6-1960

Criteria for determination of maturity of corn varieties

Billy M. Piper

To the Graduate Council:

I am submitting herewith a thesis written by Billy M. Piper entitled "Criteria for determination of maturity of corn varieties." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agronomy.

Lawrence N. Skold, Major Professor

We have read this thesis and recommend its acceptance:

T. H. Campbell, Lloyd F. Seatz, Henry Andrews

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

May 23, 1960

To the Graduate Council:

I am submitting herewith a thesis written by Billy M. Piper entitled "Criteria for Determination of Maturity of Corn Varieties." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agronomy.

Laurence V Stold
Major Professor

We have read this thesis
and recommend its acceptance:

T. H. Campbell

Lloyd F. Seatz

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Accepted for the Council:

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Dean of the Graduate School

33
28

CRITERIA FOR DETERMINATION OF MATURITY OF CORN VARIETIES

A Thesis

Presented to

the Graduate Council of

The University of Tennessee

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

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by

Billy M. Piper

June 1960

ACKNOWLEDGEMENTS

The writer wishes to express his gratitude and appreciation to:

Professor L. N. Skold not only for advice during the planning and performance of this study, but for his continued interest and encouragement through the period of graduate study.

Dr. Thomas H. Campbell for serving as minor advisor and Dr. L. F. Seatz, Professor Henry Andrews and other members of the Agronomy Department for their cooperation and helpful suggestions.

Experiment Station workers throughout the state who contributed their time and facilities.

TABLE OF CONTENTS

CHAPTER		PAGE
I.	INTRODUCTION	1
II.	LITERATURE REVIEW	2
III.	METHODS AND PROCEDURE	5
	Dates of Planting	6
	Silking and Tasseling Data	6
	Method of Harvest	6
	Date of Harvest	7
	Determining Moisture	8
IV.	RESULTS AND DISCUSSION	9
	Tasseling and Silking	9
	Moisture Percent of Grain at Harvest	14
	Maturity Comparisons Based on Mid-silking and Mid-tasseling	23
V.	SUMMARY AND CONCLUSIONS	31
LITERATURE CITED		32
APPENDICES		34

LIST OF TABLES

TABLE PAGE

1. Days from planting to mid-silking of early maturing corn varieties at the Plateau Experiment Station, 1958 and the Main Experiment Station, 1958 and 1959. . 10
2. Days from planting to mid-tasseling of early maturing varieties at the Plateau Experiment Station, 1958, and the Main Experiment Station, 1958 and 1959. . . . 11
3. Days from planting to mid-silking of late maturing corn varieties at the Main Experiment Station, 1958 and 1959 12
4. Days from planting to mid-tasseling of late maturing corn varieties at the Main Experiment Station, 1958 and 1959. 13
5. Moisture percent of the grain of early maturing corn varieties at various dates of harvest at the Plateau Experiment Station, 1958. 15
6. Moisture percent of the grain of the early maturing corn varieties at various dates of harvest at the Main Experiment Station, 1958 16
7. Moisture percent of the grain of the late maturing corn varieties at various dates of harvest at the Main Experiment Station, 1958 17
8. Moisture percent of the grain of the early maturing corn varieties at various dates of harvest at the Main Experiment Station, 1959 18

LIST OF TABLES (continued)

TABLE PAGE

9. Moisture percent of the grain of the late maturing corn varieties at various dates of harvest at the Main Experiment Station, 1959 19

10. Days from planting to mid-silking, and from mid-silking to various stages of maturity for the early maturing varieties at the Plateau Experiment Station, 1958 . . 24

11. Days from planting to mid-silking and from mid-silking to various stages of maturity of the early and late maturing varieties at the Main Experiment Station, 1958. 25

12. Days from planting to mid-silking and from mid-silking to various stages of maturity of the early and late maturing varieties at the Main Experiment Station, 1959. 26

13. Days from planting to mid-tasseling and from mid-tasseling to various stages of maturity for the early maturing varieties at the Plateau Experiment Station, 1958. 27

14. Days from planting to mid-tasseling and from mid-tasseling to various stages of maturity of the early and late maturing varieties at the Main Experiment Station, 1958. 28

LIST OF TABLES (continued)

TABLE PAGE

15. Days from planting to mid-tasseling and from mid-tasseling to various stages of maturity of the early and late maturing varieties at the Main Experiment Station, 1959. 29

LIST OF FIGURES

FIGURE PAGE

1. Average Percent Moisture of the Grain at Harvest, Crossville 1958, and Knoxville 1958 and 1959 . . . 22

CHAPTER I

INTRODUCTION

Knowledge of the date a variety of corn will mature is of importance to the farmer so that he may best utilize the growing season and fit corn production into his overall cropping system. Some criteria for estimating maturity must be available in order to furnish him with an accurate maturity date for corn varieties.

In evaluating corn varieties the Agricultural Experiment Station obtains information on yield, lodging, husk cover, grain quality and other important characteristics which are reported to farmers in appropriate publications (6). To obtain these data accurately, corn should be harvested later than the normal harvest date. However, weather influences may then affect the accuracy of determining maturity by the percentage of moisture of the grain.

The object of this study was to evaluate criteria for more accurate maturity determination of corn varieties, based on the silking and tasseling dates of corn hybrids and the rate of moisture loss from the grain following physiological maturity, the stage of growth after which the dry matter of the corn grain no longer increases.

CHAPTER II

LITERATURE REVIEW

Research workers have established that corn is mature when the grain contains approximately 35% moisture (8).

There are basically two methods used to determine the maturity dates of corn varieties. One is based on the percentage of moisture in the grain and cob at harvest (15). The other, which is used primarily to predict when varieties will mature, is based on the number of days from planting to mid-silking.

The U.S.D.A. standard method of determining the percentage moisture of the grain is the oven dry method (15). In this method "a weighed portion of corn is heated for 96 hours in a water-jacketed oven maintained at the temperature of boiling water at an atmospheric pressure of 760 mm. The moisture content is determined from the loss of weight during heating." The "Steinlite Electronic Moisture Tester" is one of several electronic testers available for use in determining the moisture percentage of grain (13, 15). A comparison test by Warren and Dimmock (13) of this tester with the U.S.D.A. standard showed it to be accurate within 0.1%.

The number of days from planting to mid-silking gives only a relative difference in maturity dates between varieties. This varies between geographic locations as well as between years. However, most studies indicated that this is useable to determine differences in the maturity dates of different varieties. Gilmore and Rogers (5) established

that the number of days from planting to mid-silking varied, depending on the average daily temperature between planting and mid-silking. They further established that there was little variation as long as the mean temperature did not exceed 90°F. or drop below 50°F.

Dessureaux et al. (3) determined that the varieties of corn that flowered first were normally the ones which matured first. In some instances; however, this was not true. In about 5% of the varieties studied, they found that an early or late flowering variety did not mature as early or as late as expected. They established that this variation occurred with the same variety year after year and was attributed to a difference in genetic composition. In another study Alberts (1) reported that in practically all instances the variety that flowered first was the first to reach maturity.

Rather and Lyson (9) determined that the maturity date of corn could be influenced by the amount of commercial fertilizer applied and by the time of its application.

As indicated by most studies, for a given variety, the number of days from mid-silking to maturity is relatively constant from year to year. Therefore, if an accurate count of the number of days from planting to mid-silking were obtained, then the relative maturity dates of different corn varieties could be calculated. Meyers (7) developed a method that may be used to determine when a variety of corn has reached mid-silking. When about one-half of the plants were in silk, they were counted and the percentage was computed on the basis of total plants per plot. This gave a percentage of plants in silk on a given date or on a given number of days following planting. If this percentage was within the 42-58%

range, it provided a satisfactory estimate of the median, or mid-silking date. If the percentage was below the 42-58% range it was adjusted by adding a specified number of days to the median as follows: 42-29%, one day; 29-19%, two days; 19-11%, three days; less than 11%, four days. If the percentage was above the 42-58% range, it was adjusted by subtracting a specified number of days as follows: 58-71%, one day; 71-81%, two days; 81-89%, three days; more than 89%, four days.

Shaw and Thom (11), in Iowa determined that the number of days from mid-silking to maturity was either 50, 51, or 52 days. Therefore, by counting the number of days from planting to mid-silking they were able to predict maturity to an accuracy of ± 1.0%.

Miles (8) reported that the dry matter weight of the corn grain increased until the plant had reached 26% moisture. Aldrich (2) found that when the corn plant was cut prematurely, the dry weight of the grain would continue to increase to a small extent due to translocation of food to the grain.

CHAPTER III

METHODS AND PROCEDURE

This study was conducted at the Tennessee Agricultural Experiment Station near Knoxville in 1958 and 1959, and at the Plateau Experiment Station near Crossville in 1958. These two locations were selected to provide contrast in climatic conditions and length of growing season. The growing season at Crossville on the Cumberland Plateau is more than a month shorter than at Knoxville in the Tennessee Valley.

The state corn variety tests at the two locations were used for this study. This afforded an opportunity to utilize a large number of varieties at both locations, these consisted of commercially available and experimental hybrids.

The varieties used for the study were grouped into two classifications, there were 30 early and 30 full season hybrids. Each test was composed of only one maturity group. Two varieties common to each test were included to serve as a check. All hybrids under study were planted in a two-row plot and were replicated six times in a randomized block design. All hybrids were planted at twice the desired rate and then thinned to a uniform 40-plant plot. The spacing used to evaluate early maturing varieties was 3.5 feet between rows and 10.6 inches between plants in the row, each plot being 1/352.2 acre in size. In all late maturing varieties studied, rows were 3.5 feet apart, with 12 inches between plants in the row. Each plot in these tests was 1/311.1 acre in

size. Each of the experiments was fertilized with 500 pounds per acre of 6-12-12 at planting and was side-dressed with 300 pounds of ammonium nitrate per acre, when the plants were approximately 18-20 inches high.

Dates of Planting

The early maturing varieties at the Plateau Experiment Station were planted May 15, 1958. At the Main Experiment Station at Knoxville dates of planting were May 28, 1958 and May 6, 1959.

Silking and Tasseling Data

The number of plants that were silked and tasseled were counted and recorded at three to four-day intervals on all replications. A plant was considered to be silked as soon as silks were visible and tasseled as soon as pollen was shed. This information for each variety in all replications of each experiment was averaged to determine when one-half of the plants had silked or tasseled. In most instances the days to mid-silking and mid-tasseling were determined by interpolation. In some plots, over 50% of the plants were silked the first day of counting and the mid-silking date was determined by the "Meyers Method" (7).

Method of Harvest

A systematic method for harvesting the tests was established before actual harvest began. This was done to reduce bias and to eliminate as much error as possible. The original plan was to harvest each plot in five separate sub-samples. Each row of each plot was divided

into four sub-plots of five plants each. Thus each sub-harvest was composed of ears from eight plants, except in a few cases where there were barren stalks. All ears harvested from each sub-plot were sampled for moisture by shelling two rows of grain from each ear.

The harvesting of the 1958 tests was started as soon as the varieties reached 35 to 40% moisture and the 1959 tests as soon as the varieties reached 25 to 30% moisture. The varieties were left in the field longer in 1959 to determine the moisture loss pattern at the lower moisture levels. Each harvest date was determined by observation of the plots and the existing weather conditions. The harvest dates were spaced from 7 to 21 days apart and harvesting continued until all sub-plots were harvested.

The harvests of the corn at the Plateau Experiment Station deviated slightly from the original plan in that there were only four sub-harvests. A fifth harvest would have prevented establishment of a winter cover crop on the plot land.

Date of Harvest

The harvest dates for the tests of early maturing varieties in 1958 at the two locations were as follows: Crossville, September 16, October 2, October 15, and October 22; Knoxville, September 18, September 30, October 7, October 21, and October 30. The harvest dates in 1958 at Knoxville for the late maturing varieties were as follows: September 23, October 7, October 21, October 30, and November 12. In 1959 the harvest dates, September 15, October 2, October 21, November 9,

and December 1, were the same for both the early and late maturing varieties at Knoxville.

Determining Moisture

The "Steinlite Electronic Moisture Tester" was used to determine moisture percentage of the grain. Standard procedures were used and the meter reading obtained from the tester was converted to the corrected moisture percentage at 80°F. The accuracy of the moisture tester used was checked with an oven dry method and found to be accurate to within $\pm$ 0.1%.

CHAPTER IV

RESULTS AND DISCUSSION

Tasseling and Silking

Tables 1 and 2 show the number of days required for the early maturing varieties to reach mid-silking and mid-tasseling for the 1958 experiment at the Plateau Experiment Station and the experiment at the Main Experiment Station in 1958 and 1959.

From planting to mid-silking required an average of 77 days for the Crossville experiment in 1958. Four hybrids required 3 days more, one 4 days less, while all other varieties tested were within this range. The varieties at Knoxville required an average of 63 days in 1958, and 66 days in 1959 from planting to mid-silking. No variety was more than 3 days earlier or later than the average.

At Crossville the corn varieties in 1958 required an average of 75 days from planting to mid-tasseling, certain varieties being as much as 5 days later and others as much as 4 days earlier than the average. At Knoxville the average time from planting to mid-tasseling was 61 days in 1958, and 65 days in 1959. In both years no variety varied more or less than 5 days from the average.

Tables 3 and 4 contain the data from the 1958 and 1959 experiments at Knoxville, showing the average number of days required for the late maturing varieties to reach mid-silking and mid-tasseling. An average of 67 days was required in 1958, and 69 in 1959 from planting to

Table 1.--Days from planting to mid-silking of early maturing corn varieties at the Plateau Experiment Station, 1958 and the Main Experiment Station, 1958 and 1959.

Variety	Days to mid-silking		
	Plateau Exp. Sta.	Main Exp. Sta.	
	1958	1958	1959
Funk G-144	74	63	64
Ky. 105	78	63	67
T-7021	--	65	--
Meacham M-5	76	63	66
Tenn. 501	76	61	66
T-7013	--	61	--
T-4114	74	61	66
Dixie 29	77	64	68
P.A.G. 636W	77	65	--
Funk G-134	74	61	64
Funk G-512W	74	64	68
Stull 101Y	76	62	68
U.S. 13	73	60	62
U.S. 523W	78	66	67
Pioneer 309A	79	65	67
DeKalb 1024	79	64	--
T-5005	77	61	63
DeKalb 925	80	60	66
Stull 400W	76	61	66
T-7018	77	62	66
McCurdy 988	76	62	67
Stull 111Y	80	65	69
T-7015	78	61	66
Broadbent 337	80	63	66
DeKalb 869	--	--	63
DeKalb 898A	--	--	67
Ky. 204	76	--	67
T-7110	--	--	65
DeKalb 803A	--	--	63
U.S. 658	--	--	66
Ky. 106A	76	--	64
U.S. 642	--	--	67
Coker 616	--	--	68
S.S. 903	80	--	69
P.A.G. 631W	79	--	67
T-7012	76	--	--
T-4406B	74	--	--
T-7009	78	--	--
T-7017	79	--	--
Average	77	63	66

Table 2.--Days from planting to mid-tasseling of early maturing varieties at the Plateau Experiment Station, 1958, and the Main Experiment Station, 1958 and 1959.

Variety	Days to mid-tasseling		
	Plateau Exp. Sta. 1958	Main Exp. Sta. 1958	Main Exp. Sta. 1959
Funk G-144	75	61	63
Ky. 105	77	63	65
T-7021	--	64	--
Meacham M-5	73	59	63
Tenn. 501	76	61	65
T-7013	--	59	--
T-4114	76	56	62
Dixie 29	76	62	66
P.A.G. 636W	72	64	--
Funk G-134	78	66	64
Funk G-512W	72	63	67
Stull 101Y	72	59	65
U.S. 13	76	62	62
U.S. 523W	78	64	66
Pioneer 309A	72	62	67
DeKalb 1024	74	61	--
T-5005	76	61	66
DeKalb 925	74	63	67
Stull 400W	74	59	63
T-7018	75	59	64
McCurdy 988	73	63	66
Stull 111Y	74	64	69
T-7015	73	58	63
Broadbent 337	79	62	63
DeKalb 869	--	--	62
DeKalb 898A	--	--	65
Ky. 204	71	--	66
T-7110	--	--	63
DeKalb 803A	--	--	63
U.S. 658	--	--	64
Ky. 106A	74	--	63
U.S. 642	--	--	65
Coker 616	--	--	67
S.S. 903	73	--	66
P.A.G. 631W	80	--	65
T-7012	72	--	--
T-4406B	76	--	--
T-7009	76	--	--
T-7017	77	--	--
Average	75	61	65

Table 3.--Days from planting to mid-silking of late maturing corn varieties at the Main Experiment Station, 1958 and 1959.

Variety	Days to mid-silking, Main Experiment Station, 1958	1959
T-7004	61	67
T-6003	66	70
P.A.G. 633W	62	66
Dixie 77	64	65
Funk G-779W	71	73
Dixie 22	67	71
Funk G-710	68	--
DeKalb 1023	66	65
Dixie 29	68	68
DeKalb 1028	66	70
Funk G-711	66	69
Keystone 256	68	70
Pioneer 309A	64	67
Keystone 222	68	69
Pioneer 309B	72	68
A.E.S. 904W	67	68
T-7024	67	--
T-4113	67	--
N.C. 288	69	71
P.A.G. 653W	66	70
P.A.G. 488	72	70
Dixie 55	68	70
Tenn. 90	68	70
Dixie 33	66	68
T-7005	--	66
Ga. 102	--	66
T-8103	--	68
T-8003	--	69
T-7002	--	69
Funk G-710AA	--	70
E-6W	--	70
Broadbent 402B	--	67
Average	67	69

Table 4.--Days from planting to mid-tasseling of late maturing corn varieties at the Main Experiment Station, 1958 and 1959.

Variety	Days to mid-tasseling, Main Experiment Station, 1958	1959
T-7004	56	63
T-6003	63	67
P.A.G. 633W	58	65
Dixie 77	59	65
Funk G-779W	75	71
Dixie 22	63	70
Funk G-710	72	--
DeKalb 1023	64	67
Dixie 29	65	66
DeKalb 1028	64	67
Funk G-711	69	69
Keystone 256	66	68
Pioneer 309A	62	70
Keystone 222	71	69
Pioneer 309B	68	65
A.E.S. 904W	63	67
T-7024	63	--
T-4113	63	--
N.C. 288	65	69
P.A.G. 653W	64	70
P.A.G. 488	68	70
Dixie 55	65	68
Tenn. 90	64	66
Dixie 33	64	67
T-7005	--	62
Ga. 102	--	67
T-8103	--	66
T-8003	--	66
T-7002	--	68
Funk G-710AA	--	67
E-6W	--	71
Broadbent 402B	--	65
Average	65	67

mid-silking. No variety was more than 5 days later or 6 days earlier than the average. In 1958, an average of 65 days was required from planting to mid-tasseling as shown in table 4. One variety was 10 days later and one 9 days earlier than the average. An average of 67 days was required in 1959, one variety being 4 days later and one 5 days earlier.

Differences in climate and weather conditions probably account for the fact that the early maturing varieties required 14 days longer to reach mid-silking and mid-tasseling at Crossville than at Knoxville in 1958.

The early maturing varieties reached mid-silking and mid-tasseling 4 days sooner, on the average, than did the late maturing varieties at Knoxville in 1958. A difference of 3 days from planting to mid-silking and 2 days from planting to mid-tasseling was found between the early and late maturing varieties in 1959.

The difference in 1958 between Knoxville and Crossville in days from planting to mid-silking or mid-tasseling of the early maturing group of varieties was greater than the variation between the early and the late maturing varieties at Knoxville in 1958 or 1959. Thus in this study greater differences in maturity occurred due to geographic location than occurred between the two maturity groups.

Moisture Percent of Grain at Harvest

Tables 5 through 9 show the moisture content of the grain of each variety at various dates of harvest. In each table the moisture

Table 5.--Moisture percent of the grain of early maturing corn varieties at various dates of harvest at the Plateau Experiment Station, 1958.

Variety	Days in field			
	124	140	153	160
	Percent Moisture of the Grain			
Funk G-144	36.1	28.7	25.0	20.4
Ky. 105	36.2	32.0	24.2	20.7
Meacham M-5	36.0	31.9	25.3	22.3
Tenn. 501	34.8	30.7	27.7	24.2
T-4114	34.9	31.0	27.3	23.6
Dixie 29	38.7	35.5	30.8	28.2
P.A.G. 636W	37.2	31.7	28.4	22.7
Funk G-134	32.7	27.3	23.5	21.8
Funk G-512W	37.7	30.4	24.9	21.8
Stull 101Y	34.0	29.2	23.2	20.4
U.S. 13	33.6	25.5	21.4	19.4
U.S. 523W	35.0	29.6	26.7	22.4
Pioneer 309A	39.5	33.9	27.6	24.3
DeKalb 1024	39.0	32.0	24.8	23.4
T-5005	35.8	33.0	25.5	21.1
DeKalb 925	36.8	30.6	27.0	22.9
Stull 400W	35.2	30.0	23.1	19.8
T-7018	37.9	29.3	26.6	22.2
McCurdy 988	36.6	30.6	24.4	19.5
Stull 111Y	38.6	39.2	33.5	27.8
T-7015	36.4	30.5	28.9	24.4
Broadbent 337	36.2	30.9	26.1	23.4
Ky. 204	37.2	30.1	27.8	22.5
Ky. 106A	33.4	29.0	24.5	19.9
S.S. 903	36.2	29.0	23.9	21.0
P.A.G. 631W	37.0	31.6	29.8	23.5
T-7012	36.7	31.1	26.3	23.4
T-4406B	34.5	28.0	24.4	20.9
T-7009	39.1	31.5	27.7	22.1
T-7017	34.4	28.9	23.7	20.7
Average	36.2	30.8	26.1	22.4
L.S.D. (.05) between varieties	.8	1.8	.9	.7
F. Test Between Replications (.05) *	N.S.	N.S.	S.	S.

* Results of F test S = significant difference, N.S. = no significant difference.

Table 6.--Moisture percent of the grain of the early maturing corn varieties at various dates of harvest at the Main Experiment Station, 1958.

Variety	Days in field				
	113	125	132	146	155
	Percent Moisture of the Grain				
Funk G-144	38.5	31.0	26.1	20.5	19.0
Ky. 105	41.2	30.5	29.0	20.3	18.9
T-7021	39.4	31.4	28.9	21.2	19.0
Meacham M-5	39.0	29.6	28.0	20.7	20.2
Tenn. 501	39.0	29.3	29.4	22.3	21.0
T-7013	38.0	29.2	27.0	21.2	19.2
T-4114	38.3	29.2	29.1	21.2	19.6
Dixie 29	41.1	33.6	34.5	26.6	24.1
P.A.G. 636W	39.2	32.2	30.1	22.2	21.9
Funk G-134	37.6	25.7	24.7	20.9	18.4
Funk G-512W	38.3	28.2	29.9	20.9	19.6
Stull 101Y	37.9	25.8	24.9	18.0	17.3
U.S. 13	38.1	23.8	25.4	19.1	17.3
U.S. 523W	40.4	32.5	29.2	22.4	19.8
Pioneer 309A	42.1	31.2	32.5	23.7	21.3
DeKalb 1024	39.4	33.0	30.5	21.1	20.0
T-5005	37.5	30.1	27.2	19.3	18.2
DeKalb 925	39.0	29.5	30.7	21.5	20.4
Stull 400W	38.7	27.8	26.5	19.3	18.1
T-7018	37.5	30.2	27.8	18.5	18.1
McCurdy 988	40.5	30.6	27.0	19.8	18.1
Stull 111Y	43.2	35.9	34.6	27.2	23.1
T-7015	38.8	31.4	28.2	22.4	20.5
Broadbent 337	38.8	28.0	28.6	21.6	19.7
Average	39.2	30.0	28.8	21.3	19.7
L.S.D. (.05) between varieties	3.3	.7	2.8	1.9	.4
F. Test Between Replications (.05) *	S.	N.S.	S.	N. S.	S.

* Results of F test S = significant difference, N.S. = no significant difference.

Table 7.--Moisture percent of the grain of the late maturing corn varieties at various dates of harvest at the Main Experiment Station, 1958.

Variety	Days in field				
	118	132	146	155	168
	Percent Moisture of the Grain				
T-7004	34.2	28.2	19.4	19.3	18.2
T-6003	38.4	36.0	29.2	25.0	23.1
P.A.G. 633W	34.1	29.9	22.4	21.6	20.0
Dixie 77	39.3	37.8	28.1	25.3	23.8
Funk G-779W	40.0	35.7	28.3	24.2	23.5
Dixie 22	39.3	35.0	26.9	23.9	22.6
Funk G-710	39.9	37.6	28.1	23.8	23.5
DeKalb 1023	37.0	31.7	27.1	22.2	21.4
Dixie 29	38.2	35.6	26.8	23.7	22.8
DeKalb 1028	36.2	30.6	23.0	22.0	20.8
Funk G-711	39.3	34.4	27.8	24.6	23.4
Keystone 256	40.7	35.4	27.2	23.8	22.4
Pioneer 309A	37.8	31.5	23.4	21.6	20.8
Keystone 222	37.9	33.1	25.3	21.9	20.8
Pioneer 309B	39.2	34.7	26.5	23.9	21.6
A.E.S. 904W	36.8	31.2	22.8	20.5	19.5
T-7024	38.0	31.4	23.5	21.5	19.9
T-4113	38.5	32.6	24.6	22.2	20.6
N.C. 288	37.8	38.6	29.5	24.6	23.6
P.A.G. 653W	37.9	33.9	24.9	22.7	21.3
P.A.G. 488	39.4	35.8	28.7	26.3	24.4
Dixie 55	38.6	34.1	26.6	22.5	21.5
Tenn. 90	41.0	33.8	24.7	22.9	21.2
Dixie 33	36.8	35.0	25.4	21.7	20.0
Average	38.2	33.9	25.8	23.0	21.7
L.S.D. (.05) between varieties	2.9	2.6	2.3	1.3	1.6
F. Test Between Replications (.05) *	N.S.	N.S.	S.	N.S.	S.

* Results of F test S = significant difference, N. S. = no significant difference.

Table 8.--Moisture percent of the grain of the early maturing corn varieties at various dates of harvest at the Main Experiment Station, 1959.

Variety	Days in field				
	132	149	168	187	209
	Percent Moisture of the Grain				
Funk G-144	24.4	17.2	15.6	16.4	16.2
Ky. 105	23.0	16.8	16.0	15.5	16.9
Meacham M-5	23.0	17.3	15.9	16.3	17.3
Tenn. 501	24.4	18.4	16.4	16.4	16.4
T-4114	25.6	17.9	16.5	16.0	15.8
Dixie 29	27.3	18.9	16.9	15.8	16.7
Funk G-134	21.7	16.9	15.4	17.3	15.8
Funk G-512W	23.7	16.5	15.8	17.5	15.8
Stull 101Y	22.2	16.2	15.3	15.9	16.2
U.S. 13	22.0	15.9	15.0	15.1	16.5
U.S. 523W	24.4	17.7	16.0	17.0	17.2
Pioneer 309A	25.2	19.2	16.3	16.2	16.4
T-5005	22.3	16.6	15.6	15.4	16.2
DeKalb 925	24.2	17.3	16.1	16.5	16.0
Stull 400W	22.4	16.5	15.4	15.3	16.0
T-7018	22.4	16.7	15.4	15.5	15.8
McCurdy 988	22.5	16.0	15.1	15.2	15.4
Stull 111Y	27.9	19.1	15.9	16.2	16.5
T-7015	23.7	16.9	16.2	16.0	16.1
Broadbent 337	23.3	16.7	15.7	15.9	16.0
DeKalb 869	21.4	16.4	15.4	15.4	15.7
DeKalb 898A	22.1	15.7	16.1	17.1	16.5
Ky. 204	24.7	17.7	16.1	15.7	16.0
T-7110	23.5	17.3	16.2	15.5	15.6
DeKalb 803A	22.3	16.5	15.9	16.4	16.7
U.S. 658	23.1	17.1	15.8	16.1	16.5
Ky. 106A	23.2	15.9	15.4	16.2	15.9
U.S. 642	25.0	17.4	15.4	16.2	17.3
Coker 616	26.9	19.8	17.4	16.9	16.2
S.S. 903	24.6	17.0	16.2	16.0	15.4
P.A.G. 631W	24.3	17.6	16.2	17.3	16.7
Average	23.6	17.1	15.9	16.1	16.2
L.S.D. (.05) between varieties	1.4	.9	.6	1.3	2.8
F. Test Between Replications (.05) *	N.S.	S.	S.	S.	S.

* Results of F test S = significant difference, N.S. = no significant difference.

Table 9.--Moisture percent of the grain of the late maturing corn varieties at various dates of harvest at the Main Experiment Station, 1959.

Variety	Days in field				
	132	149	168	187	209
	Percent Moisture of the Grain				
T-7004	24.4	17.7	15.7	15.6	15.8
T-6003	28.7	19.6	17.9	16.8	17.1
P.A.G. 633W	26.2	18.2	16.1	16.2	15.9
Dixie 77	27.6	19.2	17.7	16.6	16.4
Funk G-779W	27.2	19.4	17.0	16.0	16.3
Dixie 22	27.4	19.4	17.3	16.8	16.4
DeKalb 1023	25.3	17.8	16.5	16.4	16.6
Dixie 29	27.4	20.1	16.8	16.7	16.0
DeKalb 1028	26.2	18.8	16.3	16.8	16.6
Funk G-711	28.0	19.5	17.9	18.1	16.3
Keystone 256	26.8	18.0	16.2	15.8	15.9
Pioneer 309A	25.0	19.4	16.0	15.7	15.6
Keystone 222	26.7	18.2	17.2	16.4	16.7
Pioneer 309B	27.8	20.2	15.8	16.2	16.1
A.E.S. 904W	26.2	18.9	17.1	16.1	16.1
N.C. 288	27.9	19.9	17.8	16.7	16.2
P.A.G.653W	27.1	19.4	16.6	16.0	16.2
P.A.G. 488	28.9	21.6	18.0	17.4	16.8
Dixie 55	28.7	18.2	16.6	16.4	16.4
Tenn. 90	26.9	20.3	17.0	15.9	16.8
Dixie 33	28.4	18.8	17.1	16.2	16.1
T-7005	25.0	17.6	16.3	15.4	16.2
Ga. 102	25.9	19.2	16.6	16.5	16.6
T-8103	26.3	19.0	17.6	16.0	16.4
T-8003	26.1	19.0	16.5	16.9	16.5
T-7002	26.7	19.2	17.0	16.1	16.6
Funk G-710AA	28.9	20.2	17.1	16.0	16.2
E-6W	27.6	19.6	17.3	16.4	16.2
Broadbent 402B	23.9	16.6	15.6	15.8	16.0
Average	26.9	19.1	16.9	16.3	16.3
L.S.D. (.05) between varieties	1.9	1.3	.9	1.1	N.S.
F. Test Between Replications (.05)*	S.	S.	N.S.	S.	S.

* Results of F test S = significant difference, N.S. = no significant difference.

percent shown for each variety on any given harvest date is the average of six replications. There was a significant difference between some varieties in each test in the moisture content of the grain at each harvest date, except for the final harvest of the varieties at Knoxville in 1959 (table 9). An F value was calculated for each harvest of the sub-plot to determine variation between replications. Results are shown in each table. The significant difference that occurred between replications was indicative that variation in moisture sampling does occur even though all possible precautions are taken. Even though significant differences did occur between replications (for moisture samples) there were no significant differences between replications, based on yields as reported in the appropriate variety bulletins.

Table 5 shows the moisture content of the grain of each early maturing variety at Crossville in 1958 at 124, 140, 153, and 160 days after planting. A significant difference occurred between varieties at all harvests but between replications only on the final two harvests.

Table 6 shows the grain moisture content of each early variety at Knoxville in 1958 harvested 113, 125, 132, 146, and 155 days after planting. Here a significant difference occurred between varieties at each harvest date and between replications at three of the five harvest dates.

Table 7 shows the grain moisture content at Knoxville in 1958 of each late variety harvested 118, 132, 146, 155, and 168 days following planting. A significant difference occurred between varieties on each

harvest date, but between replications only for the harvests 146 and 168 days following planting.

Tables 8 and 9 show the moisture content of the grain of the early and late varieties at Knoxville in 1959 at harvests 132, 149, 168, 187, and 209 days after planting. A significant difference occurred between early varieties at each harvest but between replications only at the first harvest. A significant difference occurred between the late varieties, except in the final harvest and between replications, except at the harvest 168 days following planting.

Once the varieties reached physiological maturity the grain lost moisture at varying rates. The rate varied slightly between years and locations. Using the average moisture percent of all varieties in a maturity group at harvest, a relatively good moisture loss curve can be plotted. The date shown in figure 1 are these averages for each harvest of each study. In 1958, the early maturing varieties were about 2 weeks later reaching comparable moisture levels at Crossville than at Knoxville. Since the rainfall at the two locations was adequate, one might assume that the differences were due to different average daily temperatures, or other weather conditions.

At Knoxville in 1958, the early maturing varieties reached specified moisture percentages approximately 8 to 12 days earlier than the late maturing varieties. This difference was relatively constant throughout all harvests. However, had the varieties been left in the field for a longer period of time, this constant difference might have

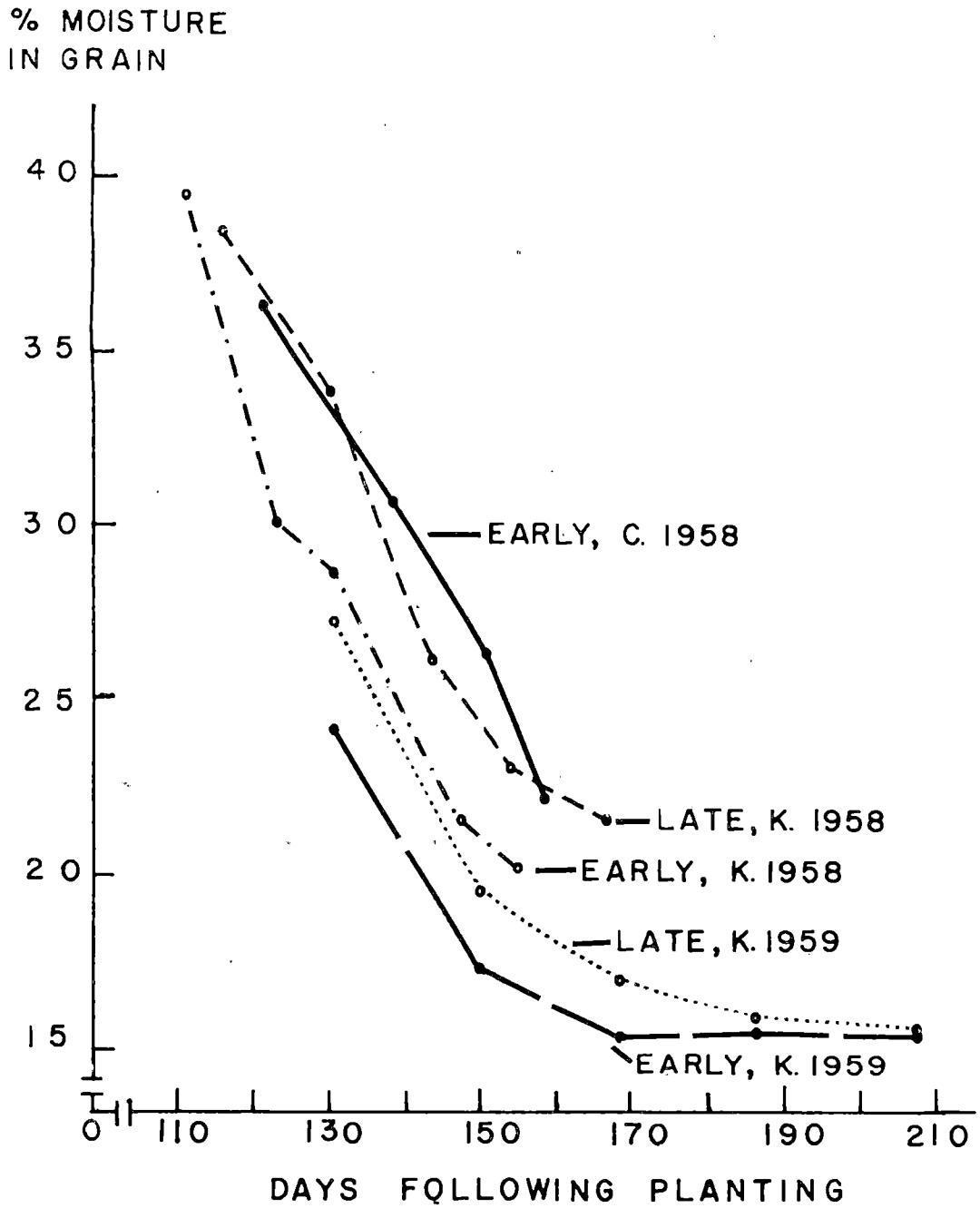

Figure 1.--Average percent moisture of the grain at harvest, Crossville 1958, and Knoxville 1958 and 1959.

changed. At Knoxville in 1959, there was a difference of 6 to 8 days between the early and late maturing varieties when the moisture was above 20%. Once the moisture content dropped below the 20% level, the difference between the early and late maturing varieties became progressively less. Finally, the average moisture content of the early maturing varieties began to increase. However, this did not occur until after the moisture percentage had dropped to 15.9%, 168 days following planting and was due, presumably, to increased relative humidity of the atmosphere.

Maturity Comparisons Based on Mid-silking and Mid-tasseling

The varieties were classified as either prolific or non-prolific from data obtained from the State Uniform Variety Trials (6) for 1958 and 1959. Three prolific and three non-prolific varieties were selected at random from each group. None of the extremely early or late maturing varieties was included in the randomly selected group. These were studied to determine whether a constant relation existed among them for days from mid-silking to maturity or from mid-tasseling to maturity.

Tables 10 through 15 show the number of days from planting to mid-silking or to mid-tasseling and the number of days required for the grain to reach certain specified moisture percentages. Days from tasseling or silking to specified moisture percent of the grain was determined by interpolation of data in tables 5 through 9.

Table 10.--Days from planting to mid-silking, and from mid-silking to various stages of maturity for the early maturing varieties at the Plateau Experiment Station, 1958.

Variety	Days to mid-silking	Days from mid-silking to: 35% moisture	30% moisture	25% moisture
Non-prolific early maturing varieties				
U.S. 13	73	50*	59	69
Funk G-144	74	52	63	79
DeKalb 925	80	49	62	76
Prolific early maturing varieties				
Tenn. 501	76	47*	67	82
Dixie 29	77	64	78	84*
T-5005	77	52	68	77

* Determined by extrapolation.

Table 11.--Days from planting to mid-silking and from mid-silking to various stages of maturity of the early and late maturing varieties at the Main Experiment Station, 1958.

Variety	Days to mid-silking	Days from mid-silking to: 35% moisture	30% moisture	25% moisture
Non-prolific early maturing varieties				
U.S. 13	60	56	60	73
DeKalb 925	60	58	64	81
Funk G-144	63	56	63	72
Prolific early maturing varieties				
Tenn. 501	61	57	63	80
T-5005	61	58	66	84
Dixie 29	64	69	72	86
Non-prolific late maturing varieties				
DeKalb 1023	66	53	62	72
DeKalb 1028	66	50	60	64
Tenn. 90	68	55	60	66
Prolific late maturing varieties				
Dixie 77	64	59	65	83
Dixie 33	66	59	63	68
Dixie 55	68	59	63	72

Table 12.--Days from planting to mid-silking and from mid-silking to various stages of maturity of the early and late maturing varieties at the Main Experiment Station, 1959.

Variety	Days to mid-silking	Days from mid-silking to: 22% moisture	20% moisture	18% moisture
Non-prolific early maturing varieties				
U. S. 13	62	70	76	81
Funk G-144	64	74	78	83
DeKalb 925	66	72	76	81
Prolific early maturing varieties				
T-5005	63	70	76	82
Tenn. 501	66	73	78	87
Dixie 29	68	75	79	89
Non-prolific late maturing varieties				
DeKalb 1023	65	74	79	84
DeKalb 1028	70	72	76	82
Tenn. 90	70	75	81	92
Prolific late maturing varieties				
Dixie 77	65	78	82	99
Dixie 33	68	75	79	90
Dixie 55	70	73	76	81

Table 13.--Days from planting to mid-tasseling and from mid-tasseling to various stages of maturity for the early maturing varieties at the Plateau Experiment Station, 1958.

Variety	Days to mid-tasseling	Days from mid-tasseling to: 35% moisture	30% moisture	25% moisture
Non-prolific early maturing varieties				
DeKalb 925	74	49*	58	68
Funk G-144	75	51	62	78
U.S. 13	76	53	64	80
Prolific early maturing varieties				
Tenn. 501	76	47*	67	82
Dixie 29	76	65	79	85*
T-5005	76	53	69	78

* Determined by extrapolation.

Table 14.--Days from planting to mid-tasseling and from mid-tasseling to various stages of maturity of the early and late maturing varieties at the Main Experiment Station, 1958.

Variety	Days to mid-tasseling	Days from mid-tasseling to: 35% moisture	30% moisture	25% moisture
Non-prolific early maturing varieties				
Funk G-144	61	60	67	76
U.S. 13	62	52	56	69
DeKalb 925	63	52	58	75
Prolific early maturing varieties				
Tenn. 501	61	57	63	80
T-5005	61	58	66	84
Dixie 29	62	63	76	90
Non-prolific late maturing varieties				
DeKalb 1023	64	57	66	76
DeKalb 1028	64	54	64	68
Tenn. 90	64	63	68	74
Prolific late maturing varieties				
Dixie 77	64	67	63	81
Dixie 33	67	58	62	67
Dixie 55	68	59	63	72

Table 15.--Days from planting to mid-tasseling and from mid-tasseling to various stages of maturity of the early and late maturing varieties at the Main Experiment Station, 1959.

Variety	Days to mid-tasseling	Days from mid-tasseling to: 22% moisture	20% moisture	18% moisture
Non-prolific early maturing varieties				
U.S. 13	62	70	76	81
Funk G-144	63	76	80	85
DeKalb 925	67	72	76	80
Prolific early maturing varieties				
Tenn. 501	65	72	77	86
T-5005	66	64	70	76
Dixie 29	66	75	79	89
Non-prolific late maturing varieties				
Tenn. 90	66	83	89	100
DeKalb 1023	67	70	75	80
DeKalb 1028	67	78	82	88
Prolific late maturing varieties				
Dixie 77	65	78	82	99
Dixie 33	67	77	81	92
Dixie 55	68	77	80	85

There was only a small difference between varieties in the number of days from planting to either mid-silking of mid-tasseling or in the number of days from mid-silking of mid-tasseling to physiological maturity. Moreover, the difference between varieties in the number of days to mid-silking or to mid-tasseling did not always reflect the difference between the same varieties in the number of days from mid-silking or mid-tasseling to physiological maturity. The number of days from mid-silking or mid-tasseling to the lower moisture levels was more variable due to the difference in the rate of moisture loss from the different varieties following physiological maturity. Although the variation in moisture loss began with physiological maturity, the difference in relative maturity of different varieties could be estimated if the moisture samples were taken before the moisture dropped below the 30% level.

The varieties classified as early maturing hybrids reached physiological maturity sooner than the varieties classified as late maturing. However, in most cases the late maturing non-prolific varieties reached the 20 to 25% moisture range in approximately the same number of days as did the early maturing prolifics. Therefore, when comparing the moisture percentages of various corn varieties following physiological maturity, it should be known whether a variety is prolific or non-prolific.

CHAPTER V

SUMMARY AND CONCLUSIONS

A study to evaluate the criteria for determining corn maturity was conducted at Crossville and Knoxville, using 30 early and 30 late maturing varieties of hybrid corn. The number of days from planting to mid-silking and mid-tasseling was recorded for each variety. The corn was harvested at various intervals following physiological maturity and the moisture percentage of the grain at each harvest was determined.

There was only a small difference between varieties in the number of days from planting to either mid-silking or mid-tasseling. The rate of moisture loss from the different varieties following physiological maturity was not constant. Because of this variation some of the late maturing non-prolific varieties reached the 20 to 25% moisture range in about the same number of days as the early maturing prolifics.

The number of days from planting to either mid-silking or mid-tasseling was not a good criterion for predicting the days to physiological maturity. After all the different criteria for estimating maturity were studied, it was concluded that the most suitable approximation of the relative difference of maturity of the varieties under study could be made by determining the moisture percentage of the grain, provided samples were taken following physiological maturity but before moisture dropped below the 30% level.

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APPENDICES

APPENDIX A

DAILY RAINFALL, PLATEAU EXPERIMENT STATION, MAY 15-OCTOBER 22, 1958.

Date	Rainfall in inches					
	May	June	July	August	September	October
1		--	--	.03	--	.63
2		.55	--	.20	--	.01
3		--	--	.72	--	.06
4		--	--	--	--	--
5		--	--	--	--	--
6		--	.15	--	--	--
7		--	.41	--	--	--
8		--	.37	--	.15	--
9		--	.13	.01	--	--
10		.25	.01	--	--	.07
11		--	--	--	--	--
12		.02	.93	.28	.09	--
13		--	.42	.04	--	--
14		--	1.88	.26	--	--
15	--	--	--	.01	--	--
16	--	.10	--	--	--	--
17	--	--	.13	.03	.20	--
18	--	--	--	--	1.18	--
19	.25	--	--	--	--	--
20	.30	--	.23	--	.04	--
21	--	--	.24	--	1.84	--
22	--	.51	.12	--	.03	--
23	--	.08	.04	--	--	
24	--	.02	.16	.53	--	
25	.56	--	.07	.16	--	
26	.06	1.35	.42	--	--	
27	--	.03	--	--	--	
28	--	--	--	--	.04	
29	--	--	.35	--	--	
30	--	--	--	--	--	
31	--	--	--	--	--	
Total	1.17	2.91	6.06	2.27	3.57	.77

APPENDIX B

DAILY RAINFALL, MAIN EXPERIMENT STATION, MAY 28-NOVEMBER 12, 1958.

Date	Rainfall in inches						
	May	June	July	August	September	October	November
1		.06	--	.01	.01	.49	.45
2		--	--	.58	--	--	.04
3		--	--	.03	--	.14	--
4		--	.11	--	--	--	--
5		--	--	--	--	--	.41
6		--	.51	--	--	--	.10
7		--	1.04	--	.20	--	--
8		--	.35	--	--	--	.24
9		--	.42	.63	--	--	.10
10		--	--	--	--	.03	--
11		--	--	--	.01	--	--
12		--	.52	--	.01	--	--
13		--	.43	--	--	--	
14		--	--	.02	--	--	
15		.72	--	--	--	--	
16		--	.60	.29	--	--	
17		--	--	--	.05	--	
18		--	--	--	.06	--	
19		--	--	--	--	--	
20		--	.02	--	.19	--	
21		.03	.40	.59	.72	--	
22		.59	.03	.13	--	--	
23		--	--	--	--	--	
24		--	.21	.54	--	--	
25		--	--	.01	--	--	
26		.61	--	--	--	--	
27		--	--	--	--	--	
28	--	--	.08	--	--	--	
29	--	--	--	--	--	--	
30	--	--	--	--	.24	.02	
31	--	--	.85	--	--	--	
Total	--	2.01	5.57	2.83	1.49	.68	1.34

APPENDIX C

DAILY RAINFALL, MAIN EXPERIMENT STATION, MAY 6-DECEMBER 1, 1959.

Date	Rainfall in inches							
	May	June	July	August	September	October	November	December
1		.74	.07	.03	.04	--	--	--
2		.23	.19	--	.04	--	--	
3		--	--	.13	--	--	--	
4		--	--	--	--	--	--	
5		.44	--	.71	.01	--	.12	
6	--	--	--	.06	--	.75	.03	
7	--	--	--	.18	.10	.31	--	
8	--	--	--	--	--	.07	--	
9	.04	--	--	--	--	1.07	--	
10	--	--	.45	--	.65	--	--	
11	--	--	.04	--	--	.05	--	
12	.28	--	--	--	--	--	--	
13	--	--	--	--	--	.93	--	
14	--	--	.01	--	--	.28	.24	
15	--	--	--	--	--	--	--	
16	--	--	--	--	--	--	.33	
17	--	--	.61	--	--	.03	.18	
18	--	--	.42	.14	--	--	--	
19	--	--	.44	.05	--	--	--	
20	.93	--	.01	--	--	--	--	
21	--	--	.06	--	--	--	.03	
22	.04	--	.12	.01	--	--	--	
23	--	.01	--	--	--	.49	.51	
24	--	.77	--	3.25	--	.56	.55	
25	.03	.59	.08	--	--	.02	--	
26	--	--	--	.01	--	.02	--	
27	.75	--	.47	--	--	.12	2.60	
28	--	--	--	.32	--	--	.09	
29	--	--	--	.02	.07	.10	--	
30	.68	--	--	--	.02	.01	--	
31	.43	--	--	--	--	.01	--	
Total	3.18	2.78	2.97	4.91	.93	5.00	4.68	