Co. K. 30.

1. BOTANICAL

A. PARENTAGE



Co.K.30

(For complete genealogy see Appendix VI)

Co.312 X Co.285.— Unbagged cross. The pistil parent, Co.312, has ninety-eight per cent, open anthers. The flowers open late and pollen of Co.285 was dusted immediately after flower opening. The pollen parent, Co.285, has ninety-eight per cent, open anthers. Co.K.30 has in it the complements of *SaccJiarum officinarum* (from Black Cheribon, Kaludai Boothan, Vellai and Striped Mauritius), *SaccJiarum Barberi* (from Chunnee) and *SaccJiarum spontaneum*.

This is a seedling bred at Coimbatore and tried at the Karnal Sugarcane Sub-Station from where it was released for trial to the State farms under the name Co.K.30, the letter *K* in its name standing for Karnal.

The chromosome number is $2n = 115-116$ which represents the haploid complements of the parents (Co.312, $n = 59$ and Co.285, $n = 56$).

B. HABIT AND GENERAL APPEARANCE

A good stand of erect, thin canes with slightly swollen growth ring; foliage abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Dark green, (ii) *Length and width*. Long ; narrow.

2. SHEATH—(i) *General*. Light green with purplish blotches in older sheaths ; heavy bloom; scarious border prominent in older sheaths, (ii) *Clasping*. Fairly loose. (ii) *Spines*. Sparse about the middle of sheath.

3. BLADE JOINT—(i) *Transverse mark*. Purplish, big, fair bloom. (//) *Ligitle*. Very shallow, deltoid, the width decreasing gradually towards the edges, symmetrical, inclined. (Hi) *Ligular process*. Present on both sides, one short and the other just indicated.

4. ARRANGEMENT—(i) *Number*. Abundant. (//) *Carriage*. Young leaves with erect tips ; older ones with drooping tips, (in) *Top*. Open.

D. CANE.

1. GENERAL--Thin, straight, round in cross section, internal tissue tinge of light green ; rind fairly hard ; whitish pith cells at centre.

2. COLOUR—Light green with tinge of yellow at the bottom, turning purple on exposure; growth ring light brown ; root zone light yellow.

3. JOINT- (i) *Shape and markings.* Bobbin shaped, sometimes conoidal; splits absent; ivory markings absent, bud groove absent. Fairly heavy bloom throughout the joint, (n) *Wax band.* Distinguishable, medium, constricted especially below bud. (iii) *Growth ring.* Medium, slightly swollen, (iv) *Root zone.* Medium, even, having 2-3 rows of root eyes.

4. NODE—Even ; leaf scar not prominent, straight, protruding below bud.

5. BUD—(i) *Size, shape and position.* Fairly big, plump ; ovate, tending to an oval shape, reaching bottom of growth ring ; inserted at leaf scar, (ii) *Flange.* Not prominent, narrow, width equal throughout, arising from top half of bud. (iii) *Venation and germpore.* Nerves few, parallel, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination satisfactory ; shoots make an angle of 75° at two-month stage and are erect at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Chunnee, Hemja, Co.205 and Co.213 ; sett roots thinner than those of Hemja, Chunnee and Co.205 and thicker than those of Co.213 ; at thirty days from planting, sett roots longer than those of Hemja, Chunnee, Co.205 and Co.213 ; development of shoot roots later than in Hemja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

Satisfactory ; only very few roots penetrate to three feet depth ; surface feeding roots not many ; lateral spread satisfactory.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single and multiple pairs, mostly the former ; number of cork cells per unit area high ; solitary and pointed cork cells absent ; long cells broad ; walls of long cells slightly wavy.

2. VARIETAL POSITION

This variety has been released in the Central range in Uttar Pradesh, where it is doing well. It is also promising in the Punjab (I).

The variety was released from Karnal to State Research Stations in the year 1940.

3. AGRICULTURAL

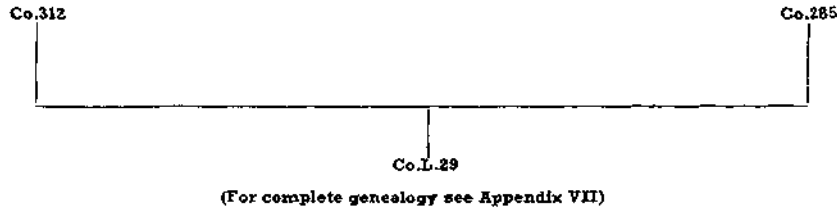
A thin variety suited to lighter soils, mid-season in ripening with fairly good yield.

Germination satisfactory ; early stand fairly good ; vigorous in growth ; profuse in tillering, the large number of tillers making up for the thinness of stalk ; average yield comparable to Co.421 ; not a good ratooner ; responds well to irrigation ; does well under lighter conditions of soil ; fairly tolerant to drought ; sucrose content fairly good and better than that of Co.421 which it is expected to replace ; reaches peak maturity in January ; susceptible to top and stem borers ; resistant to red rot.

28. Co. L. 29.

1. BOTANICAL

A. PARENTAGE



Co.L.29

(For complete genealogy see Appendix VII)

Co. 312 x Co. 285.—Unbagged cross. The pistil parent Co. 312, has ninety-eight percent, open anthers, but the flowers open late and Co.285 pollen was dusted immediately on flower opening. The pollen parent, Co.285, has ninety-eight per cent, open anthers. Co.L.29 has in it the complements of *Saccharum officinarum* (from Black Cheribon, Kaludai Boothan, Vellai and Striped Mauritius), *Saccharum Barberi* (from Chunnee) and *Saccharum spontaneum*.

The cross was effected at Coimbatore and the seeds sent to the Sugarcane Research Station at Lyallpur (now in Pakistan) where the seedling was raised from seed. The variety was released to cultivators in Punjab (I) after trial at the Sugarcane Research Station, Jullundur. The letter *L* in its name stands for Lyallpur.

B. HABIT AND GENERAL APPEARANCE

A mass of erect, medium-thin canes with conoidal joints and bulge opposite bud ; foliage medium-abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Green, (ii) *Length and width*. Long; of medium width.

2. SHEATH—(i) *General*. Green with purplish blotches; slight bloom; scarious border not prominent, (ii) *Clasping*. Fairly loose. (Hi) *Spines*. Absent.

3. BLADE JOINT—(i) *Transverse mark*. Green, medium, slight bloom, (ii) *Ligule*. Shallow, crescentiform, sloping gradually, symmetrical, inclined. (Hi) *Lignlar process*. Indicated on both sides.

4. ARRANGEMENT—(z) *Number*. Medium-abundant, (ii) *Carriage*. Young leaves with tips erect; older ones with tips drooping. (Hi) *Top*. Compact.

D. CANE

1. GENERAL—Medium-thin, slightly staggered, oval in cross section, internal tissue light green ; rind hard ; pitch present as whitish cells at the centre.

2. COLOUR—Green with yellow at the nodal region turning slightly purple on exposure ; growth ring brownish yellow turning concolorous in bottom joints ; root zone bone yellow turning concolorous.

PLATE XV



Co. 622
Patna



Co. K. 30
Shahjahanpur



Co. L. 29
Jullundur

3. JOINT—(i) *Shape and markings.* Conoidal with bulge opposite bud ; splits very rare ; ivory markings profuse as thin, long, brownish lines ; bud groove absent; slight bloom throughout joint, (ii) *Wax band.* Fairly distinguishable, medium, even, characteristically constricted below bud. (Hi) *Growth ring.* Medium, even, (iv) *Root zone.* Broad, even with two rows of regular root eyes which are swollen.

4. NODE—Even, leaf scar not prominent, inclined, protruding below bud.

5. **Bun**—(i) *Size, shape and position.* Medium, fairly plump, elliptic to roundish reaching bottom of growth ring ; inserted at leaf scar, (ii) *Flange.* Not prominent, narrow, width equal throughout, arising from top half of bud. (Hi) *Venation and germ-pore.* Nerves numerous, semi-radial, converging to centre ; germination sub-apical to dorsal.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; habit fairly erect at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnec, Co.205 and Co.213 ; sett roots thicker than those of all the four ; at thirty days from planting, sett roots as long as those of Co.213 ; development of shoot roots later than in Hemja, Chunnec, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

A satisfactory root system ; roots, though not many, penetrate to four feet depth ; surface feeding roots few ; lateral spread satisfactory.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single pairs only ; number of cork cells per unit area high ; solitary and pointed cork cells present; long cells broad ; walls of long cells slightly wavy.

2. VARIETAL POSITION

This variety is on the approved list for Punjab (I) and is in cultivation in very restricted areas in Amritsar and Kangra districts.

The variety was released from Jullundur to the cultivators in the year 1954.

3. AGRICULTURAL

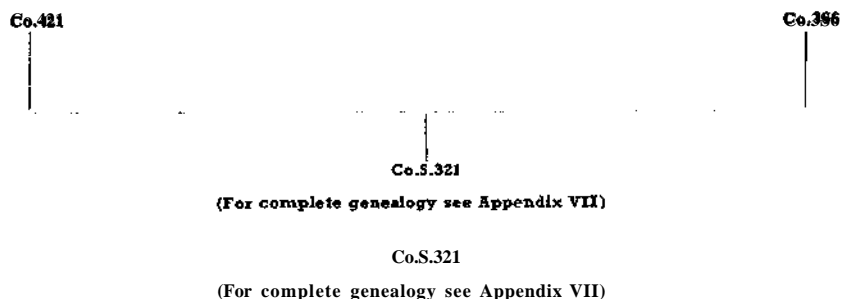
An early cane with erect habit and good ratooning capacity ; resistant to frost.

Good germinator ; early vigour marked ; good growth ; tillers well; better in yield than Co.3.13 ; good ratooner ; does very well in medium to rich soils under irrigated conditions ; responds well to manuring ; an early cane, maturing in November-December along with Co.3.13 ; gur of very good quality ; a variety suitable for gur making as well as for white sugar ; resistant to frost and moderately resistant to insect pests and diseases.

29. Co. S. 321.

1. BOTANICAL

A. PARENTAGE



Co.421 x Co.356. --Unbagged cross. The pistil parent, Co.421, has cent per cent closed anthers. The pollen parent, Co.350 has ninety-eight per cent, open anthers. Co.S.321 has in it the complements of *Saccharmn officinarumn* (from Black Cheribon, Bandjermassing Hitam, I.oethers, Lahaina, Fidji and Striped Mauritius), *Saccharmn spontaneuni* (from Coimbatore and Java forms) and *Sorghum*.

The cross was effected at Coimbatore and the seeds sent to the Director, Sugarcane Research, Shahjahanpur, Uttar Pradesh where the seedling has been raised from seed and after trial released to the cultivators under the name Co.S.321, the letter S in its name standing for Shahjahanpur.

B. HABIT AND GENERAL APPEARANCE

A good stand of erect, medium-thin canes ; foliage medium-abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Light green, (ii) *Length and width*. Long; of medium width.

2. SHEATH—(i) *General*. Young sheaths light green, older ones with purplish blotches ; slight bloom; scarious border not prominent, (ii) *Clasping*. Loose. (Hi) *Spines*. Absent.

3. BLADE JOINT—(i) *Transverse mark*. Light green, medium, slight bloom, (ii) *Lignle*. Medium, crescentiform the width decreasing gradually towards the edges, symmetrical, horizontal. (Hi) *Ligular process*. Indicated on both sides.

4. ARRANGEMENT—(i) *Number*. Medium-abundant, (ii) *Carriage*. Spindle leaves with erect tips ; the others with drooping tips. (Hi) *Top*. Fairly compact.

D. CANE

1. GENERAL—Thin, straight, round in cross section, internal tissue light green ; rind hard ; central cavity with whitish tissue around it.

2. COLOUR—Dark green with yellow tinge at side opposite bud ; growth ring light brown ; root zone ivory white.

3. JOINT—(i) *Shape and markings.* Cylindrical tending to a slight bobbin shape ; splits absent ; ivory markings present as long, narrow, brownish lines and more common in top joints ; weather markings present ; bud groove absent ; slight bloom throughout: joint. (//) *Wax band.* Distinguishable, medium, slightly constricted, (iii) *Growth ring.* Medium, even. (iv) *Root zone.* Medium, even having 2-3 rows of root eyes.

4. NODE—Even, leaf scar not prominent, straight.

5. BUD—(i) *Size, shape and position.* Fairly big, flat ; broadly ovate extending to middle of growth ring; inserted at leaf scar. (iii) *Flange.* Not prominent, medium, width equal throughout, arising from middle of bud. (iii) *Veuation and germination.* Nerves fairly numerous, parallel, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 70° at two-month stage and are fairly erect at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes less than in Hemja, Chunnee, Co.205 and Co.213 ; self roots thicker than those of Hemja, Chunnee, Co.205 and Co.213 ; at (early days from planting, self roots smaller than those of the four ; development of shoot roots later than all the four.

G. ADULT ROOT SYSTEM

Satisfactory root system ; few roots reach 3 feet depth ; surface feeding roots few ; lateral roots not many.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single pairs only ; number of cork cells per unit area high ; solitary and pointed cork cells present ; long cells narrow ; walls of long cells slightly wavy.

2. VARIETAL POSITION

This variety is in general cultivation in Western and Rohilkhand ranges of Uttar Pradesh as an early cane.

The variety was released to cultivators from Shahjahanpur in the year 1950.

3. AGRICULTURAL

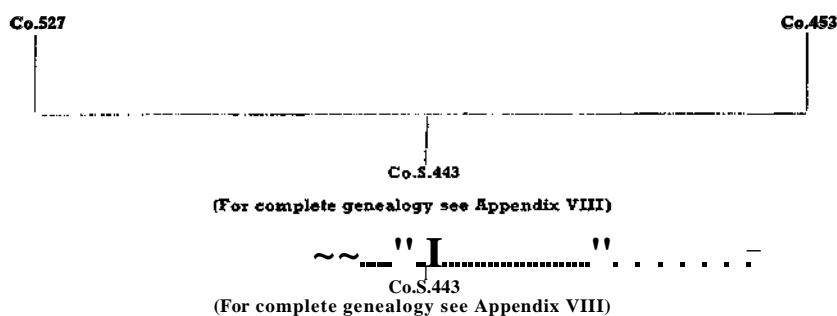
An early cane of fairly good yield and ratooning capacity.

Good germinator ; early vigour marked ; good growth. ; profuse tillering ; fairly good yield averaging about 700 maunds (about 28 tons) in Rohilkhand range of Uttar Pradesh and 900 maunds in the Western range ; gave a maximum yield of 1,400 maunds in Rosa factory ; a good ratooner ; prefers irrigated and lighter soils ; moderately tolerant to drought ; an early cane superior to Co.313 in quality; ripens in December ; a suitable variety for gur manufacture; susceptible to stem borer ; moderately resistant to red rot and smut.

30. Co. S. 443.

1. BOTANICAL

A. PARENTAGE



Co.527 x Co.453. Unbagged cross. The pistil parent, Co.527, has five per cent, open anthers. The pollen parent, Co.453, has ninety-five per cent, open anthers. Co.S.443 lies in the complements of *Saccharum officinarum* (from Black Cheribon, Bandjermassing Mitam, Loethers, Lahaina, Fidji, Ashy Mauritius, Kaludai Boothan, Vellai and Striped Mauritius), *Saccharum Barberi* (from Chunnee) and *Saccharum spontaneum*.

The cross was effected at Coimbatore and the seeds sent to the Director, Sugarcane Research, Shahjahanpur, Uttar Pradesh, where the seedling has been raised from seed and released to the cultivators under the name Co.S.443, the letter S in its name standing for Shahjahanpur.

B. HABIT AND GENERAL APPEARANCE

A mass of loosely packed greenish canes with the swollen growth ring and internode showing out of the self-trashed lower joints ; foliage abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Light green, (ii) *Length and width*. Long ; narrow.

2. SHEATH—(i) *General*. Young sheaths light green, older ones with purplish blotches ; slight bloom ; scarious border not prominent, (ii) *Clasping*. Loose. (Hi) *Spines*. Present throughout back of sheath.

3. BLADE JOINT—(i) *Transverse mark*. Purplish, big slight bloom, (ii) *Ligule*. Very shallow, crescentiform, the width decreasing gradually towards the edges ; symmetrical, slightly sloping. (Hi) *Ligidar process*. Indicated on both sides.

4. ARRANGEMENT—(i) *Number*. Abundant, (ii) *Carriage*. Younger leaves with erect tips ; older ones broadly curving, (in) *Top*. Open.

D. CANE

1. GENERAL—Medium-thin, straight, round in cross section, internal tissue light green ; rind hard ; solid.

2. COLOUR—Green ; growth ring light brown ; root zone brownish yellow.

3. JOINT—(i) *Shape and markings.* Cylindrical with slight curve of the sides; splits absent; ivory markings absent; bud groove absent; fair bloom throughout the joint, (ii) *Wax band.* Distinguishable, medium, even, (Hi) *Growth ring.* Narrow, swollen, (iv) *Root zone.* Medium, even having two rows of sparse root eyes, sometimes only one row

4. NODE-- Swollen, leaf scar not prominent, straight.

5. BUD—(i) *Size, shape and position.* Big, plump; ovate reaching bottom of growth ring; inserted at leaf scar, [it) *Flange.* Prominent, medium-broad, not uniformly wide, arising from top half of bud. (Hi) *Venation and gempore.* Nerves numerous, radiating to centre; germination sub-apical to dorsal.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination rather poor; shoots make an angle of 70° at two-month stage and are fairly erect at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes less than in Hemja, Chunnee, Co.205 and Co.213; sett roots thicker than those of Hemja and Chunnee and of the same thickness as those of Co.205 and Co.213; at thirty days from planting, sett roots longer than in Hemja, Chunnee, Co.205 and Co.213; development of shoot roots at the same time as those of Co.213.

G. ADULT ROOT SYSTEM

Satisfactory; the depth is not much but the lateral spread is good; surface feeding roots fairly numerous.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single and double pairs; number of cork cells per unit area high; solitary cork cells present; pointed cork cells absent; long cells of medium width; walls of long cells highly wavy.

2. VARIETAL POSITION

The variety has been released for general cultivation in the eastern and mid-eastern ranges and in the Faizabad circle in Uttar Pradesh as a mid-season or mid-early cane.

The variety was released from Shahjahanpur in the year 1954.

3. AGRICULTURAL

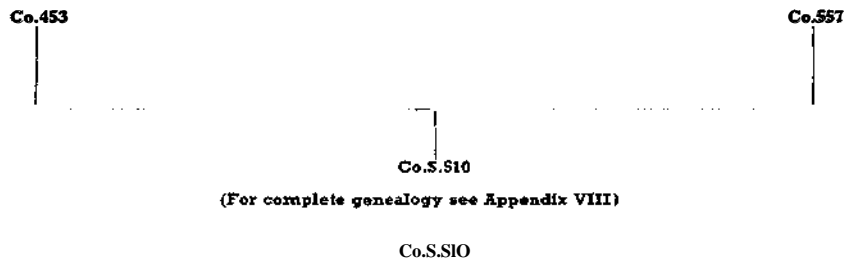
Shy and late germinator; early vigour not marked but makes up after the rains; good in vigour; poor in tillering but makes up in yield due to less of mortality and weight of individual canes which are solid; yield good; moderate ratooner; fairly tolerant to drought; moderate in juice quality; mid-season or mid-early variety; gur of average quality; fairly resistant to top shoot and stem borers; rind hard and hence little damage of cane by rodents and jackals; highly resistant to red rot.

The advantage, with the variety is the solid core of the cane which enables keeping in the field after maturity as also after harvest without rapid deterioration.

31. Co. S. 510.

1. BOTANICAL

A. PARENTAGE



Co.453 X Co.557.....Unbagged cross. The pistil parent, Co.453, has ninety-five per cent. open anthers hut the flowers open late and Co.557 pollen was dusted immediately on flower opening. Co.557 has ninety per cent, open anthers. Co.S.SIO has in it the complements of *Saccharum officinarum* (from Black Cheribon, Striped Mauritius, Kaludai Boothan and Vellai), *Saccharmn Barberi* (from Chunnee) and *Saccharum spontaneum*.

The cross was effected at Coimbatore and the seeds sent to the Director, Sugarcane Research, Shahjahanpur, Uttar Pradesh, where the seedling has been raised from seed and after trial released to the cultivators under the name Co.S.510, the letter 5 in its name standing for Shahjahanpur.

The chromosome number is $2n = 120-121$.

B. HABIT AND GENERAL APPEARANCE

An erect mass of closely packed, rather medium stalks with swollen growth ring and root zone ; foliage abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Dark green, (ii) *Length and width*. Long ; narrow.

2. SHEATH—(i) *General*. Light green with purplish blotches ; very slight bloom ; scarious border prominent in older sheaths, (ii) *Clasping*. Fairly loose, (iii) *Spines*. Present in fair profusion in the middle portion of the sheath ; deciduous.

3. BLADE JOINT—(z) *Transverse mark*. Light green, medium, slight bloom, (ii) *Ligule*. Medium, crescentiform, sloping gradually ; symmetrical ; horizontal. (Hi) *Ligular process*. Short on one side and indicated on the other.

4. ARRANGEMENT—[i] *Number*. Abundant. (ii) *Carriage*. Younger leaves with erect tips ; older ones with curved tips. (iii) *Top*. Open.

D. CANE

I. GENERAL—Medium-thin, slightly staggered, oval in cross section, internal tissue light green ; rind hard ; hollow with whitish cells surrounding it.

PLATE XVI



Co. S. 321
Shahjahanpur



Co. S. 443
Shahjahanpur



Co. S. 510
Shahjahanpur

2. COLOUR—Dark green turning purple on exposure ; growth ring brownish turning concolorous ; root zone ivory yellow turning concolorous.

3. JOINT—(i) *Shape and markings.* Cylindrical with sides slightly incurved ; splits rare ; ivory markings present as small, thin, brownish lines 1-2" below wax band ; weather markings present; bud groove shallow, medium in width extending to | length of joint ; heavy bloom throughout the joint, (ii) *Wax band.* Not clearly distinguishable, medium, even ; (iii) *Growth ring.* Medium, swollen ; (iv) *Root zone.* Medium, swollen having 2-3 rows of scattered root eyes which are slightly brownish in colour.

4. NODE—Even ; leaf scar not prominent ; straight.

5. BUD—(i) *Size, shape and position.* Medium, plump ; broadly ovate stopping below growth ring ; inserted at leaf scar, sometimes slightly above, (ii) *Flange.* Not prominent, narrow, width equal throughout, arising from middle of bud. (iii) *Venation and gempore.* Nerves numerous, radial, converging to centre ; germination dorsal.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 75° at two-month stage ; become fairly erect at six months and continue to be so at harvest.

F. SETT AND SHOOT ROOTS

Total number of root eyes less than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thicker than those of Hemja and Chunnee and thinner than those of Co.205 and Co.213 ; at thirty days from planting, sett roots longer than those of Hemja, Chunnee, Co.205 and Co.213 ; development of shoot roots later than in Co.213.

G. ADULT ROOT SYSTEM

Fairly satisfactory ; a few roots penetrate to three feet depth ; surface feeding roots numerous ; lateral spread fairly good.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single pairs only ; number of cork cells per unit area high ; solitary cork cells absent ; pointed cork cells present ; long cells broad ; walls of long cells slightly wavy.

2. VARIETAL POSITION

This variety has been released for cultivation in the Central and Rohilkhand ranges in Uttar Pradesh where it is intended to replace Co.453.

It was released from Shahjahanpur in the year 1954.

3. AGRICULTURAL

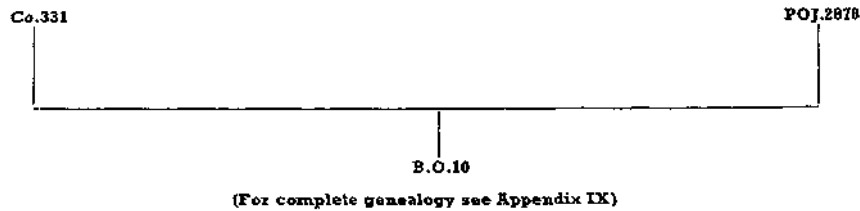
A mid-early variety, very good in germination, heavy yielder with good sucrose content.

Very good germinator ; possesses marked early vigour ; tillering heavy which makes up for the individual medium-thin, pithy canes ; heavy yielder giving about 20 per cent, more in yield than Co.421 and comparing favourably with Co.453, under good cultural conditions ; good ratooning capacity ; suited to varied soil conditions and adapted to sandy and loamy soils ; tolerant to drought ; a mid-early ripening cane with high sucrose content like Co.313 ; moderately susceptible to top shoot borer ; resistant to red rot.

32. B. O.10.

1. BOTANICAL

A. PARENTAGE



Co.331 X POJ.2878. Unbagged cross. This is a variety evolved at the Sugarcane Research Station, Pusa, Bihar. The name B.O. stands for Bihar and Orissa. B.O.10 has in it the complements of *Saccliarum officinarum* (from Black Cheribon, Kaludai Boothan, Striped Mauritius, Bandjermassing Hitam, Loethers, Lahaina and Fidji), *Saccliarum Barberi* (from Chunnee and Saretha) and *Saccliarum spontaneum* (from Coimbatore and Java forms).

The chromosome number is $2n = 120-121$.

B. HABIT AND GENERAL APPEARANCE

A good stand of erect, green thick stalks with staggered joints and splits showing in the self stripping joints ; leaves broad ; foliage abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Light green, (ii) *Length and width*. Long; broad.
2. SHEATH—(i) *General*. Younger sheaths light green, older ones with purplish blotches and streaks ; fair bloom throughout sheath; scarious border prominent in older sheaths, (ii) *Clasping*. Loose. (iii) *Spines*. Present all over back of sheath.
3. BLADE JOINT—(i) *Transverse mark*. Light green, sometimes brownish, big, slight bloom ; (ii) *Ligide*. Shallow, crescentiform, sloping gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Absent.
4. ARRANGEMENT—(i) *Number*. Abundant, (ii) *Carriage*. Younger ones with erect tips ; older ones curving broadly. (iii) *Top*. Open.

D. CANE

1. GENERAL—Medium to medium-thick, staggered, round to slightly oval in cross section, internal tissue light yellow ; rind fairly hard ; small cavity with whitish pithy cells surrounding it.
2. COLOUR—Green with pinkish blotches often noticed in top joints ; growth ring yellow, turning concolorous in lower joints ; root zone whitish yellow turning concolorous.
3. JOINT—(i) *Shape and markings*. Cylindrical, splits present in profusion one at each joint ; ivory markings absent ; weather markings present particularly in lower joints ; bud

groove absent ; very slight bloom throughout joint, (ii) *Wax band*. Prominent, medium., slightly constricted, (iii) *Growth ring*. Narrow, swollen, (iv) *Root zone*. Narrow, even, having 2-3 rows of small root eyes.

4. NODE—Even ; leaf scar fairly prominent, inclined, protruding below bud.

5. BUD—(i) *Size, shape and markings*. Big, plump, broadly ovate or round extending to middle of growth ring ; inserted at leaf scar, (ii) *Flange*. Fairly prominent, medium, width equal throughout, arising from top half of bud. (iii) *Venation and germ pore*. Nerves numerous, semi-radial, converging to centre ; germination sub-apical to dorsal.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 70° at two-month stage and are erect at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Chunnee and Co.205 and less than in Hemja and Co.213 ; sett roots thicker than those of Hemja, Chunnee, Co.205 and Co.213; at thirty days from planting, sett roots as long as those of Co.213 ; development of shoot roots earlier than in Hemja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

A satisfactory root system suited for tapping surface and deeper layers ; deep roots extend to three feet and more ; superficial roots many ; lateral spread satisfactory.

H. STEM EPIDERMAL PATIERN

Cork silica cells in single or multiple pairs ; number of cork cells per unit area low ; solitary cork cells absent ; pointed cork cells present ; long cells narrow; walls of long cells fairly wavy.

2. VARIETAL POSITION

This variety is in cultivation in North and South Bihar.

The variety was released from Pusa in the year 1948.

3. AGRICULTURAL

A mid-season cane of good yield and juice quality ; resistant to red rot.

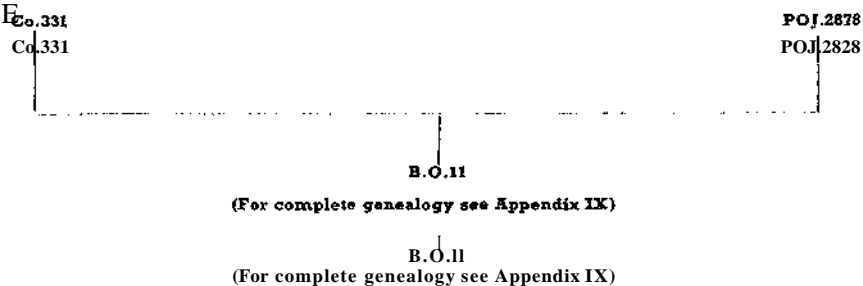
Germination good ; early vigour not marked ; tillering good ; yield good giving on an average about 700 maunds (about 28 tons) of cane per acre ; does well in all soils but gives maximum yield in well drained loamy soils ; does well under conditions of good irrigation where its response is superior to Co.453 ; juice quality good and comparable with that of Co.313 ; ripens in December and reaches a maximum of about 19 per cent Pol. during March ; fibre content high.; resistant to red rot which is its outstanding feature.

33. B. O. 11.

*55> JDH |JU 1,1,3

1. BOTANICAL

A. PARENTAGE



Co.331 × POJ.2878. - Unbagged cross. The parentage is the same as that of B.O.10. This variety was also evolved at the Sugarcane Research Station, Pusa, Bihar. The name B.O. stands for Bihar and Orissa.

The chromosome number is $2n = 120-121$.

B. HABIT AND GENERAL APPEARANCE

A loose mass of erect, medium-thick canes with light green colour and heavy bloom ; leaves broad ; foliage abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Light green, (ii) *Length and width*. Long ; broad.

2. SHEATH—(i) *General*. Younger sheaths light yellowish green with purplish blotches, older ones more or less completely purple ; heavy bloom throughout sheath ; scarious border prominent in older sheaths, (ii) *Clasping*. Loose. (iii) *Spines*. Absent.

3. BLADE JOINT—(i) *Transverse mark*. Light green, big and wide, fair bloom. (ii) *Ligide*. Of medium width, crescentiform, the width decreasing gradually towards the edges, symmetrical, slightly inclined on one side. (iii) *Ligular process*. Short on one side and indicated on the other.

4. ARRANGEMENT—(i) *Number*. Abundant, (ii) *Carriage*. Younger leaves with erect tips, older ones curving a little distance from tip. (iii) *Top*. Fairly compact.

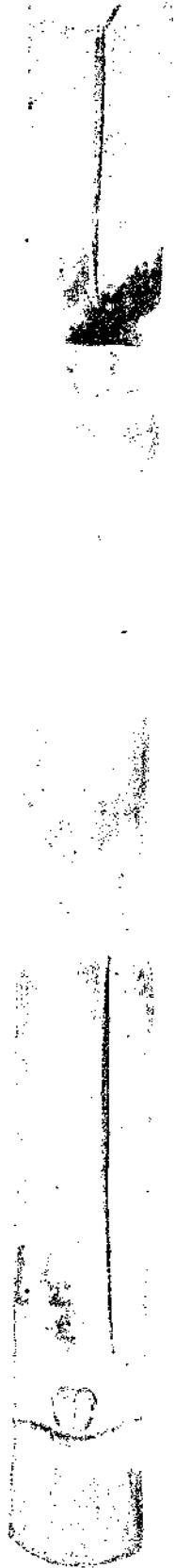
D. CANE

1. GENERAL—Medium-thick, slightly staggered, oval in cross section, internal tissue light green ; rind hard ; a small cavity present at centre.

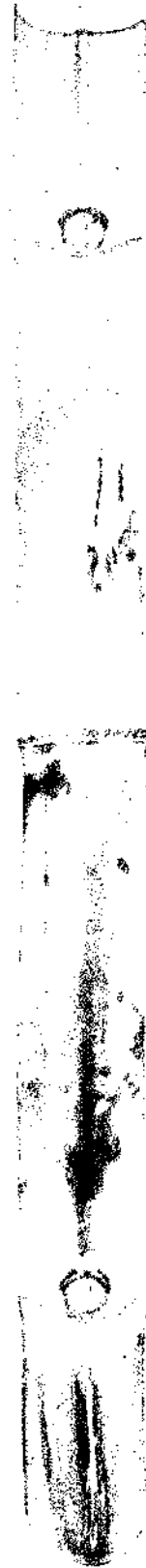
2. COLOUR—Light green with little of yellow often pinkish even in unexposed canes ; growth ring light brown turning concolorous ; root zone ivory yellow turning concolorous.

3. JOINT—(i) *Shape and markings*. Cylindrical ; splits absent ; ivory markings absent ; bud groove shallow, of medium width extending to full length of joint ; fairly heavy bloom throughout the joint, (ii) *Wax band*. Distinguishable, narrow, prominently constricted forming a

PLATE XVII



B.O. 10
Patna



B.O. 11
Patna

bottle neck, (iii) *Growth ring*. Medium, swollen, (iv) *Root zone*. Narrow, even having two fairly regular rows of bulging root eyes.

4. NODE—Even, leaf scar fairly prominent, slightly inclined forming a lip below bud.

5. BUD—(i) *Size, shape and position*. Big, plump, broadly ovate reaching growth ring ; inserted at leaf scar ; hairs present on top. (ii) *Flange*. Fairly prominent, medium, uniform width throughout, arising from top half of bud. (iii) *Venation and gempore*. Nerves numerous, parallel, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 70° at two-month stage and are fairly erect at harvest.

F. SETT AND SHOOT ROOTS

Total number of root eyes less than in Hemja. and Co.213 and more than in Chunnee and Co.205 ; sett roots thicker than those of Hemja, Chunnee, Co.205 and Co.213 ; at thirty days from planting sett roots shorter than those of Chunnee, Co.205 and Co.213 and longer than those of Hemja.; development of shoot roots earlier than in Hemja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

A good root system, well adapted for tapping surface and deeper layers of soil ; roots extend upto four feet depth and there are numerous surface feeding roots ; lateral spread good.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single or multiple pairs with occasional two cork cells together ; number of cork cells per unit area low ; solitary and pointed cork cells present ; long cells narrow ; walls of long cells wavy.

2. VARIETAL POSITION

This variety is in cultivation in both North and South Bihar and along with B.O.10 replacing Co.453 which has become heavily infected with red rot and needs replacement.

The variety was released from Pusa in the year 1948.

3. AGRICULTURAL

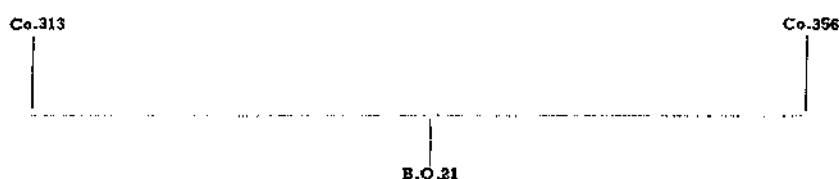
An early ripening, good yielding variety showing good response to manuring and irrigation.

Germination good ; early vigour marked ; erect in stand ; tillering fair but not so profuse as in Co.313 or Co.513, but individual stalks much thicker and heavier making up the tonnage ; fairly heavy yielder giving an average yield of about 700 maunds (about 28 tons) of cane, being similar to Co.453 ; highK' responsive to manuring and irrigation and hence does well under irrigated conditions ; drought resistant ; early in ripening giving a Pol. of 16 per cent, in juice during December ; the juice quality improves reaching the maximum in March ; fibre fairly high averaging about 16.5 per cent. ; comparatively less susceptible to red rot than the varieties Co.313 and Co.453 ; has shown high resistance to smut even in heavily infected areas ; another feature is its least field dryage ; fairly resistant to borers.

34 B. O. 21.

1. BOTANICAL

A. PARENTAGE



(For complete genealogy see Appendix X)

Co.313 ;< Co.3i5(j). Unbagged cross. This is a variety evolved at the Sugarcane Research Station, Pusa, Bihar. The name B.O. stands for Bihar and Orissa. B.O.21 has in it the complements of *Saccharinn officinariim* (from Black Cheribon, Kaludai Boothan, Vellai, Bandjcnassing Hit am, Loethers, Lahaina and Fidji), *Saccharum Barberi* (from Chunnce), *Sace ha rum spontancum* (from Coimbatore and Java forms) and *Sorghum durra* Stapf.

The chromosome number is $2n = 118$.

B. HABIT AND GENERAL APPEARANCE

A good stand of erect, medium-thin canes with leaf sheaths adhering to the stalks and not easy of stripping ; foliage abundant and leaves very broad.

C. LEAF

1. LAMINA—(i) *Colour*. Dark green, (ii) *Length and width*. Long; very broad.
2. SHEATH—(i) *General*. Dark green with purplish blotches especially at the throat ; heavy bloom ; scarious border not very prominent. (ii) *Clasping*. Rather tight. (m) *Spines*. Absent.
3. BLADE JOINT—(i) *Transverse mark*. Pinkish, medium, fair bloom. (ii) *Ligule*. Medium high, crescentiform sloping gradually towards the edges, symmetrical, horizontal, hairs on top prominent. (iii) *Ligular process*. Short on one side.
4. ARRANGEMENT—(i) *Number*. Abundant, (ii) *Carriage*. Spindle leaves with erect tips ; older ones drooping with a broad curve. (iii) *Top*. Open.

D. CANE

1. GENERAL—Medium-thin, slightly staggered, round in cross section, internal tissue green at rind portion and light yellow at the rest ; rind rather soft ; central cavity present.
2. COLOUR—Dark green with purplish blotches at bottom joints ; growth ring brownish ; root zone brownish yellow.
3. JOINT—(i) *Shape and markings*. Cylindrical, sometimes conoidal ; splits absent ; ivory markings absent; weather markings present ; bud groove very shallow, narrow extending to half the length of joint ; heavy bloom throughout joint, (ii) *Wax band*. Distinguishable,

narrow, even. (iii) Growth *ring*. Medium, prominently swollen, (iv) *Root zone*. Medium, narrowing towards the base resembling a truncated cone, even having 2-3 rows of fairly regular, bulging and prominent root eyes.

•1. NODE Even ; leaf scar prominent, inclined, slightly protruding below bud.

5. BUD (i) *Size, shape and position*. Big, plump ; Obovate reaching middle of growth ring ; inserted at leaf scar ; brownish ; hairs prominent on top. (ii) *Flange*. Fairly prominent, medium-narrow, width equal throughout, arising from middle of bud. (iii) *Venation and germ-pore*. Nerves numerous, parallel, converging to top ; germination apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 75° at two-month stage ; fairly erect at maturity.

E. SETT AND SHOOT ROOTS

Total number of root eyes more than in Chunnee and Co.205 but less than in Hemja and Co.21'S; sett roots thicker than those of all the four; at thirty days from planting, sett roots longer than those of Hemja, Chunnee and Co.205 but shorter than those of Co.213 ; development of shoot roots later than in all the four.

(i. ADULT ROOT SYSTEM

Not well adapted for tapping deeper layers of soil ; only a few roots penetrate to three feet and more ; surface feeding roots not many ; lateral spread satisfactory.

H. STEM EPIDERMAL PATTERN

Cork silica cells in single pairs ; often two or three cork cells occur together ; number of cork cells per unit area low ; solitary cork cells present ; pointed cork cells in profusion, some of them very long ; long cells narrow ; walls of long cells slightly wavy.

2. VARIETAL POSITION

The variety is grown in North and South Bihar where it competes successfully with Co.453 and B.O.11 in sugar per acre.

The variety was released from Pusa in the year 1954.

3. AGRICULTURAL

A quick growing, fairly erect cane, heavy in yield and early midseason in ripening ; susceptible to red rot and smut.

Termination quick and good ; early stand moderate ; tillering good with canes of medium weight and hollow inside ; yield heavy giving an average of about 750 maunds (about 30 tons) of cane per acre ; an early midseason cane with high sucrose content giving a Pol. of about 16 per cent, in November and improving in juice quality till March reaching a Pol. figure of 18 per cent. ; fibre moderate ; susceptible to red rot and smut.

35. B. O. 22.

I. BOTANICAL

A. PARENTAGE Not known.

B. HABIT AND GENERAL APPEARANCE

A fairly good stand of erect, medium-thin canes with profuse ivory markings and splits ; foliage medium-abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Light green, (ii) *Length and width*. Long ; medium-broad.

2. SHEATH.....- (i) *General*. Light green with purple in older leaves ; slight bloom ; scarious border fairly prominent in older sheaths, (ii) *Clasping*. Fairly tight. (iii) *Spines*. Absent.

;i. BLADE JOINT-...[i] *Transverse mark*. Light green, medium, bloom, (ii) *Ligule*. High, deltoid, the width decreasing gradually towards the edges, symmetrical, horizontal, (iii) *Ligular process*. Short on one side and indicated on the other.

4. ARRANGEMENT—(i) *Number*. Medium-abundant. (ii) *Carriage*. Young ones erect with tips drooping; older ones slightly broadly drooping, (iii) *Top*. Open.

D. CANE

1. GENERAL—Medium-thin, straight, round in cross section, internal tissue green in rind portion and light brown at the rest ; rind not hard ; cavity in centre.

2. COLOUR—Dark green turning yellowish green on exposure ; growth ring light brown turning concolorous ; root zone ivory yellow turning concolorous.

3. JOINT—(i) *Shape and markings*. Cylindrical, straight ; splits present, long and deep ; ivory markings present in profusion as long, thin lines ; weather markings present ; bud groove absent; heavy bloom throughout joint, (ii) *Wax band*. Not clearly distinguishable, narrow, even, (iii) *Growth ring*. Narrow, even or slightly constricted, (iv) *Root zone*. Medium, slightly swollen having two rows of fairly regular, sparse root eyes which are not clearly visible.

4. NODE—Even, leaf scar not prominent, straight.

5. BUD—(i) *Size, shape and position*. Small, plump, broadly ovate to roundish, stopping below growth ring ; inserted at leaf scar, (ii) *Flange*. Not at all prominent, very narrow, width equal throughout, arising from top half of bud. (iii) *Venation and gempore*. Nerves rather few, semi-radial, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination fairly good ; shoots make an angle of 65° at two-month stage and are fairly erect at harvest.

F. SETT AND SHOOT ROOTS

Total number of root eyes less than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thinner than those of Co.205 and Co.213 and as thick as those of Chunnee ; at thirty days from planting, sett roots as long as those of Co.213 ; development of shoot roots later than in Hemja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

Fairly good from the point of tapping surface, layers of soil ; many roots penetrate to a depth of only two feet ; surface roots fairly numerous ; lateral spread satisfactory.

H. STEM EPIDERMAL PATTERN

Cork-silica cells in single or double pairs ; number of cork cells per unit area high ; solitary cork cells absent ; pointed cork cells present ; long cells narrow ; walls of long cells slightly wavy.

2. VARIETAL POSITION

This variety has recently been released for cultivation in North Bihar as a mid-season cane.

The variety was released from Pusa in the year 1954.

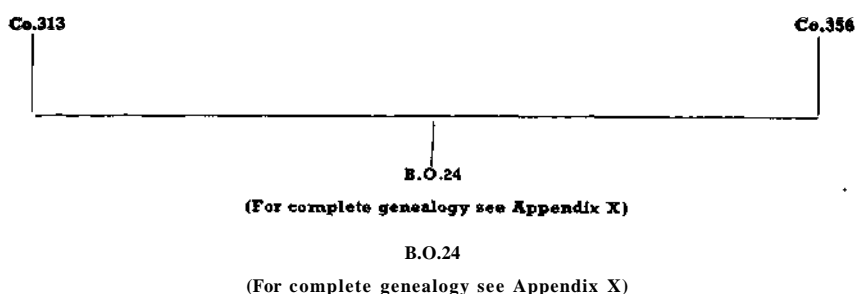
3. AGRICULTURAL

Germination fairly good ; early stand not impressive but makes up after rains ; tillering profuse making up for the light, pithy individual canes ; fair yielder recording an average of about 650 maunds of cane per acre ; a mid-season cane ripening in December with Pol. of about 15.50 per cent, and reaching a figure of 16.8 per cent, during March ; fibre content high to the extent of 17 per cent. ; fairly resistant to red-rot and smut.

36. B. O. 24.

1. BOTANICAL

A. PARENTAGE



Co.313 X Co.356.—Unbagged cross. This is a variety evolved at the Sugarcane Research Station, Pusa, Bihar. The name B.O. stands for Bihar and (')rissa. B.O.24 has in it the complements of *Saccharum officinarum* (from Black Cheribon, Kaludai Boothan, Vellai, Bandjermassing Hitam, Loethers, Lahaina and Fidji), *Saccharum Barberi* (from Chunnee), *Saccharum spontaneum* (from Coimbatore and Java forms) and *Sorghum d-itrra* Stapf.

The chromosome number is $2n = 118$.

B. HABIT AND GENERAL APPEARANCE

A good stand of erect medium canes, with the heavy bloom and swollen growth ring showing out of the self trashed lower joints ; foliage medium-abundant.

C. LEAF

1. LAMINA—(i) *Colony*. Light green. (ii) *Length and width*. Long ; broad.

2. SHEATH—(i) *General*. Light green with purplish blotches ; light bloom ; scarious border prominent in older leaves. (ii) *Clasping*. Loose. (iii) *Spines*. Sparse at the centre of sheath.

3. BLADE JOINT—(i) *Transverse mark*. Green with pinkish tinge ; big, fair bloom. (ii) *Ligule*. Medium, crescentiform, the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Present on both sides, one very short and the other indicated.

4. ARRANGEMENT—(i) *Number*. Medium-abundant. (ii) *Carriage*. Young leaves with erect tips ; older ones broadly curved ; (iii) *Top*. Open.

D. CANE

1. GENERAL—Medium, straight, slightly oval, internal tissue yellowish ; rind hard ; pith with central cavity.

2. COLOUR—Yellowish green with purple even in unexposed canes ; growth ring light brown ; root zone yellowish.

3. JOINT—(i) *Shape and markings*. Cylindrical sometimes tending to a conoidal shape ; splits absent ; ivory markings present as small, thin lines ; bud groove prominent, medium, shallow extending to $\frac{3}{4}$ length of joint ; fair bloom throughout joint. (ii) *Wax band*. Distinguishable, medium, even and constricted below bud. (iii) *Growth ring*. Medium, prominently swollen, (iv) *Root zone*. Narrow, even with 2 regular rows of prominent root eyes.

4. NODE. Even, leaf scar prominent, slightly inclined, protruding below bud.

5. BUD—(i) *Size, shape and position*. Fairly big, plump ; ovate-triangular, sometimes ovate, reaching bottom of growth ring ; inserted at leaf scar. (ii) *Flange*. Not prominent, narrow, wider at base, arising from top half of bud. (iii) *Venation and gempore*. Nerves numerous, parallel, converging to top ; germination apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; shoots make an angle of 70" at two-month stage and are erect at harvest.

P. SETT AND SHOOT ROOTS

Total number of root eyes less than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots thicker than those of all the four ; at thirty days from planting, sett roots shorter than those of all the four ; development of shoot roots earlier than in all the four.

G. ADULT ROOT SYSTEM

Rather poor root system with few surface feeding and deep feeding roots ; lateral spread also poor.

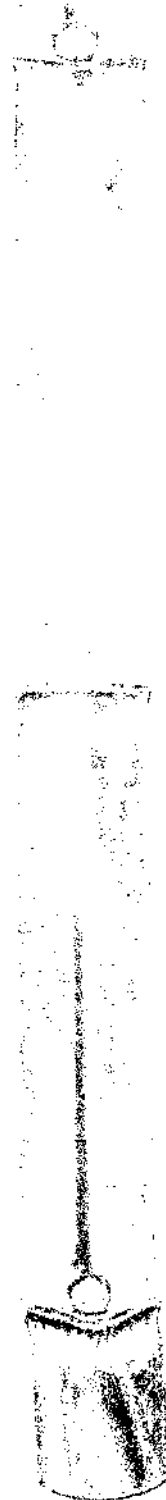
PLATE XVIII



B.O. 21
Pusa



B.O. 22
Pusa



B.O. 24
Pusa

H. STEM EPIDERMAL PATTERN

Cork-silica cells in single pairs only ; number of cork cells per unit area low ; solitary cork cells present ; pointed cork cells in profusion, some of them very long ; long cells very narrow ; walls of long cells highly wavy.

2. VARIETAL POSITION

This variety has been released for cultivation especially for the low lying areas in North and South Bihar in view of its resistance to waterlogged conditions. It is replacing Co.513 in low lying areas of the State. It was released from Pusa in the year 1953.

3. AGRICULTURAL

A good and quick germinator with pronounced early growth and tillering especially during the pre-monsoon period ; tillering good ; few late shoots ; yield fairly good at an average of about 650 maunds (about 26 tons) of cane per acre ; suited to varying amounts of soil moisture ; drought resistant and cheerful during the hot weather without showing sign of drying ; mid-season in ripening (about January) and reaching peak quality in March after which it rapidly deteriorates ; fibre content high, about 17 per cent. ; fairly resistant to red-rot and smut.

The outstanding feature of the variety is its exceptional tolerance to flood and water-logging.

37. H. M. 320.

1. BOTANICAL

A. PARENTAGE

RED MAURITIUS G.C.— A seedling obtained from an unbagged arrow of Red Mauritius. H.M. 320 has thus in it the complements of *Saccharum officinarum*.

This is a variety evolved at the Research Station at Hebbal, Mysore, the word H.M. standing for Hebbal, Mysore.

The chromosome number is $2n = 90$.

B. HABIT AND GENERAL APPEARANCE

A loose mass of thickish canes with the conoidal short joints and reddish colour showing out of the bottom self-stripped joints ; foliage medium-abundant.

C. LEAF

1. LAMINA—(i) *Colour*. Dark green, (ii) *Length and width*. Medium; broad.

2. SHEATH—(i) *General*. Pale green with purplish blotches in older leaves ; heavy bloom ; scarious border prominent. (ii) *Clasping*. Loose. (iii) *Spines*. Sparse mostly on middle of sheath.

3. BLADE JOINT—(i) *Transverse mark*. Brownish, big, heavy bloom. (ii) *Ligule*. Very shallow, crescentiform, sloping slightly, symmetrical, horizontal. (iii) *Ligular process*. Absent.

4. ARRANGEMENT—(i) *Number*. Medium-abundant. (ii) *Carriage*. All leaves with tips erect. (iii) *Top*. Compact.

I). CANE

1. GENERAL—Medium-thick, straight, slightly oval in cross section, internal tissue light green at the rind portion and yellowish at the rest ; rind very soft ; solid.

2. COLOUR—Green with yellow at the growth ring and root zone portions, turning reddish on exposure and very often even in unexposed canes ; growth ring brownish yellow; root zone brownish yellow.

3). JOINT---(i) *Shape and markings.* Conoidal, rather short, splits absent; ivory markings absent ; bud groove- present, shallow extending to half the length of joint ; no bloom. (ii) *Wax band.* Clearly distinguishable, medium, constricted below bud. (iii) *Growth ring.* Narrow, swollen, (iv) *Root zone.* Broad, slightly narrowed towards bud forming an inverted cone with 2-3 rows of root eyes.

4. NODE—Even, leaf scar prominent, inclined, protruding below bud.

5. BUD—(i) *Size, shape and position.* Big, plump, ovate-triangular, reaching top of growth ring ; inserted at leaf scar. (ii) *Flange.* Not prominent, very narrow, width equal throughout, arising from middle of bud. (iii) *Venation and germ pore.* Nerves numerous, parallel, converging to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination good ; at two-month stage shoots make an angle of 80° and are erect at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes less than in E.K.28, 247B, POJ.2878, Purple Mauritius and Pundia ; sett roots as thick as those of POJ.2878 ; at thirty days from planting, sett roots longer than those of E.K.28, 247B, POJ.2878, Purple Mauritius and Pundia; development of shoot roots earlier than all the varieties.

G. ADULT ROOT SYSTEM

A very good root system, many roots penetrating to a depth of four feet and more ; surface feeding roots many ; lateral spread good.

H. STEM EPIDERMAL PATTERN

Cork-silica cells in single or multiple pairs; number of cork cells per unit area high; solitary and pointed cork cells present ; long cells broad ; walls of long cells wavy.

2. VARIETAL POSITION

This variety is in cultivation in Mysore State and is popular in the gur producing areas.

The variety was released from Hebbal in the year 1930.

3. AGRICULTURAL

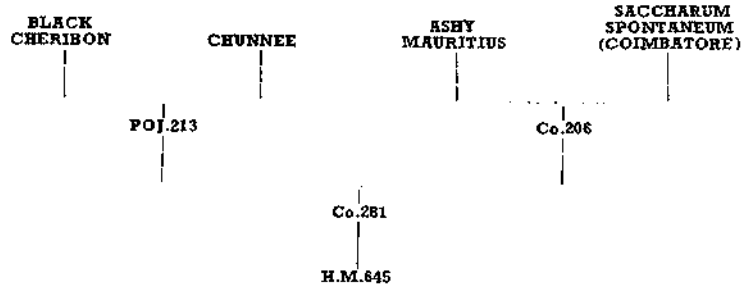
A fairly good yielding, high sucrose cane giving gur of very good quality ; Non-flowerer.

Germination good ; fair early vigour ; tillering poor but the thickish, individual, solid canes make up for the poor tillering giving an average yield of 800 maunds (about 35 tons) of cane per acre ; fair ratooner ; responds well to manuring and irrigation ; comes best in sandy loams and garden lands ; rather susceptible to dry, saline and waterlogged conditions ; a rich cane with good sucrose content, mid-season in ripening ; low fibre content ; gur of very good quality; susceptible to top and stem borers ; susceptible to mosaic.

38. H. M. 645.

1. BOTANICAL

A. PARENTAGE



Co.281 G.C. - A seedling raised from an unbagged arrow of Co.281. H.M.645 has in it the complements of *Saccharum officinarum* (from Black Cheribon and Ashy Mauritius), *Saccharum Barberi* (from Chunnee) and *Saccharum spontaneum*.

This is a variety evolved at the Research Station at Hebbal, Mysore. The name H.M. stands for Hebbal, Mysore.

The chromosome number is $2n = 114-116$.

B. HABIT AND GENERAL APPEARANCE

A moderate stand of erect, medium-thin canes ; foliage medium-abundant.

C. LEAF

1. LAMINA--(i) *Colour*. Dark green. (ii) *Length and width*. Long ; broad.
2. SHEATH--(i) *General*. Light green ; slight bloom ; scarious border prominent in older leaves ; (ii) *Clasping*. Fairly tight. (iii) *Spines*. Present in middle of sheath.
3. BLADE JOINT--(i) *Transverse mark*. Light green ; long and narrow ; slight bloom. (ii) *Ligule*. Shallow, crescentiform, the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Indicated on one side.
4. ARRANGEMENT--(i) *Number*. Medium-abundant. (ii) *Carriage*. Spindle leaves with tips erect ; others drooping broadly. (iii) *Top*. Open.

D. CANE

1. GENERAL--Medium-thin, straight, slightly oval in cross section, internal tissue light green at rind portion and light yellow at the rest ; whitish pithy cells at centre.
2. COLOUR--Greenish yellow, the former colour predominating at the top-half ; growth ring light brown ; root zone ivory yellow.
3. JOINT - (i) *Shape and markings*. Long, cylindrical with bulge opposite bud ; splits absent ; ivory markings absent ; weather markings present ; bud groove absent ; light bloom

throughout joint. (ii) *Wax band.* Clearly distinguishable, medium, constricted, (iii) *Growth ring.* Narrow, slightly swollen, (iv) *Roof zone.* Broad, even, with 3-4 rows of small, closely sett, root eyes.

4. NODE - Even, leaf scar not prominent, slightly inclined.

5). BUD) (i) *Size, shape and position.* Medium, fairly plump, round, stopping below growth ring, inserted at leaf scar. (ii) *Flange.* Not prominent, narrow, width equal throughout, arising from top half of bud. (iii) *Venation and gempore.* Rather few, semi-radical, converging to centre ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Satisfactory ; shoots make an angle of 70° at two-month stage and are fairly erect at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes more than in Hemja, Chunnee, Co.205 and Co.213 ; sett roots as thick as those of Co.205 ; at thirty days from planting, sett roots as long as those of Co.205 ; development of shoot roots later than in Hemja, Chunnee, Co.205 and Co.213.

G. ADULT ROOT SYSTEM

A good and ideal root system with many roots reaching to a depth of four feet ; surface feeding roots many and lateral spread good.

H. STEM EPIDERMAL PATTERN

A pattern characterised by a large preponderance of solitary cork cells, only a few being in single or multiple pairs with silica cells ; number of cork cells per unit area very high ; pointed cork cells rare ; long cells narrow ; walls of long cells highly wavy.

2. VARIETAL POSITION

This variety occupies some area in Mysore and has been meant specially to replace the local Cheni in places where irrigation facilities are not quite satisfactory.

The variety was released from Hebbal in the year 1939.

3. AGRICULTURAL

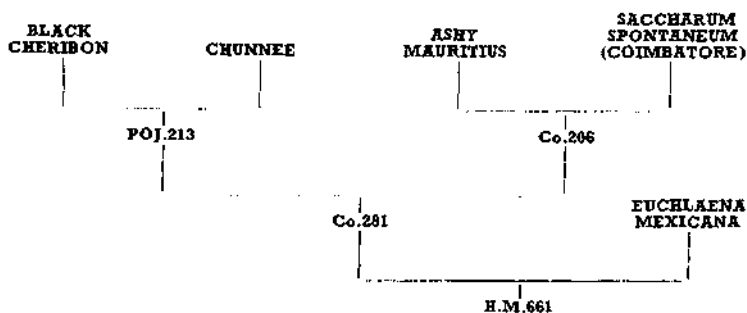
A medium-thin variety with good tillering and juice quality and suited for areas deficient in irrigation.

Germination satisfactory ; good early vigour ; growth quite satisfactory ; tillering heavy ; yield fair and of the order of 800 mauncls (30 tons) of cane per acre ; very good ratooner ; comes up well in loamy and heavy soils ; responds well to manuring ; resistant to drought and saline conditions ; fairly resistant to waterlogging ; mid-season cane with good juice quality ; fibre low ; gur of very good quality ; resistant to stem borer.

39. H. M. 661.

1. BOTANICAL

A. PARENTAGE.



Co.281 x *Euchlaena mexicana*.--An unbagged cross. H.M.661 has in it the complements of *Saccharum officinarum* (from Black Cheribon and Ashy Mauritius), *Saccharum Barberi* (from Chunnee), *Saccharum spontaneum* and *Euchlaena mexicana*.

The chromosome number is $2n = 134-136$.

B. HABIT AND GENERAL APPEARANCE

A good stand of erect, medium canes, with swollen root zone and the characteristic brownish purple colour showing out through the easily stripping leaf sheaths ; Foliage abundant.

C. LEAF

1. LAMINA-- (i) *Colour*. Dark green, (ii) *Length and width*. Long; broad.
2. SHEATH.....(i) *General*. Light green ; fair bloom ; scarious border prominent on older sheaths. (ii) *Clasping*. Loose, (iii) *Spines*. Absent.
3. BLADE JOINT- (i) *Transverse mark*. Brownish, big, heavy bloom. (ii) *Ligule*. Medium, crescentiform, the width decreasing gradually towards the edges, symmetrical, horizontal. (iii) *Ligular process*. Present on both sides, small.
4. ARRANGEMENT (i) *Number*. Abundant. (ii) *Carriage*. Young leaves with tips erect, ; older ones with drooping tips. (iii) *Top*. Compact.

D. CANE

1. GENERAL Medium, straight, oval in cross section, internal tissue light yellow ; rind fairly hard ; central small cavity with whitish pithy cells around it.
2. COLOUR Brownish purple ; growth ring light brown ; root zone yellowish brown.
3. JOINT (i) *Shape and markings*. Medium, cylindrical; splits rare; ivory markings absent ; weather markings fairly profuse ; bud groove present, shallow, medium in width extending upto $\frac{3}{4}$ of joint ; fair bloom throughout joint. (ii) *Wax band*. Clearly distinguishable,

narrow, constricted. (iii) *Growth ring*. Narrow, even, (iv) *Root zone*. Medium, swollen with 2 rows of fairly regular root eyes.

4. **NODE**—Even, leaf scar prominent, inclined with prominent protrusion below bud.

5. **BUD**—(i) *Size, shape and markings*. Big, plump, ovate, sometimes ovate-triangular reaching growth ring ; inserted at leaf scar, (ii) *Flange*. Not prominent, narrow, width equal throughout, arising from, top half of bud. (iii) *Venation and gempore*. Nerves numerous, parallel, extending to top ; germination sub-apical.

E. GERMINATION AND HABIT AT DIFFERENT STAGES

Germination fairly good ; shoots make an angle of 80° at two-month stage and are erect at maturity.

F. SETT AND SHOOT ROOTS

Total number of root eyes less than in E.K.28, 247 B, POJ.2878, Purple Mauritius and Pundia ; sett roots as thick as those of POJ.2878 ; at thirty days from planting, sett roots longer than those of E.K.28, 247 B, Purple Mauritius and Pundia but shorter than those of POJ.2878 ; development of shoot roots at the same time as those of POJ.2878.

G. ADULT ROOT SYSTEM

Poor root system ; few roots reach a depth of three feet ; surface feeding roots sparse ; lateral spread poor.

H. STEM EPIDERMAL PATTERN

Cork-silica cells in single pairs with a fairly large number of the former occurring solitary ; number of cork cells per unit area low ; pointed cork cells present ; long cells narrow ; walls of long cells wavy.

2. VARIETAL POSITION

This variety is in cultivation in Mysore State in restricted areas.

The variety was released from Hebbal in the year 1940.

3. AGRICULTURAL

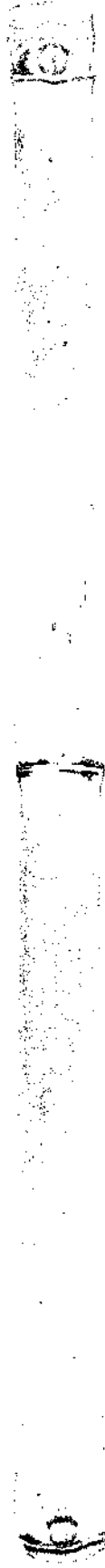
A good yielding cane with high sucrose content and purity.

Fairly good germination ; good early vigour and final growth ; tillering very satisfactory ; good yielder giving on an average 1,000 maunds (40 tons) of cane per acre ; good ratooner ; gives good response to manuring and irrigation ; gives good growth and yield when planted as an *adsali* crop ; adapts itself to different soil conditions ; resists drought and saline conditions ; shows fair resistance to waterlogging ; a midseason cane with good sucrose content ; high fibre content which stands in the way of milling in bullock driven crushers ; gur of good quality ; fairly resistant to stem and top borers.

PLATE XIX



H.M. 320
Mandya



H.M. 645
Hebbal



H.M. 661
Mandya

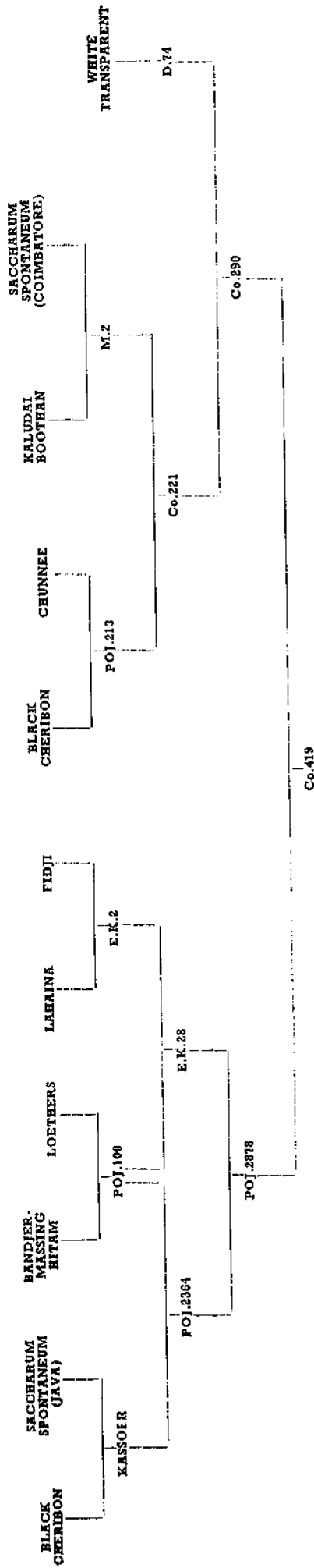
VIII REFERENCES.

1. ARTSCHWAGER, E. 1930.—A comparative study of the stem epidermis of certain varieties of sugarcane. Jour. Agric. Res., 41.
2. ----- 1939.--Illustrated outline for use in taxonomic description of sugarcane varieties. Int. Soc. Sug. Tech., Sixth. Cong. Proc. (1938).
3. ----- 1940.—Morphology of the vegetative organs of sugarcane. Jour. Agric. Res., 60.
4. BARBER, C. A. 1915. — Studies in Indian sugarcanes. No. I Punjab canes. Mem. Dept. Agric. India, Bot. Ser. 7, No. 1.
5. BREMER, G. 1923.-- A cytological investigation on some species and species hybrids in the genus *Saccharum*. Genetica, 5.
6. ----- 1924. - The cytology of the *Saccharum*. II. Genetica, 6.
7. ----- .1925.- The cytology of the sugarcane. III. Genetica, 7.
8. COWGILL, H. B. 1917.—A method of identification and description of sugarcane varieties and its application to types grown in Porto Rico. Jour. Dept. Agric, Porto Rico, 1 ; No. 3.
9. DEERR, N. 1921.—Cane Sugar.
10. DUTT, N. L. 1939.—Certain suggested floral characters for distinguishing commercial sugarcane varieties. Proc. Ind. Sci. Cong. 26th Session, Lahore.
11. DUTT, N. L. AND SUBBA RAO, K. S. 1933.—Observations on the cytology of sugarcane. Ind. Jour. Agric. Sci. 3.
12. DUTT, N. L., KRISHNASWAMI, M. K., AND THULJARAM RAO, J. 1947.—Suggested standards for botanical description and identification of sugarcane varieties. Proc. Ind. Sci. Cong. Session, Delhi.
13. EARLE, F. S. 1928.—Sugarcane and Its Culture.
14. HOLE, R. S. 1911.—On some Indian Forest Grasses and their Ecology. Ind. For. Mem., For. Bot. Ser. 1, pt. 1.
15. JESWIET, J. 1918.—Beschrijving der Soorten van het Suikerriet. Mededeelingen van het Proefstation voor de Java-Suikerindustrie, Landbouwkundige Serie, No. 5.
16. MOBERLY, G. S. AND STAFF OF EXPERIMENT STATION 1943.—The Cane Tester's Hand Book.

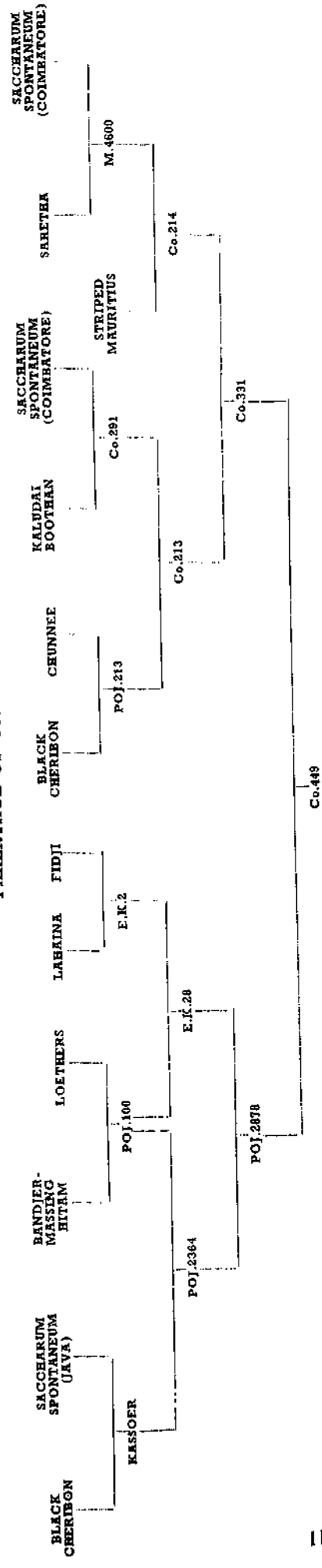
17. NARASIMHAN, V. R. AND THULJARAM RAO, J. 1951.-- Comparative study of the stem epidermis of Coimbatore canes in cultivation. Proc. 1st Bienn. Conf. Sug. Res. Workers, India.
18. PANJE, RAMA RAO 1933.- *Saccharum spontaneam*, L. A comparative study of the forms grown at the Imperial Sugarcane Breeding Station, Coimbatore. Ind. Jour. Agri. Sci. 3.
19. ROSENFELD, A. H. 1927. - A Monograph of Sugarcane varieties. Jour. Dept. Agric, Porto Rico, XL
20. STEVENSON, G. C. 1952.....-The Barbados sugarcane varieties. British West Indies Central Sugarcane Breeding Station, Barbados.
21. VENKATRAMAN, T. S. 1927.- Sugarcane Breeding — Indications of Inheritance. Mem. Dept. Agri. India, Bot. Ser. XIV, No. 3.
22. VENKATRAMAN, T. S. AND VITTAL RAO, U. 1928.- Coimbatore Seedling canes. (Co.'s 205, 210, 213, 214 and 223 described and illustrated). Agri. Jour. India, XXIII, pt. 1.
23. YENKATRAMAN, T. S. AND THOMAS, R. 1931.—Coimbatore Seedling canes. (Co.281 and Co.290 described and illustrated). Agric. and Live Stock in India, 1, pt. II.

APPENDIX I.

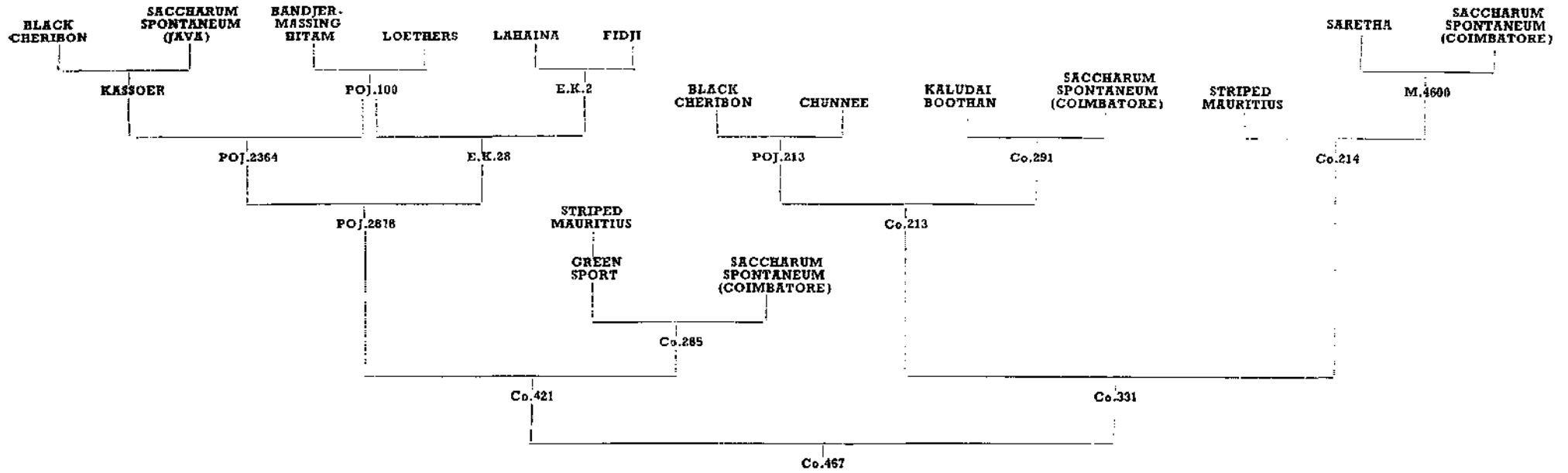
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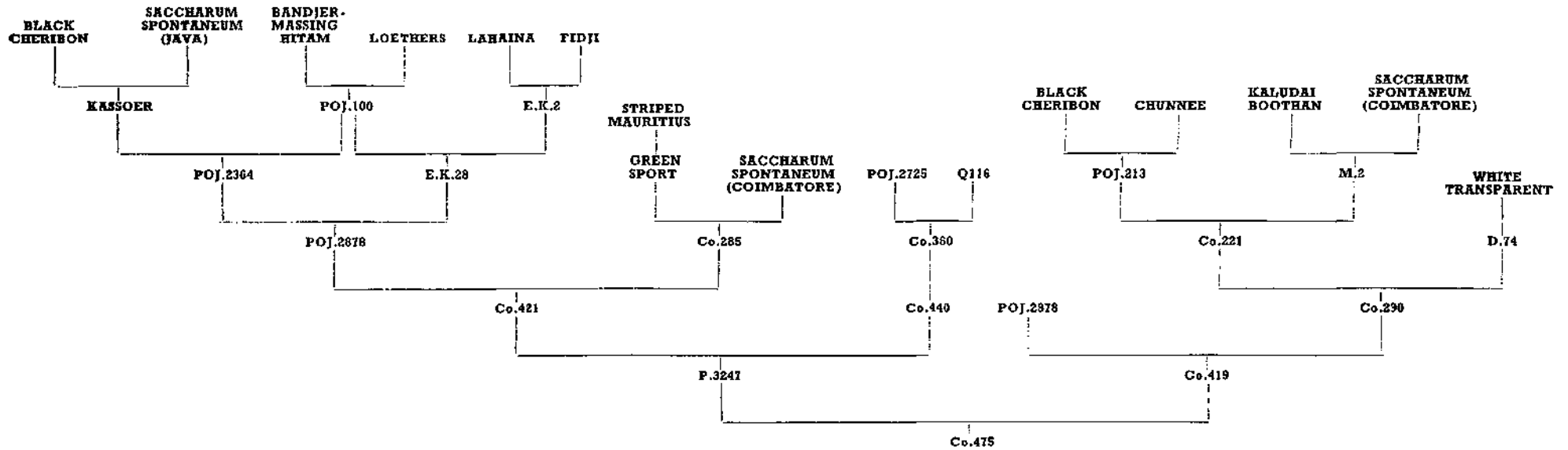
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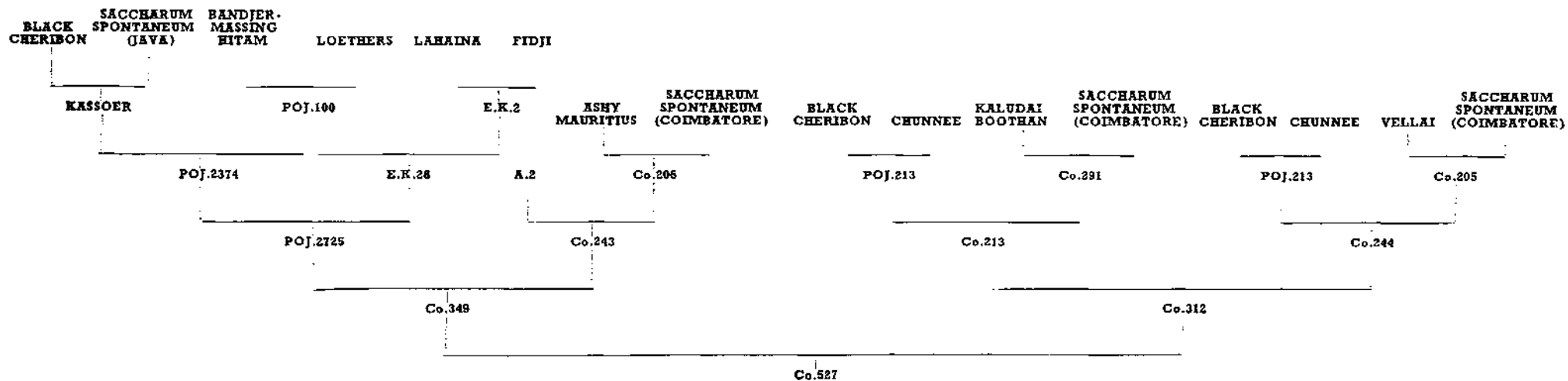


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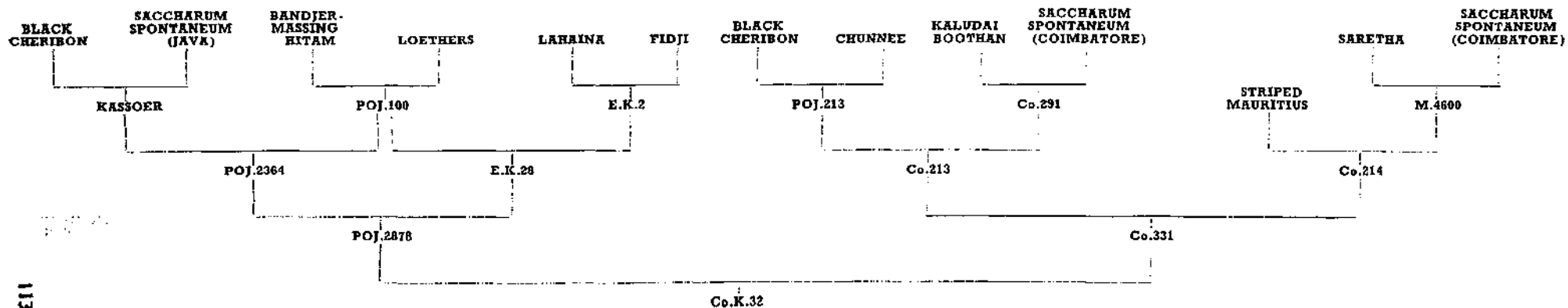


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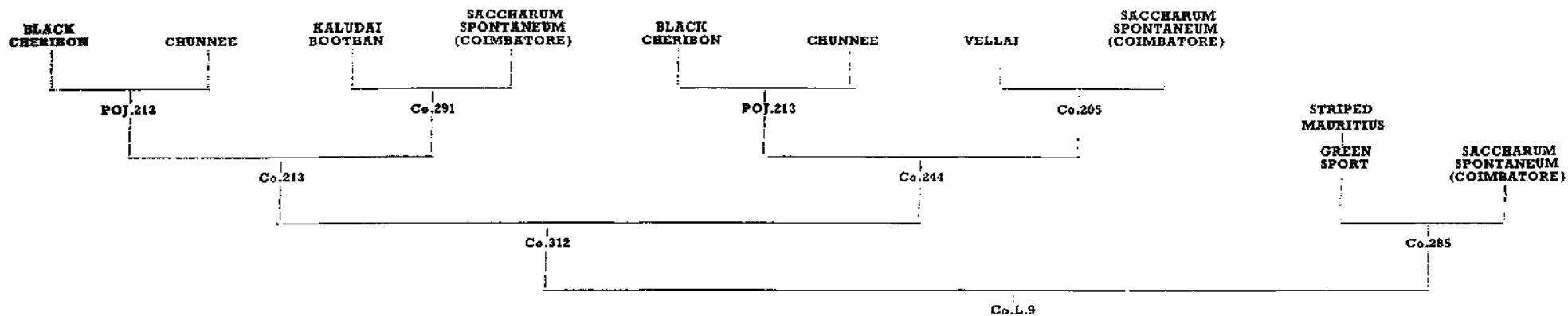


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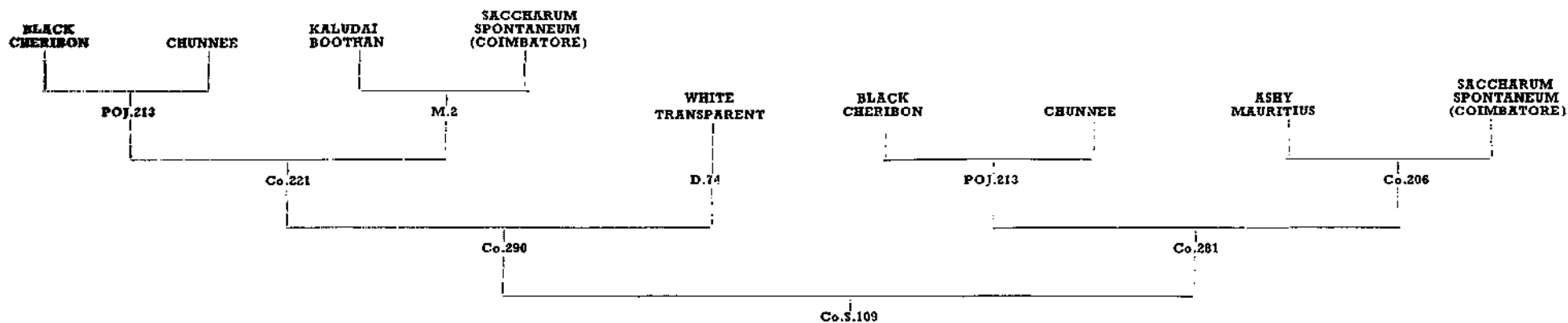


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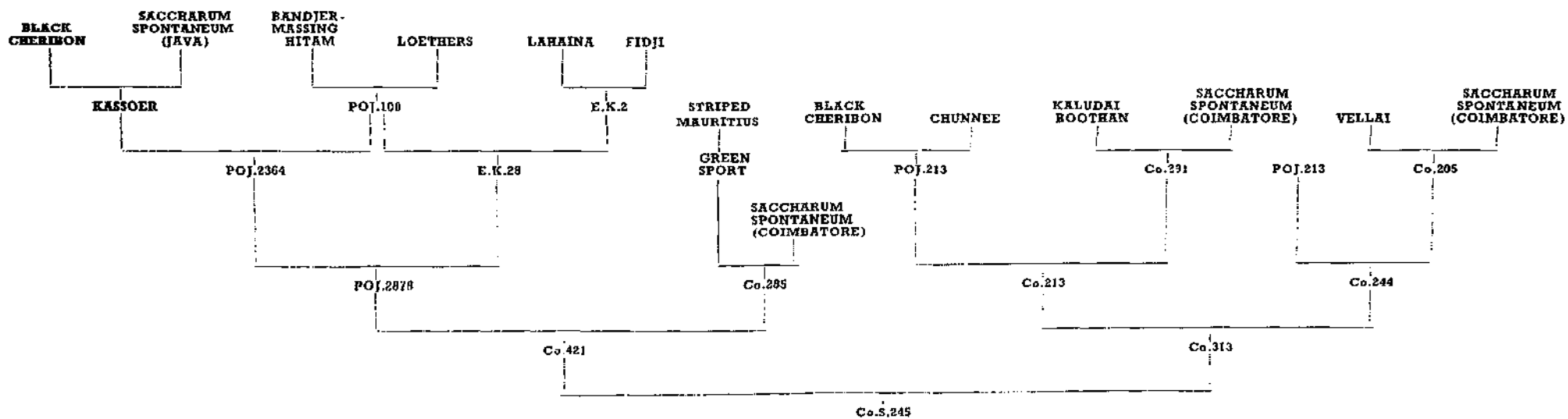
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PARENTAGE OF Co. S. 109.

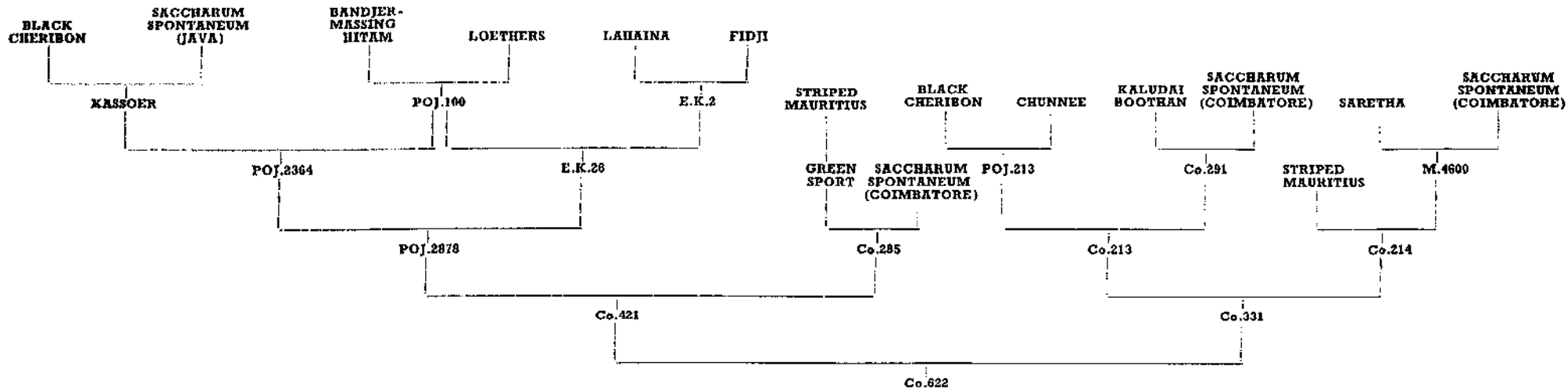


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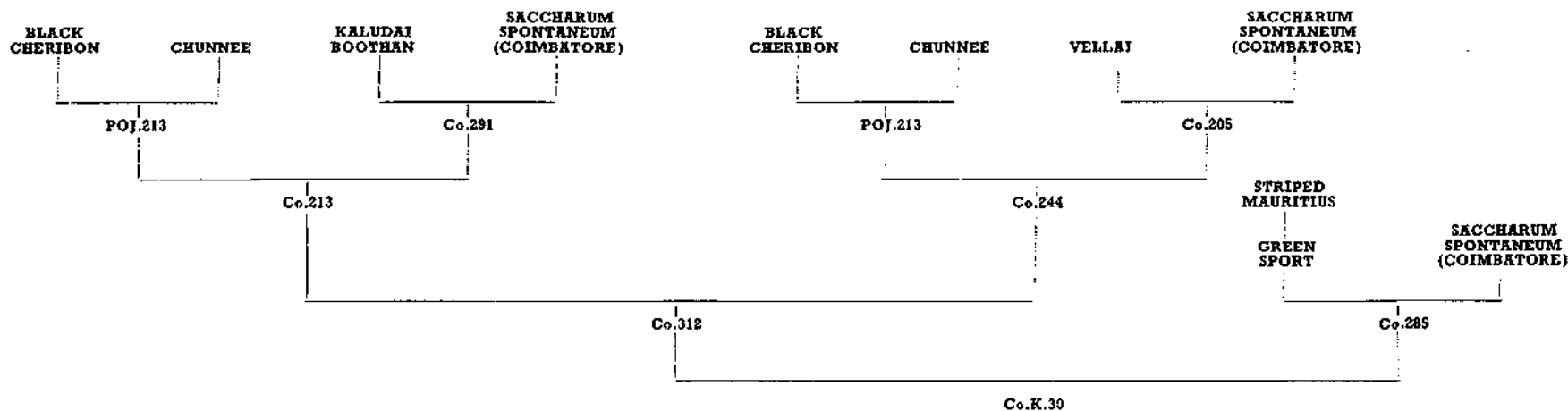


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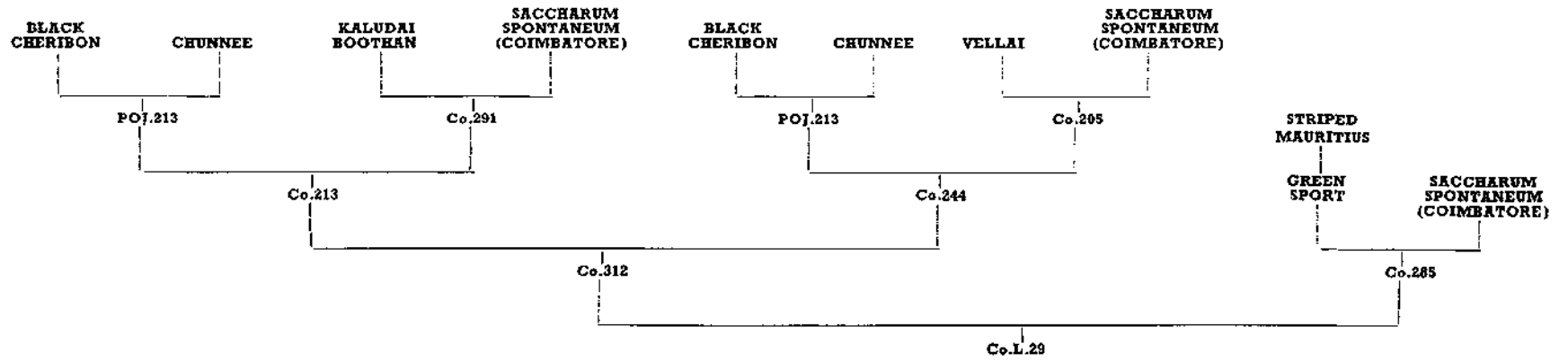


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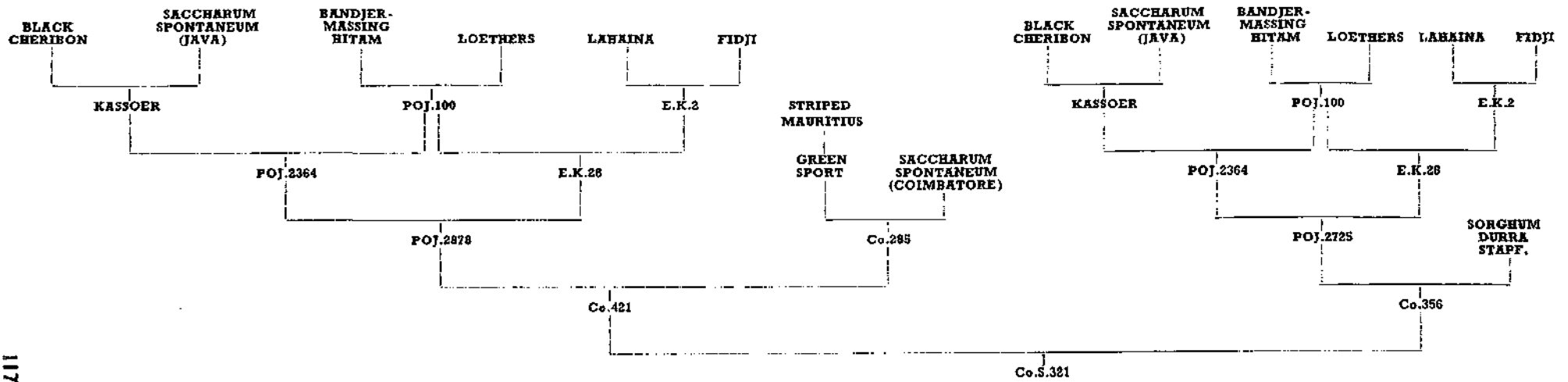


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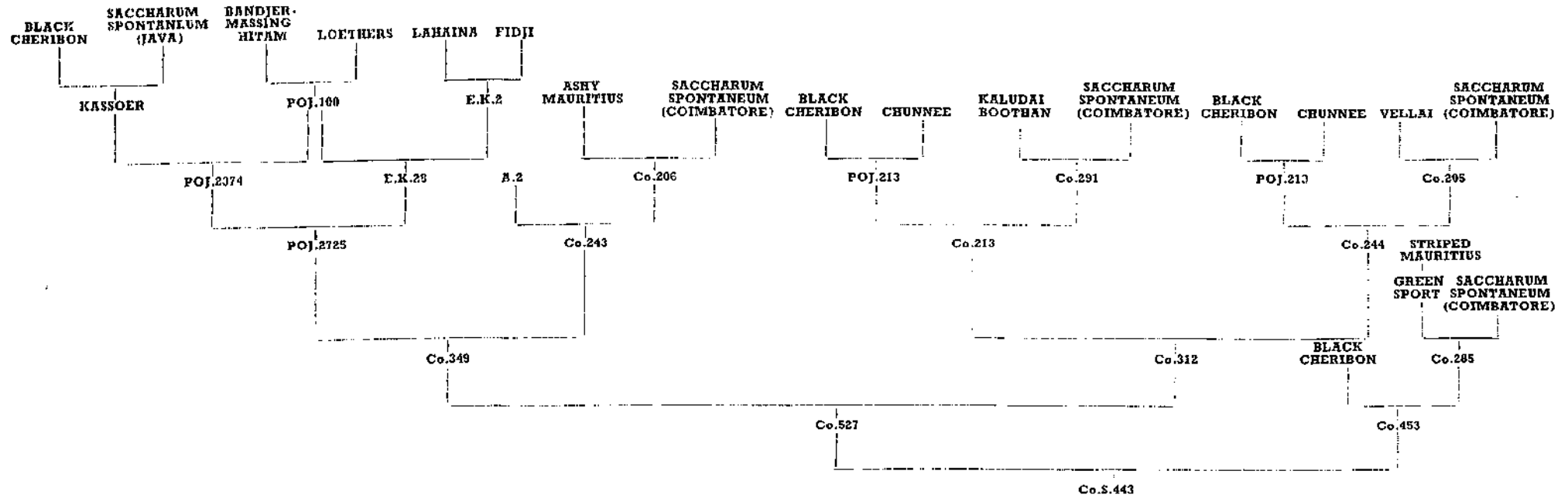
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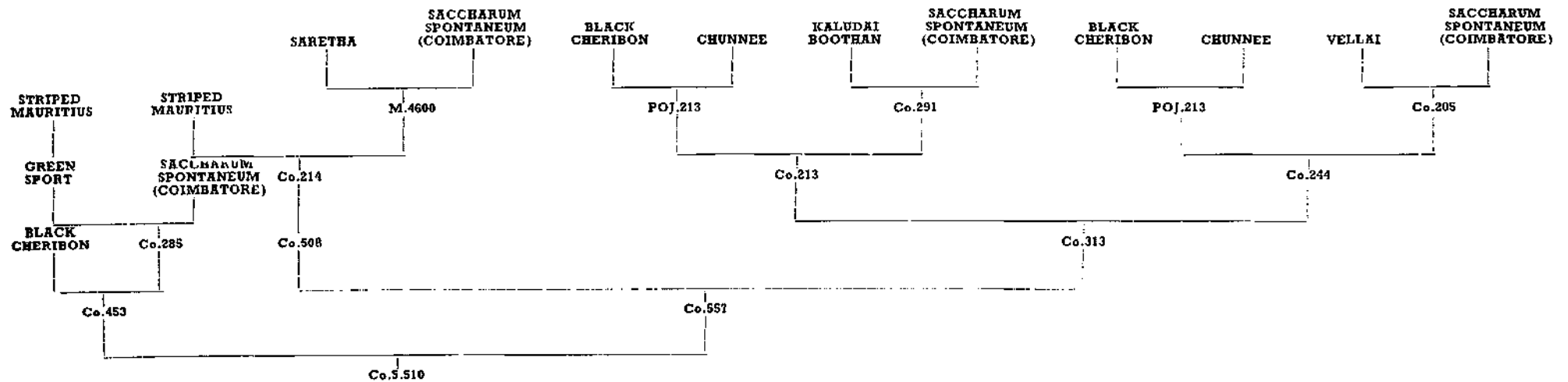
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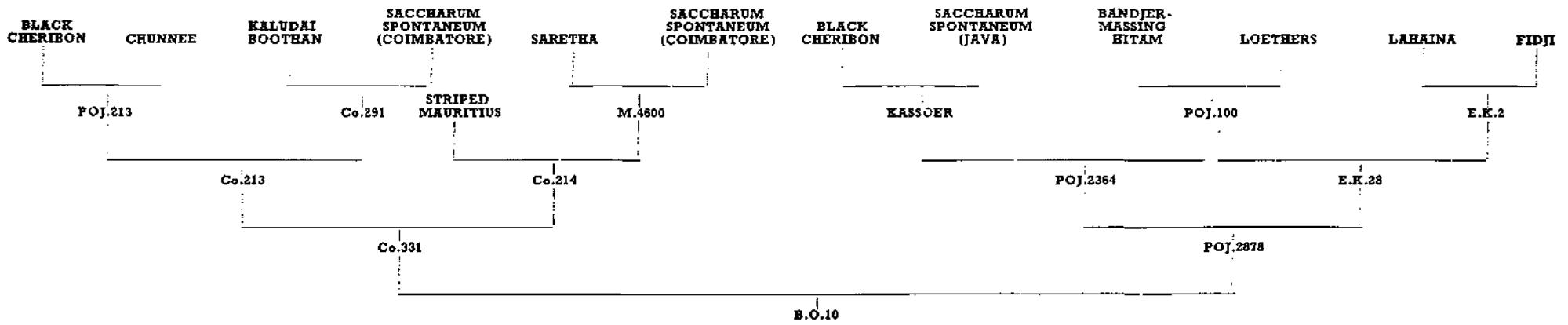
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PARENTAGE OF Co. S. 443.



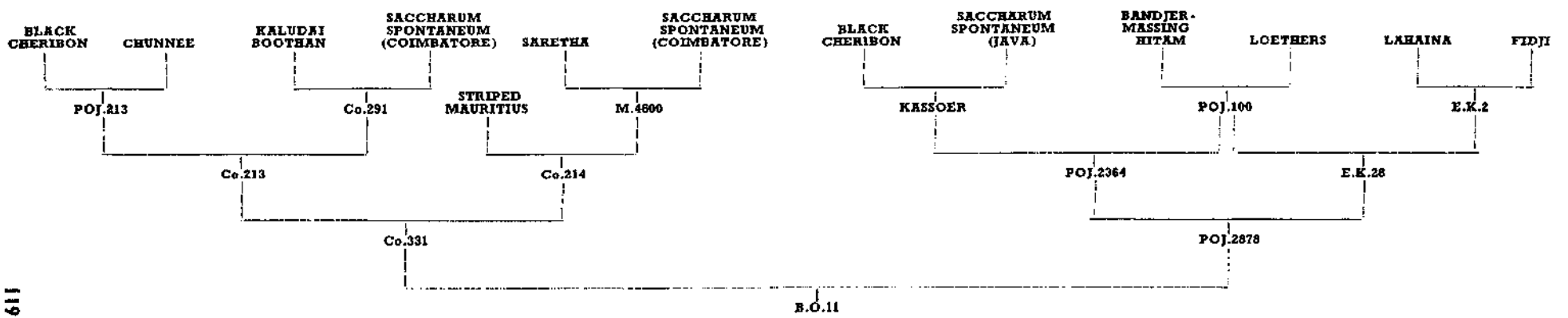
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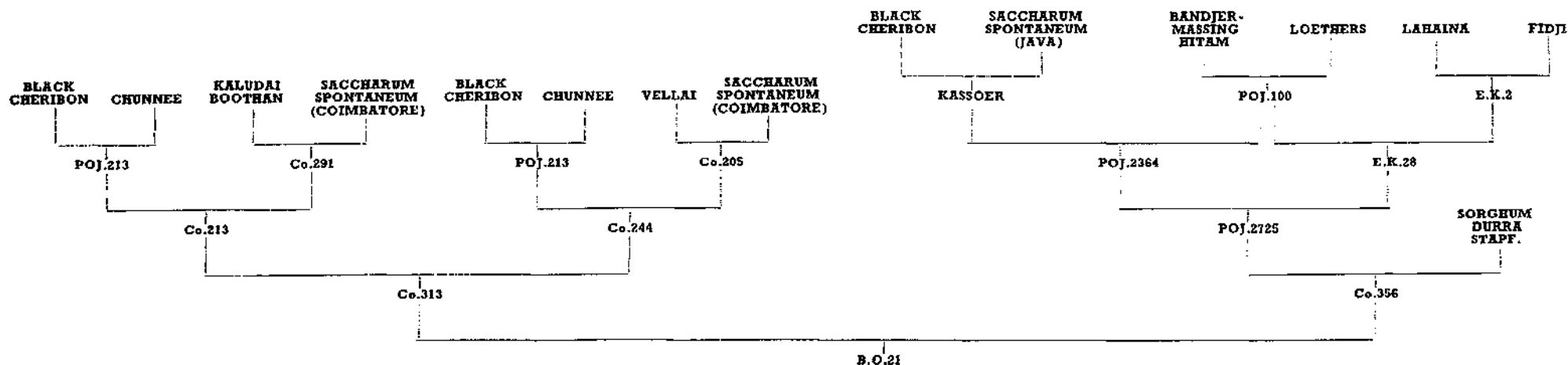
APPENDIX IX.
PARENTAGE OF B.O. 10.



PARENTAGE OF B.O. 11.



APPENDIX X.
PARENTAGE OF B.O. 21.



PARENTAGE OF B.O. 24.

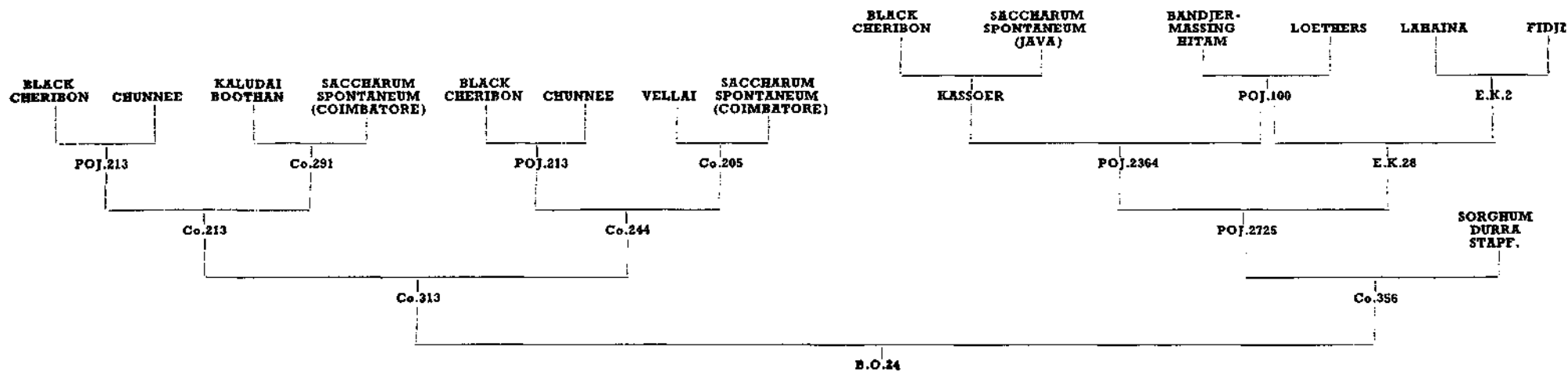
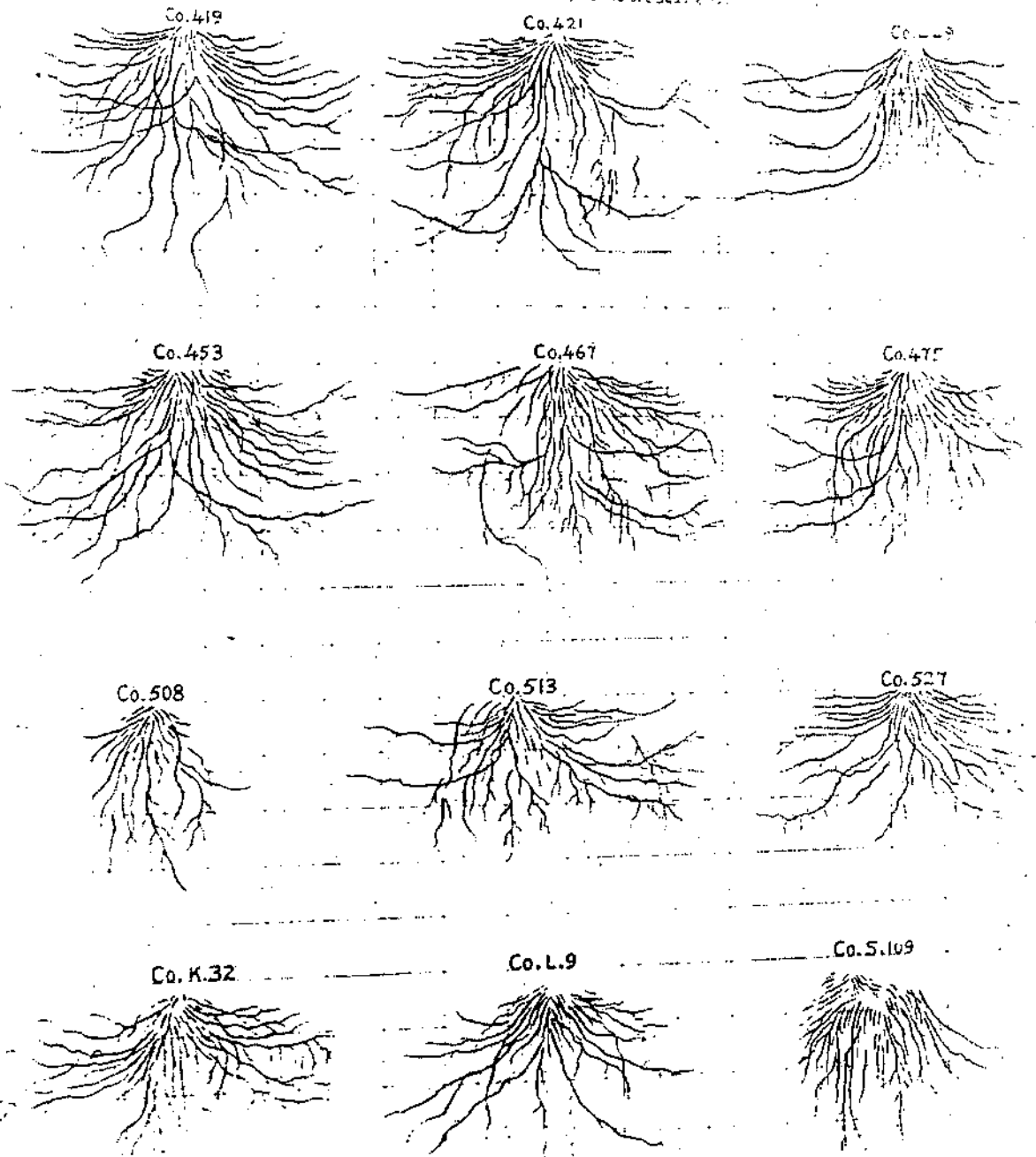


PLATE XX TO PLATE XL

ROOT SYSTEMS

of Co. Canes under cultivation

Scale: Each square represents one square foot

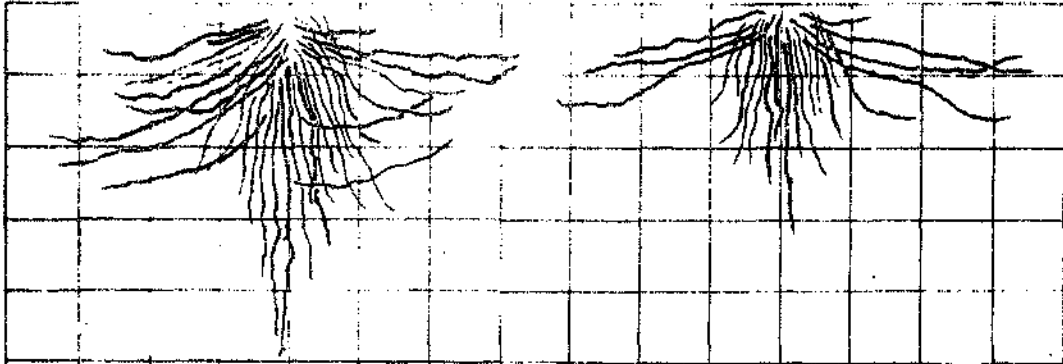


ROOT SYSTEMS of Sugarcane varieties in Cultivation

Scale --- Each square represents one square foot

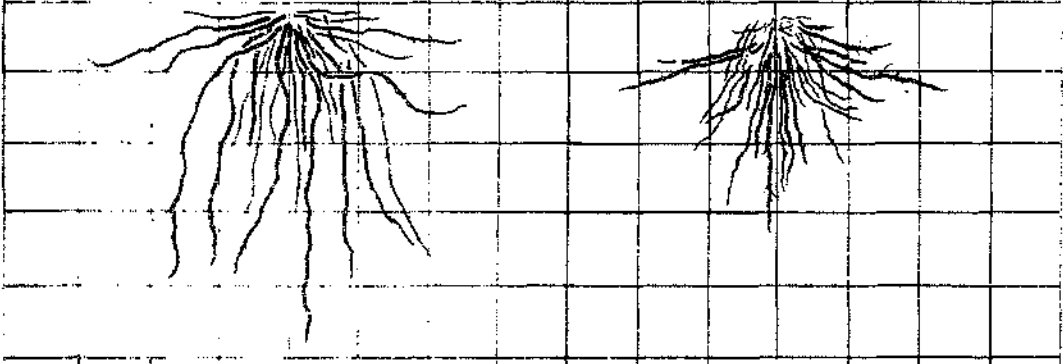
Co. 622

Co. K. 30



Co. L. 29

Co. S. 321



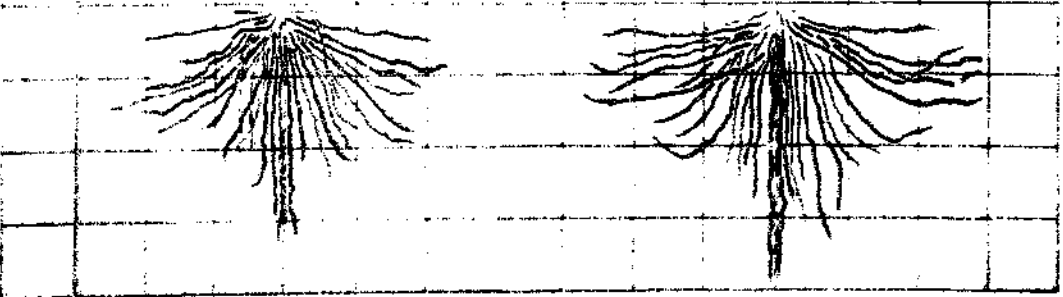
Co. S. 443

Co. S. 510



B. O. 10

B. O. 11

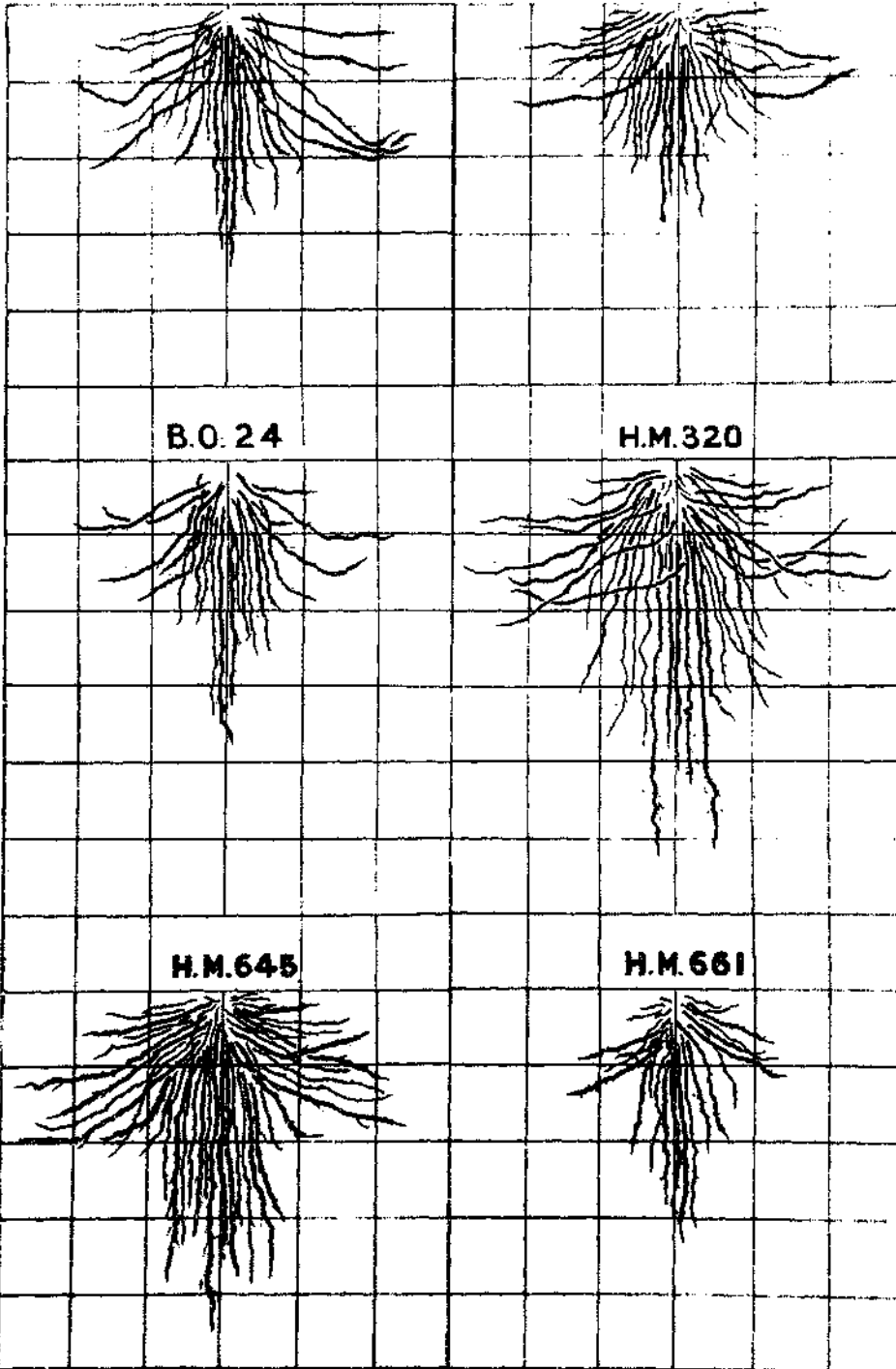


ROOT SYSTEMS of Sugarcane varieties in Cultivation

Scale --- Each square represents one square foot

B.O. 21

B.O. 22



B.O. 24

H.M. 320

H.M. 645

H.M. 661

PLATE XXI

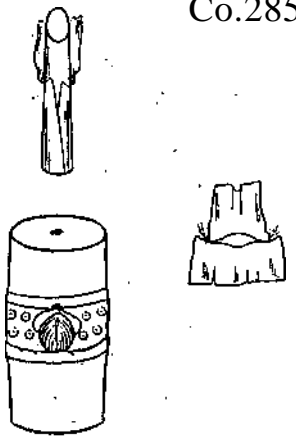
Co. 244 *xm*. n

y
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1 I
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Co. 285 3=



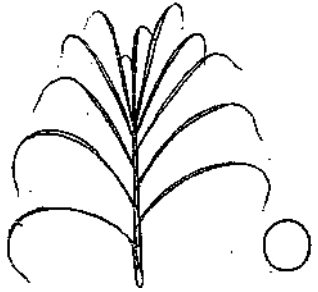
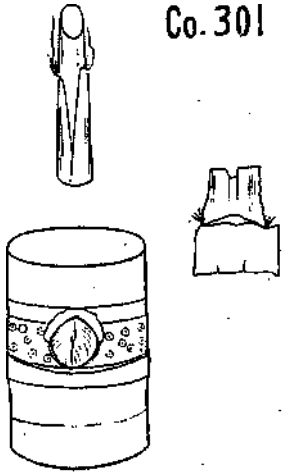
35S



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PLATE XXII

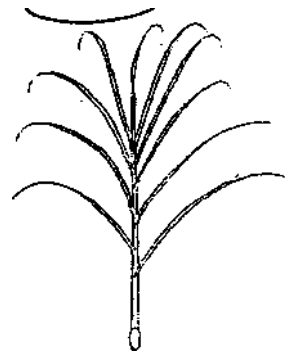
Co. 301



Co. 312



fjdt⁹

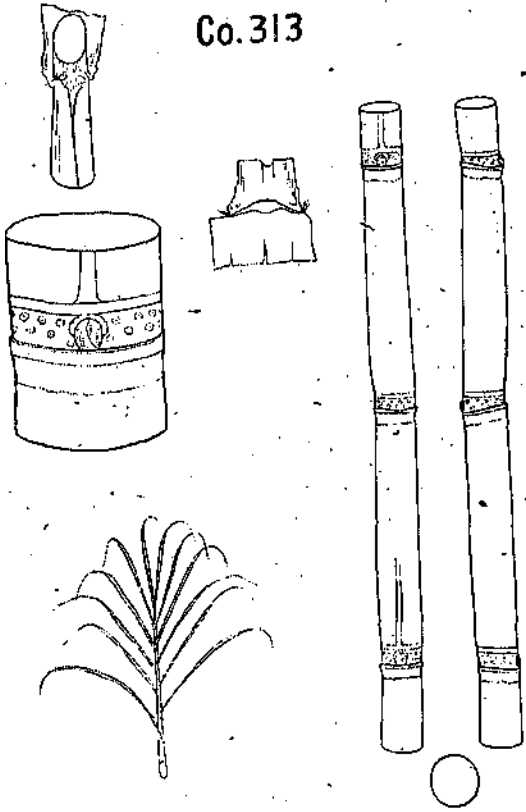


Sd a

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PLATE XXIII

Co.313



Co.331

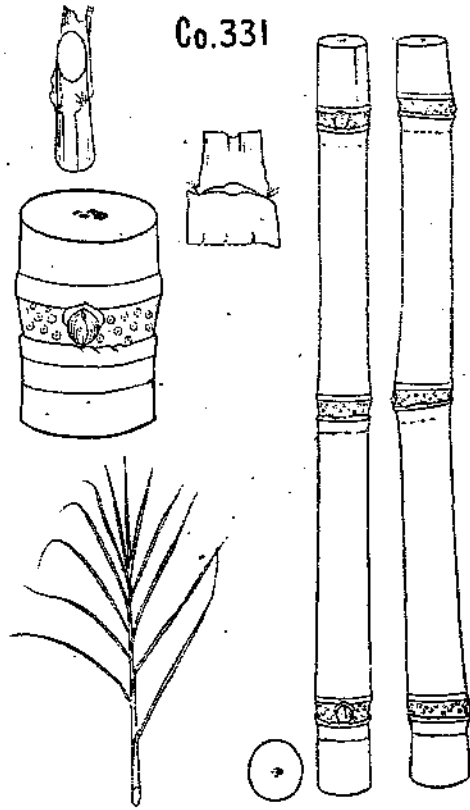
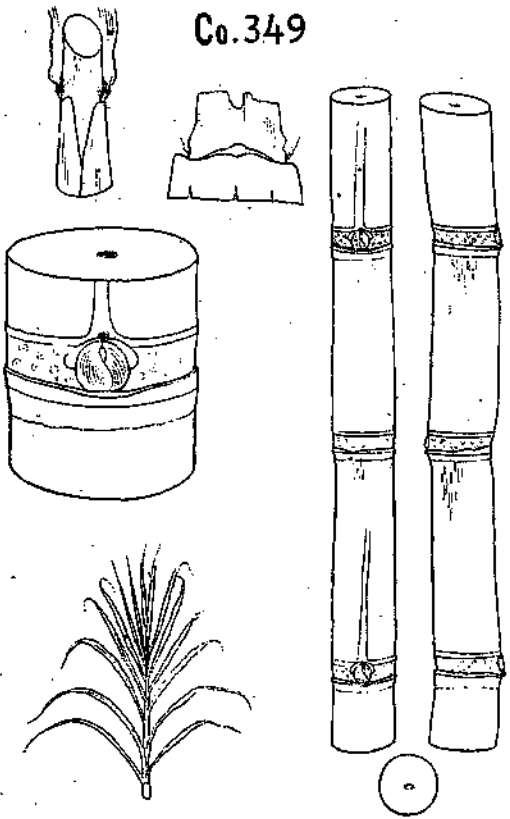


PLATE XXIV

Co.349



Co.356

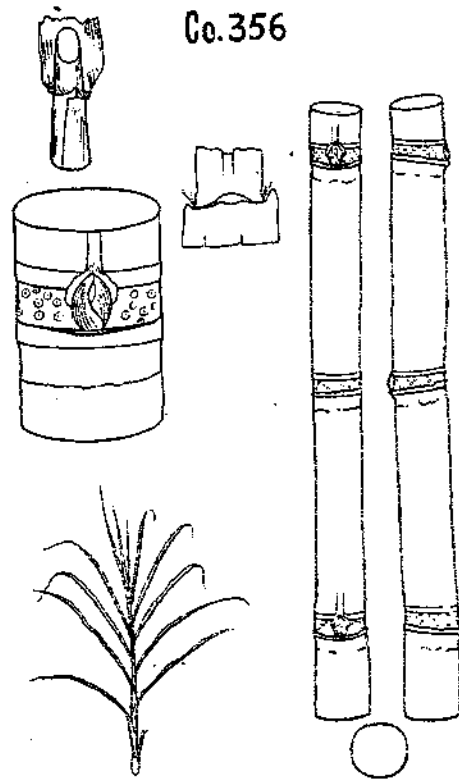


PLATE
XXV

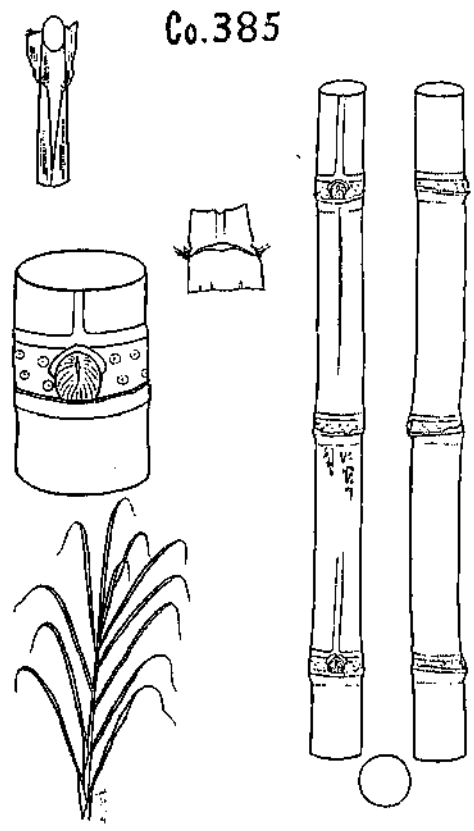
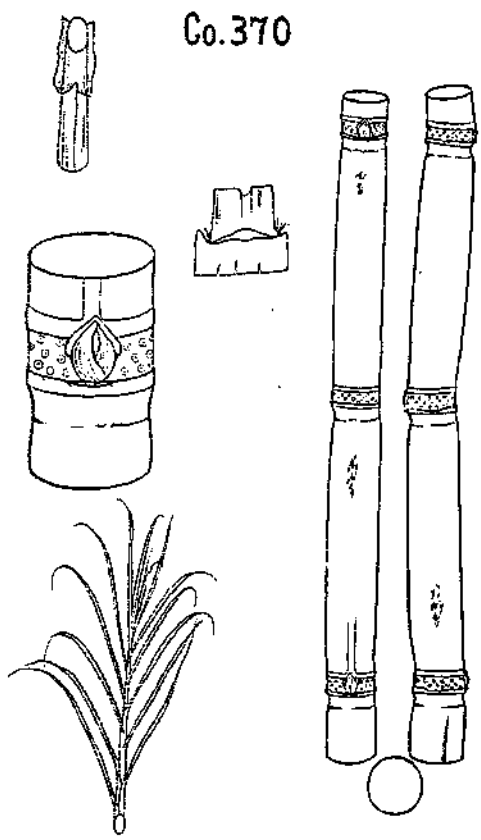
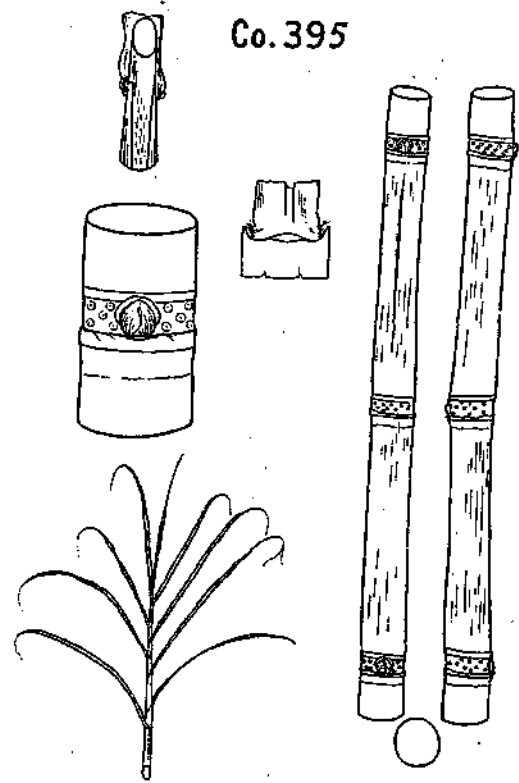
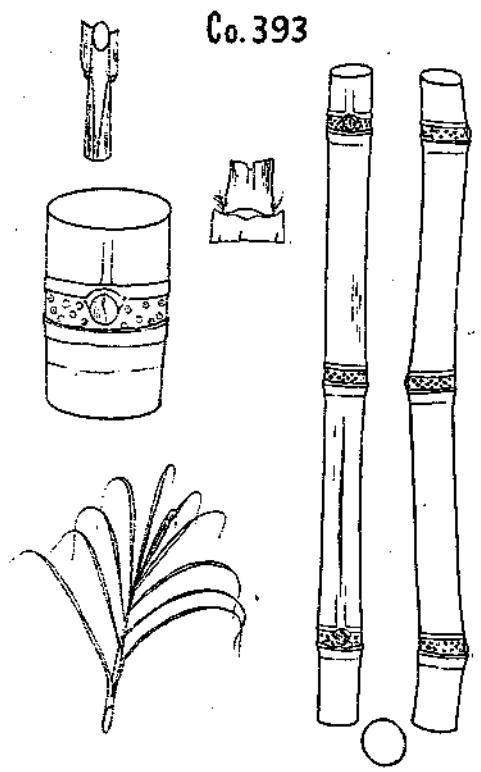
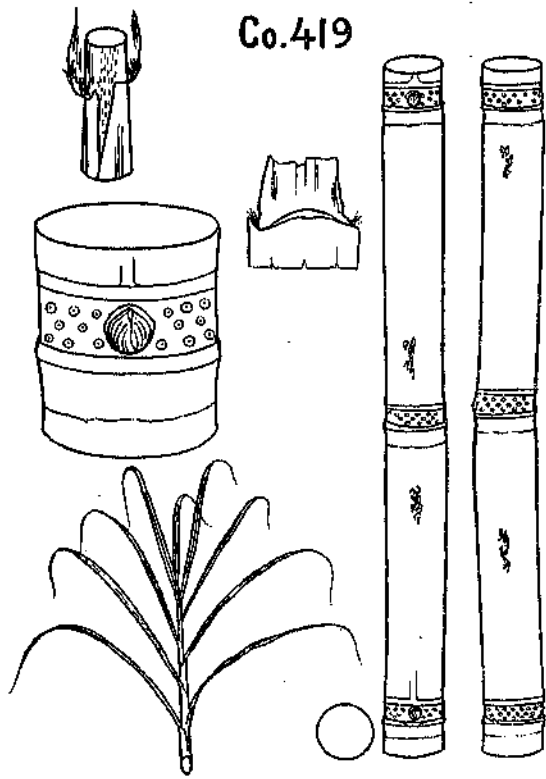


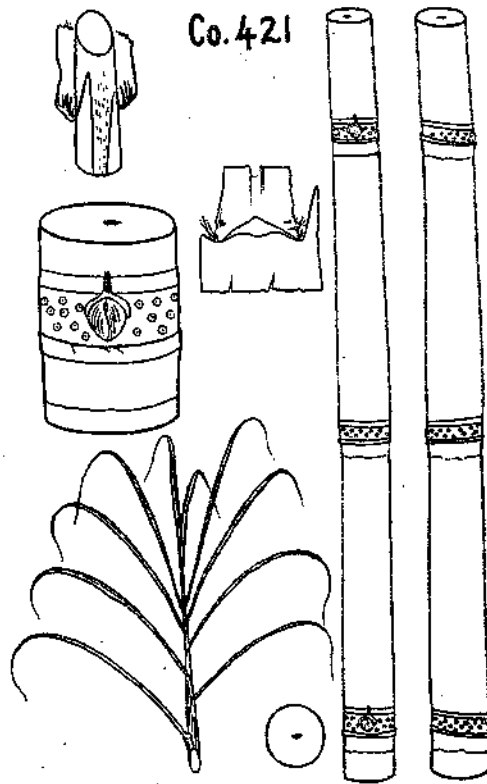
PLATE
XXVI



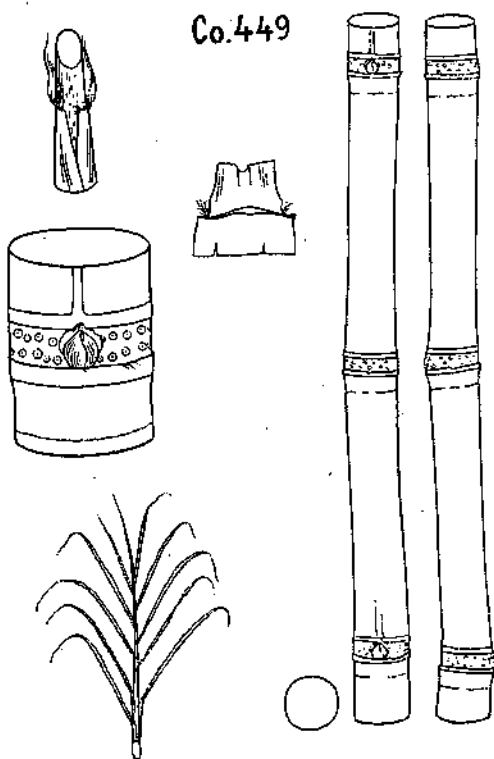
Co.419



Co.421



Co.449



Co.453

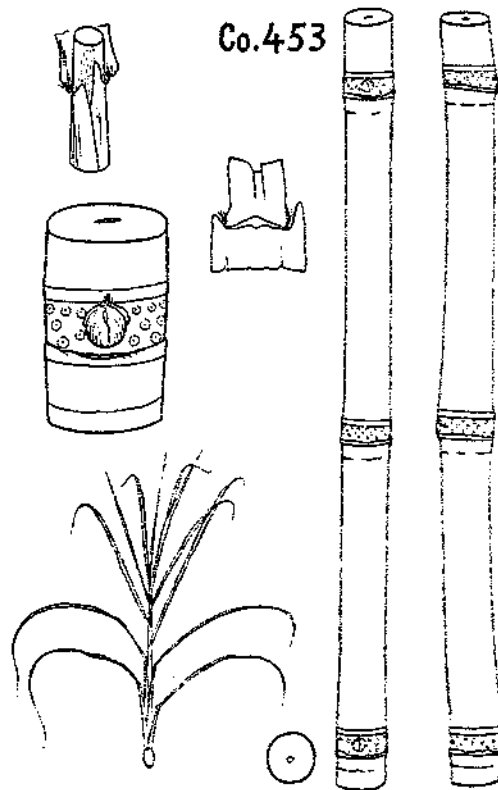


PLATE
XXIX

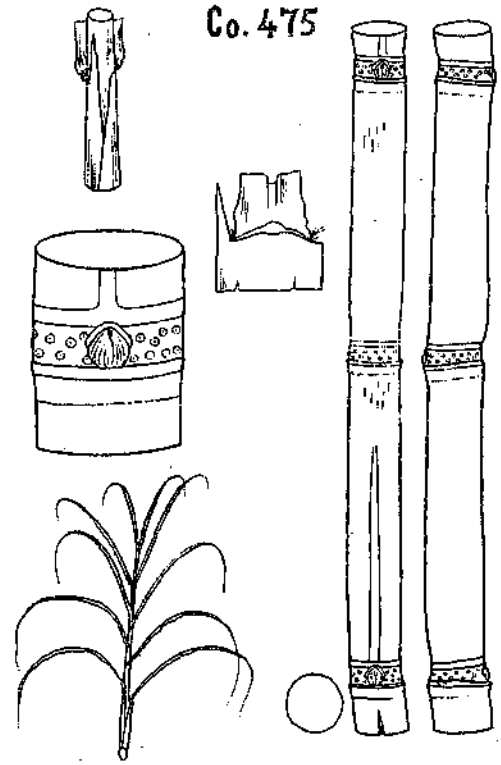
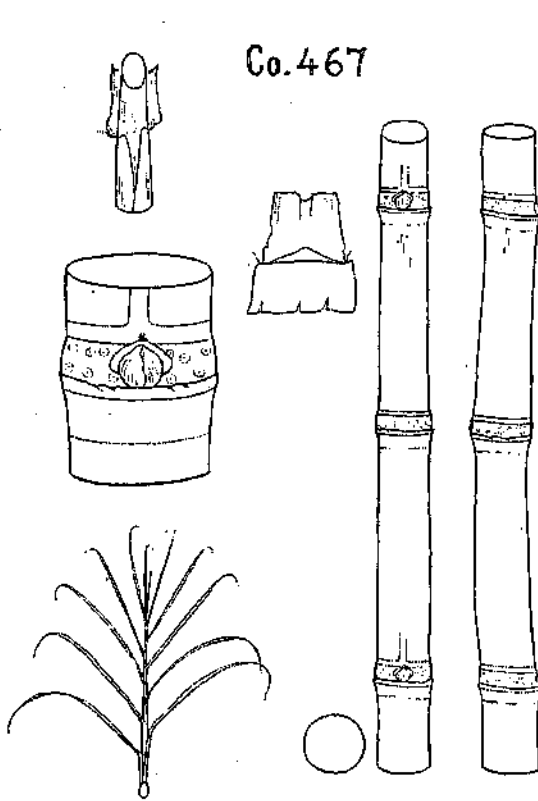
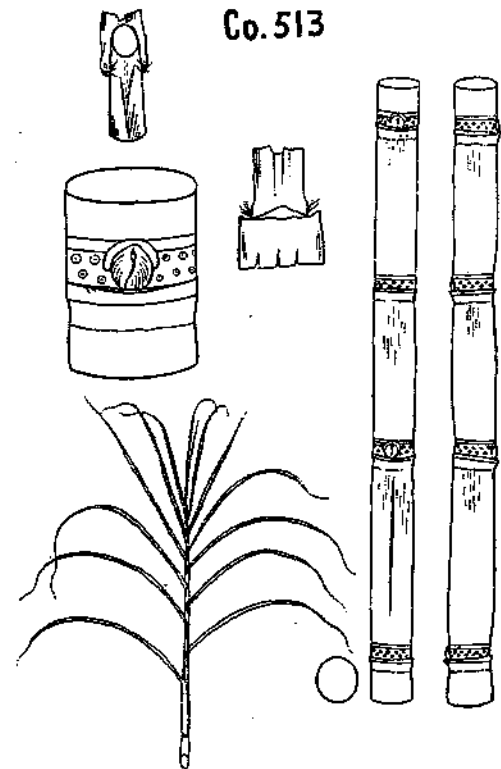
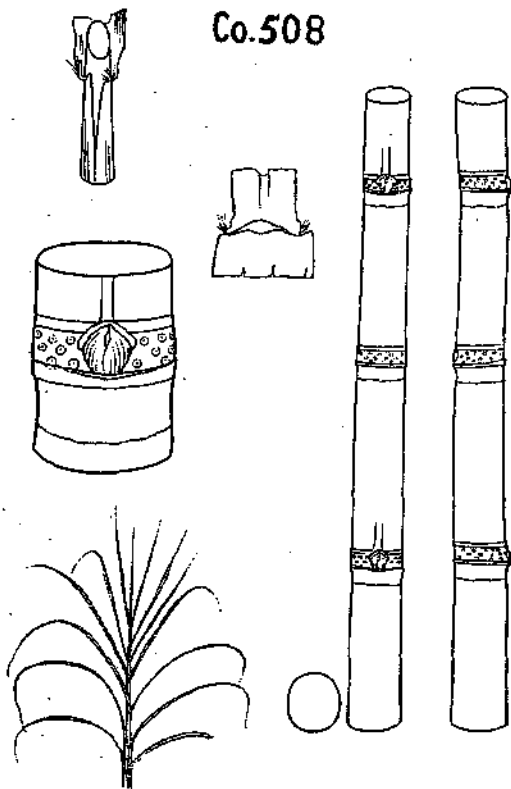


PLATE
XXX



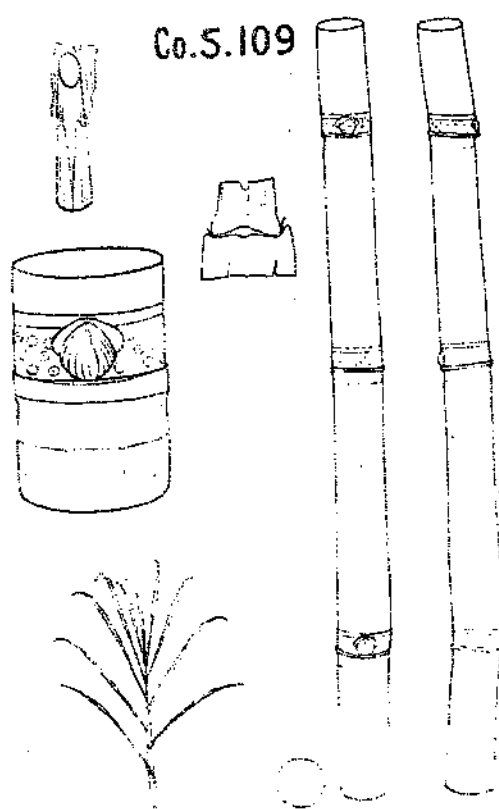
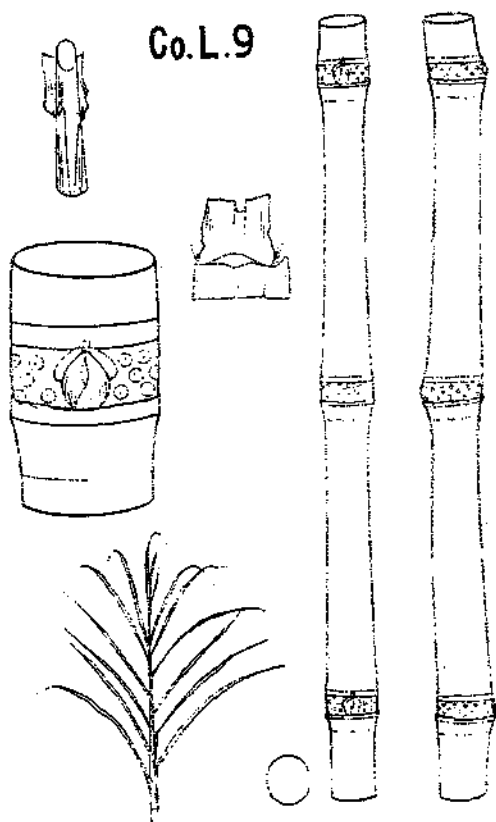
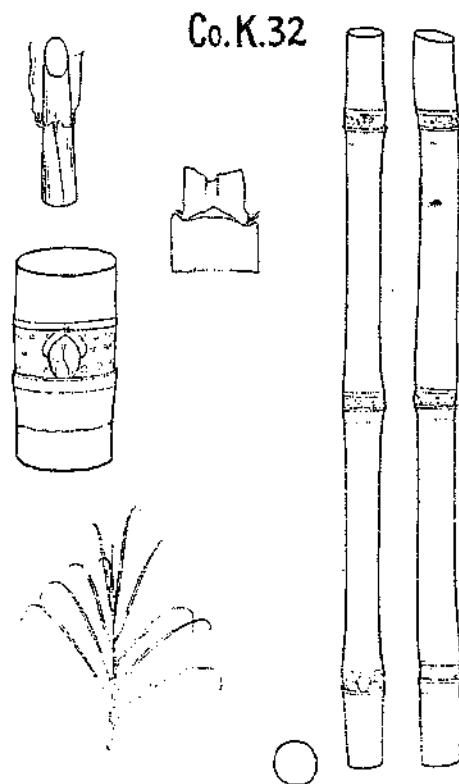
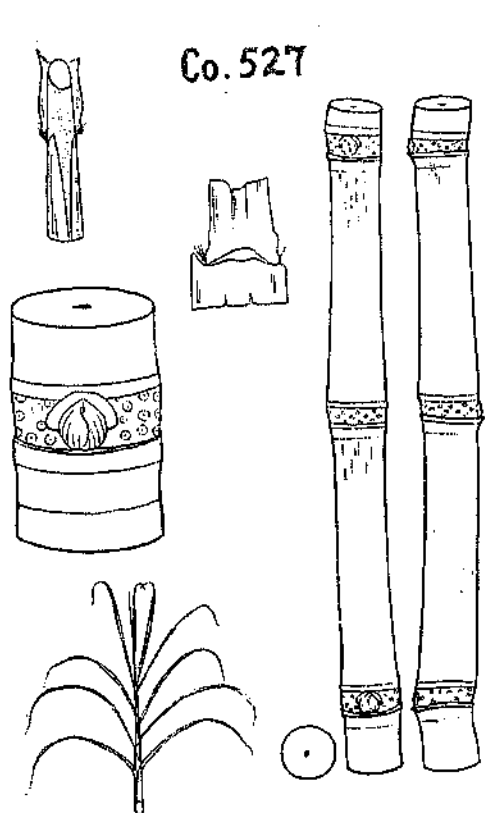
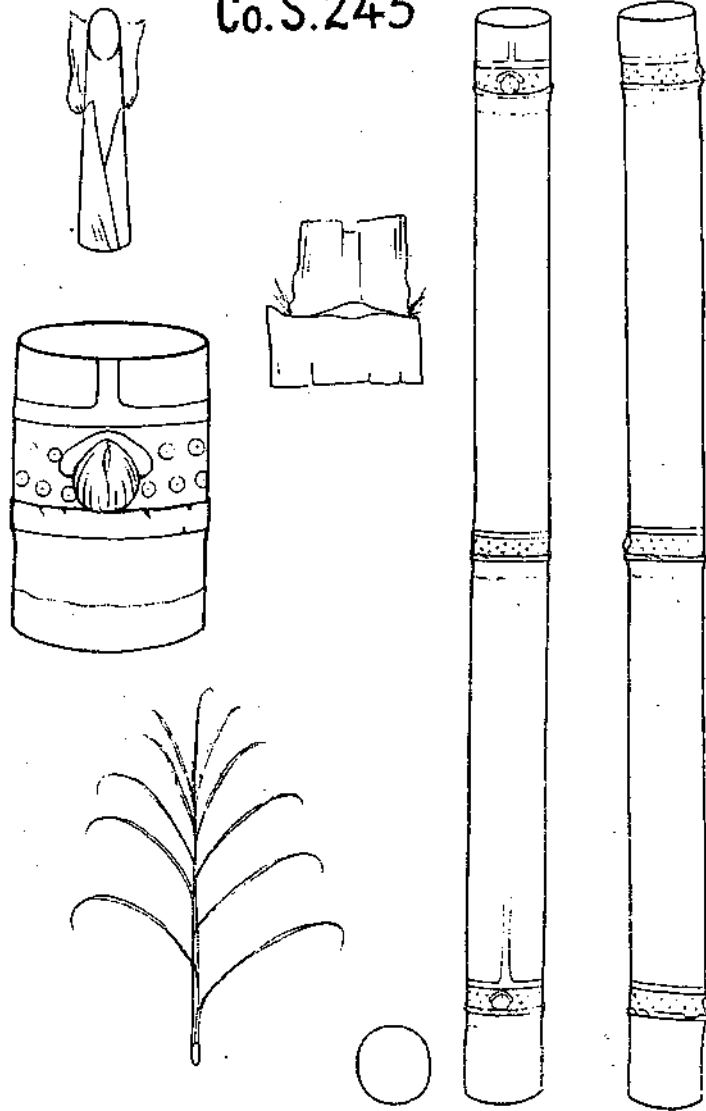


PLATE XXXIII

Co.S.245



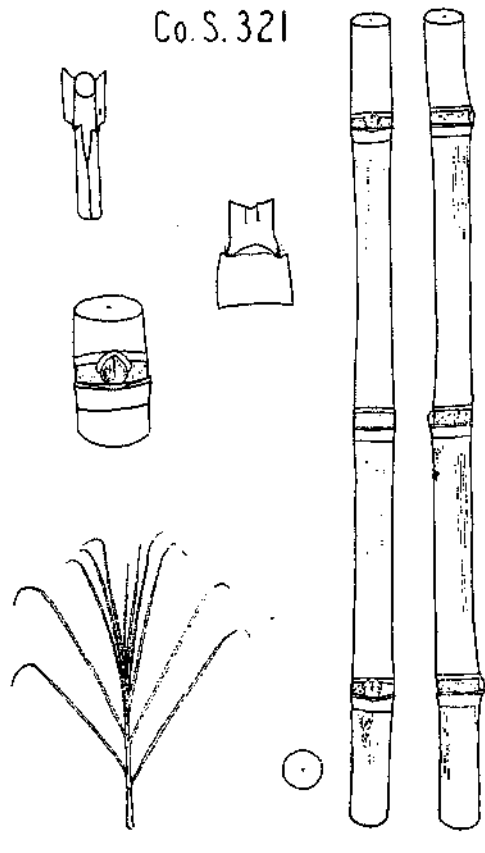
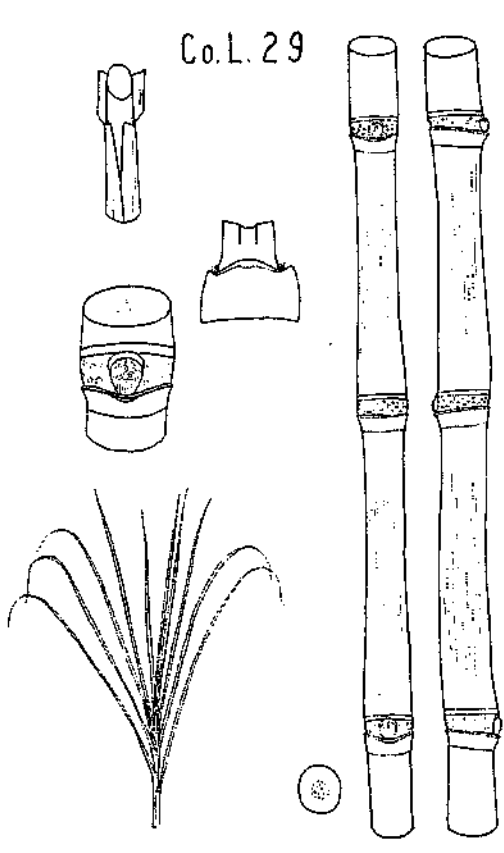
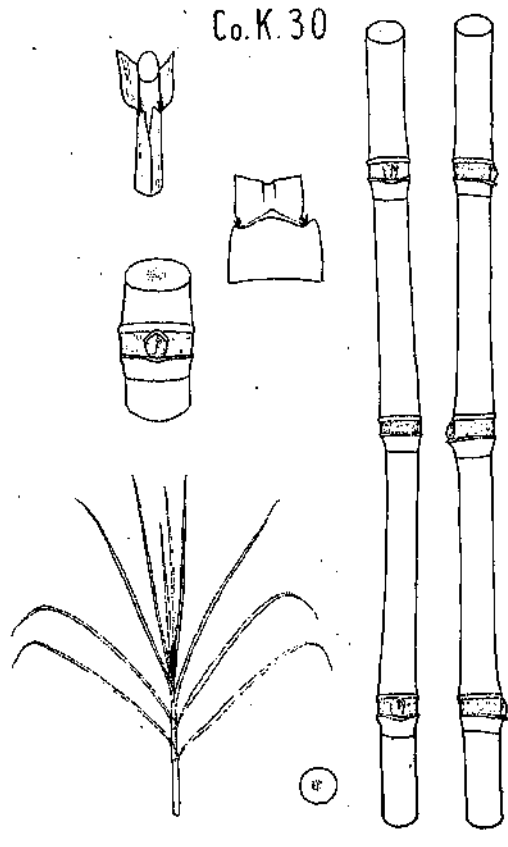
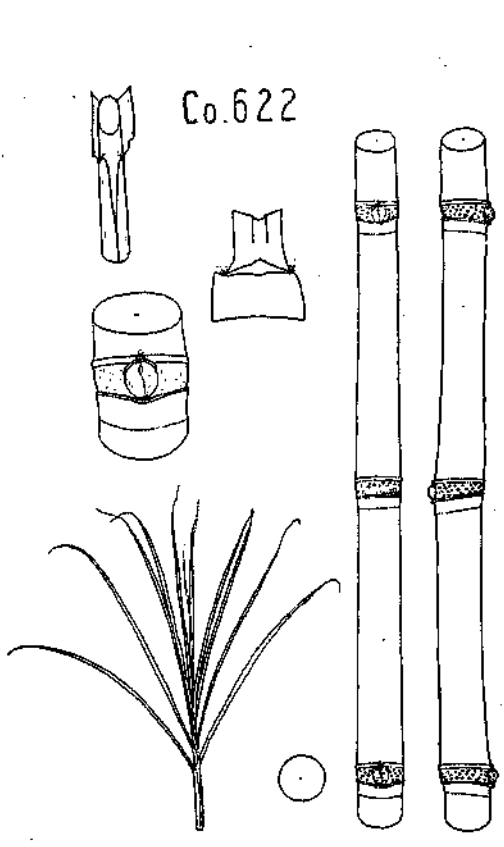


PLATE
XXXVI

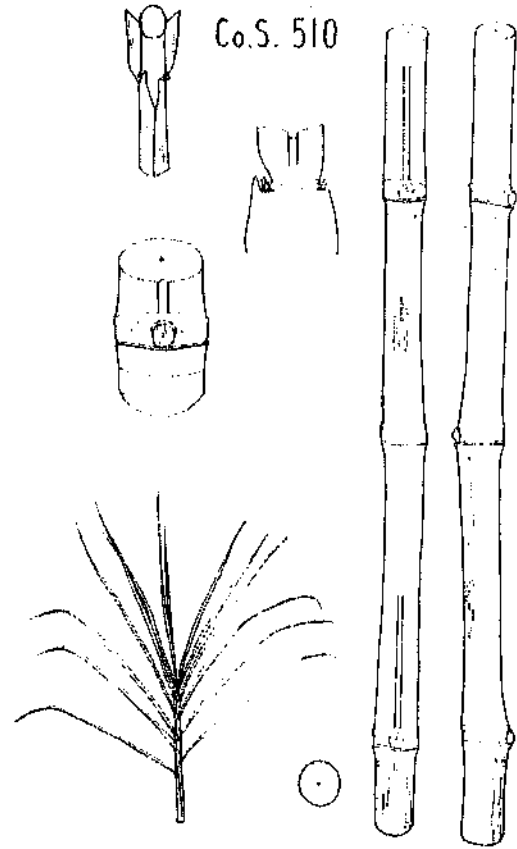
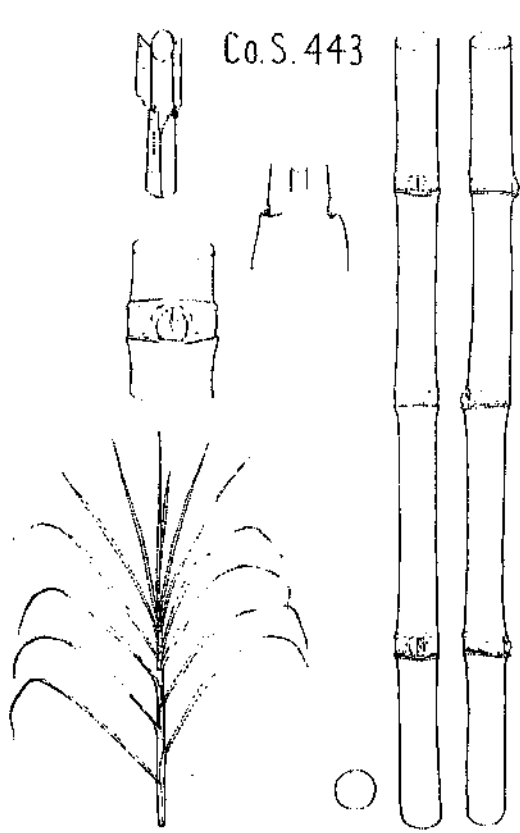
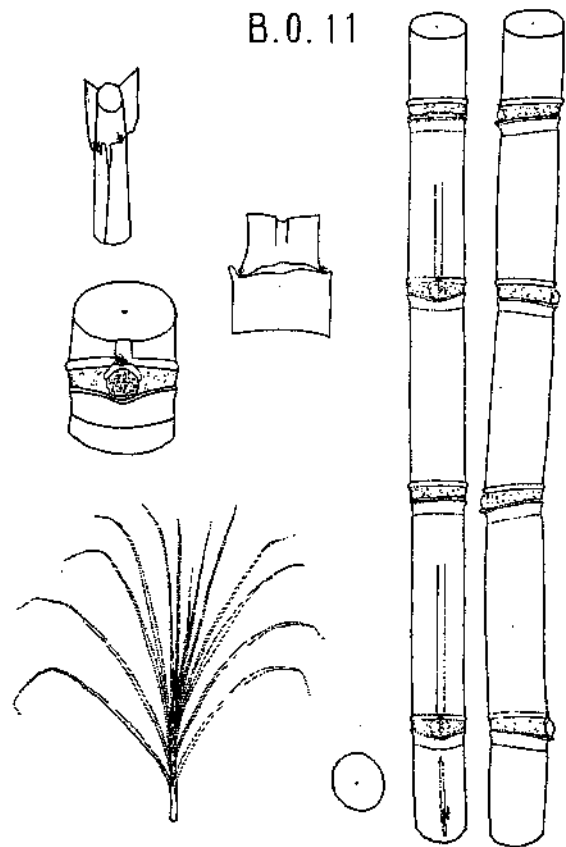
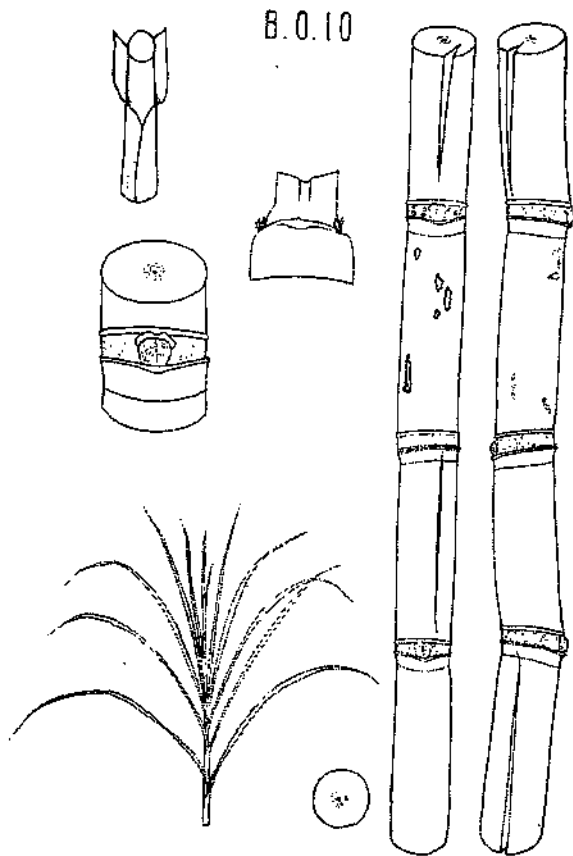
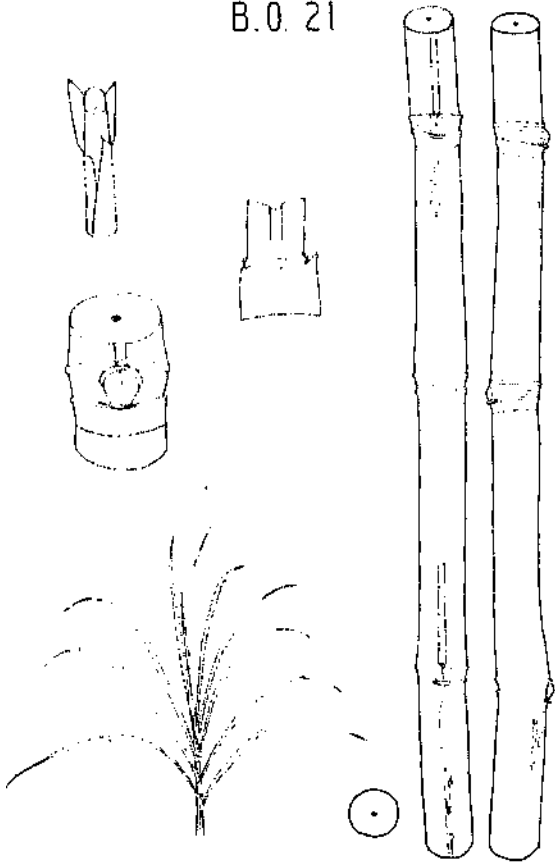


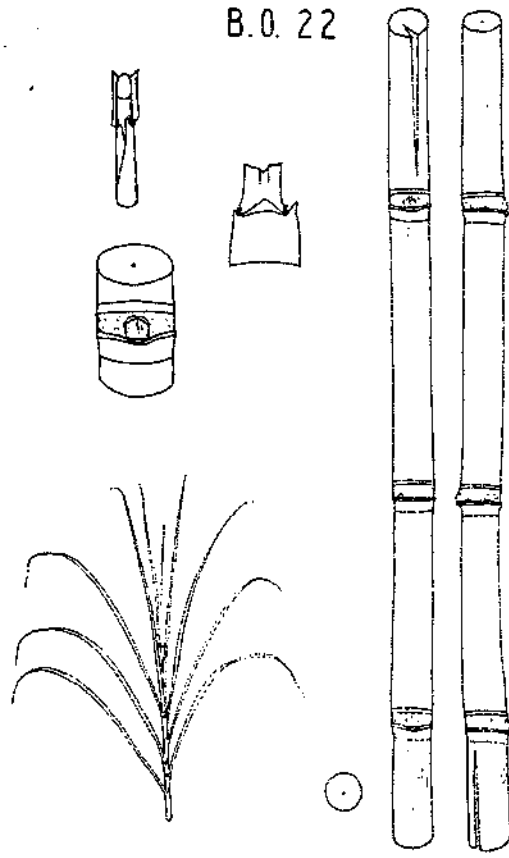
PLATE
XXXVII



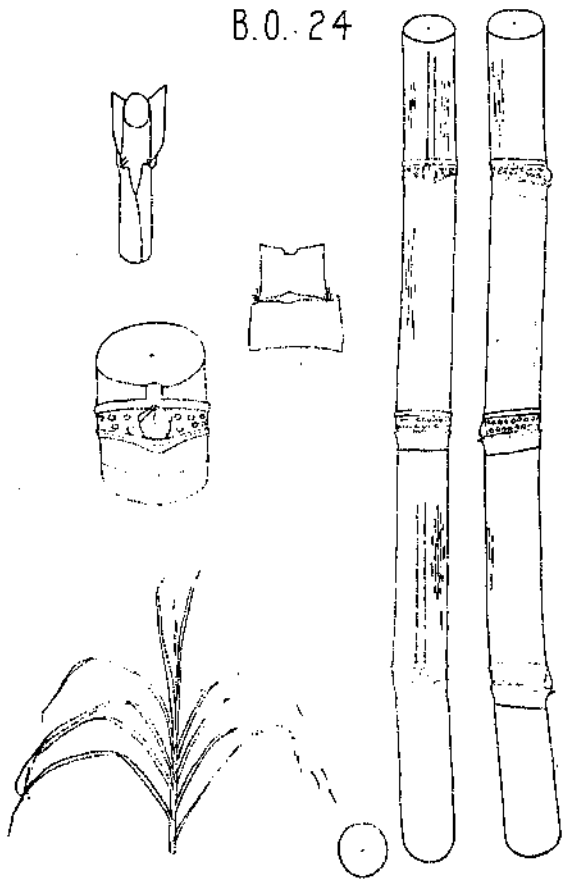
B.O. 21



B.O. 22



B.O. 24



H.M. 320

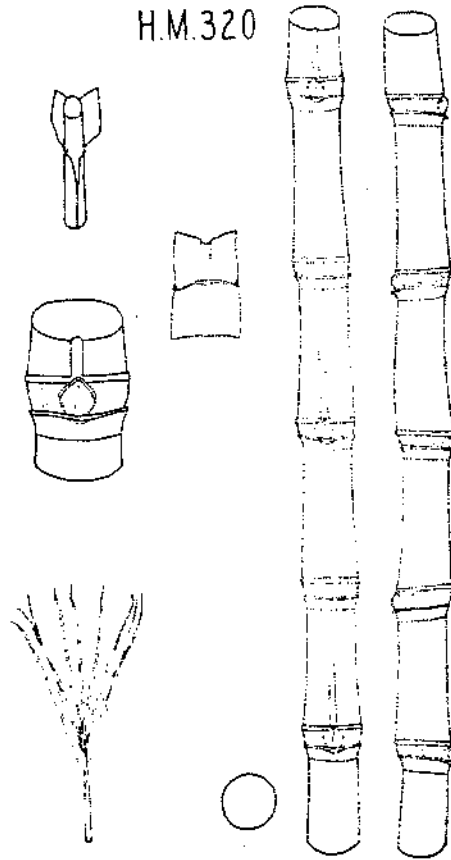
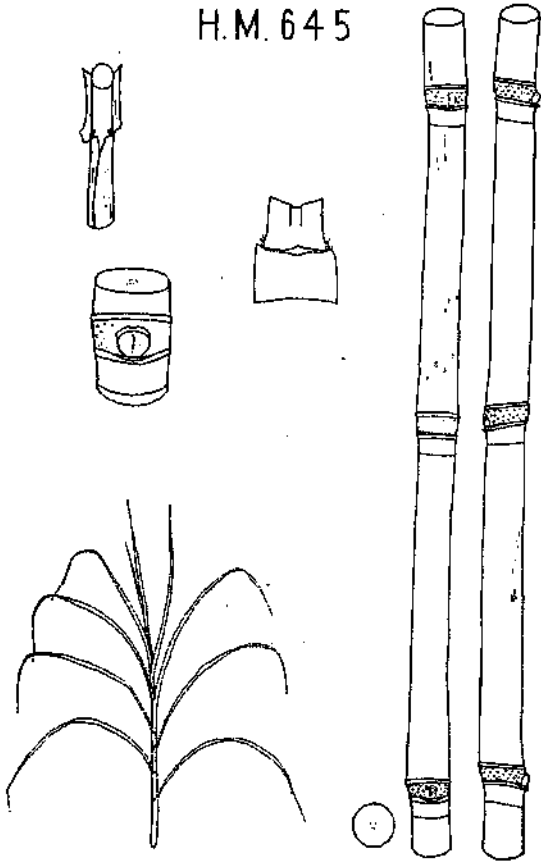


PLATE XL

H.M. 645



H.M. 661

