

FUSARIUM SP. PARASITIC ON *EPIPYROPS*, A LEPIDOPTEROUS PARASITE OF THE SUGARCANE *PYRILLA*

BY S. Y. PADMANABHAN
(*Sugarcane Research Station, Anakapalle*)

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INTRODUCTION

In October 1939, the late Dr. John MuliyaI brought to the writer's notice pupæ of *Epipyrops* sp. attacked by a fungus. In its larval stage, *Epipyrops* is a parasite on *Pyrilla* the well-known pest of sugarcane. A study was undertaken to identify the fungus and to establish its pathogenicity on *Epipyrops*.

DESCRIPTION OF THE MATERIAL

The pupæ are rectangular in shape, 22–25 mm. long and 8–9 mm. broad and were attached to the ventral surface of the sugarcane leaf, the longer axes of the pupæ being along the length of the leaf. The pupæ were covered over by salmon coloured mycelium. When a portion of the mycelium was examined under the microscope innumerable conidia of *Fusarium* sp. were observed.

IDENTIFICATION TESTS

The morphology of the fungus was studied in detail. The characters of the conidia produced on the mycelium parasitising *Epipyrops* were compared with those produced by single spore cultures isolated from the former. A remarkable variability was at once perceived in the spores produced in culture. One of the single spore isolates differed from the fungus obtained directly from *Epipyrops* in the total absence of macroconidia, while both the micro- and macro-conidia were present in other isolates.

Three isolates were used in the study of the morphology of the fungus: (i) the fungus from *Epipyrops*, (ii) a single conidial culture from (i) but producing only microconidia, (iii) a single conidial culture from growths isolated from artificially infected *Epipyrops* pupæ [the healthy *Epipyrops* pupæ were artificially infected in the laboratory with spore suspensions of (ii) above].

The two isolates, (ii) and (iii) were grown on the following seven media:

1. Potato cylinders.
2. 2% potato Dextrose agar.
3. 5% potato Dextrose agar (Wollenweber, *et al.*, 1925).
4. Oatmeal agar.
5. Steamed rice (Wollenweber, *et al.*, 1925).
6. Brown's standard agar (Brown, 1925).
7. Brown's starch agar (Brown, 1925).

The potato cylinders were prepared in the usual manner and were sterilized at 10 lbs. pressure for 45 minutes.

The oatmeal agar was prepared by taking 100 grams of Quaker Oats in water, using a sufficient quantity of water to bring the oats into solution when warmed. The warm solution was strained through cheese cloth, taking care that no crushing or pressure was applied to help the slow streaming through of the solution. The solution was made up to 1000 c.c., tubed, and sterilized at 10 lbs. pressure for 45 minutes.

Triplicate tubes of the cultures grown in the seven media were maintained at two temperatures, 18–20° C. and 35° C., to study the range of variation exhibited by the fungus, and to identify it on the basis of the characters so observed taken in conjunction with the morphology of the fungus from the naturally occurring parasite on *Epipyrops*. For convenience, the two cultures will be referred to in the following text as culture 1, and culture 2, while the *Fusarium* sp. from *Epipyrops* will connote the fungus obtained directly from the parasitised material.

Observations were made on the 10th and 21st day on the amount and colour of aerial mycelium and substrate, production of sclerotia stroma and pionnotes. The data are recorded in Tables I and II.

The spore measurements and data on the percentage occurrence of the different septate spores were obtained on the 22nd day in culture 1, and on the 23rd and 24th days in culture 2. The spore measurements, etc., were made only on the cultures maintained at 18° C. The data are presented in Tables III, IV, V, VI. The spore measurements data for *Fusarium* sp. from *Epipyrops* are shown in Table VII.

The data presented in the tables may be summarised as follows: In both the cultures, the aerial mycelium is colourless or white.

TABLE I

Showing the amount of Aerial Mycelium, colour of Aerial Mycelium and of Substrate, Conidial Production, Sclerotia, Stroma, Pinnotes on the 10th and 21st days of growth at two Temperatures in different media

Medium	Culture	Temperature series O.C.	Aerial Mycelium		Surface of substratum		Sclerotia Stroma	Pinnoter
			10th day	21st day	10th day	21st day		
Potato cylinder	I	18	White	White abundant, 0.3 septate spores, abundant	Unchanged	Olive gray	Absent	Absent
		35	White	White; abundant, 0.2 septate spores abundant	Dark Olive gray	Deep Olive buff; iron gray	Absent	Absent
	II	18	White	White; abundant conidia 0.5 septate abundant	Light vinaceous Cinnamon	Buff-pink, deep colonial buff; spores scattered over the surface	Absent	Absent
		35	White	White abundant	Apricot buff	Apricot buff; spores scattered over the surface	Absent	Absent
2% Potato Dextrose	I	18	White	White and deep dull bluish violet; moderate abundant; conidia 0.1 septate, abundant	Pale violet gray	Deep slaty brown; conidia scattered, 0.1 septate	Absent	Thin
		35	Lacking	Lacking	Onion skin pink dark nigrosin violet	Cinnamon buff. dark nigrosin violet; conidia 0.1 septate, scattered	Absent	Thin
	II	18	White	White scanty; conidia 0.6 septate	Salmon buff	Salmon buff, conidia 0.6 Septate	Absent	Thin
		35	Lacking	White scanty conidia few; 0.3 septate mostly	Flesh ochre	Flesh ochre; abundant conidia 0.5 septate	Absent	Thin

TABLE I—(Contd.)

Medium	Culture	Temperature series 0°C.	Aerial Mycelium		Surface of substratum		Sclerotia Stroma	Pinnotes
			10th day	21st day	10th day	21st day		
5% Potato Dextrose	I	18	White	White; moderately abundant as in 27	Unchanged	Deep slaty brown	Absent	Thin
		35	Lacking	Lacking	Dark nigrosin violet; pinkish Cinnamon	Dark nigrosin violet and buff pink; conidia scattered, 0.1 septate	Absent	Thin
	II	18	White	White	Salmon buff	Salmon buff	Absent	Thin
		35	Lacking	White; scanty conidia as in 2%	Flesh ochre	Flesh ochre	Absent	Thin
Oatmeal Agar	I	18	White	Lacking	Unchanged	Hyssop violet; argyle purple. Conidia 0.1 septate	Absent	Thin
		35	White trace of spinal red	Lacking	Unchanged	Unchanged; Conidia abundantly 0.1 septate	Absent	Thin
	II	18	White	White moderately abundant; conidia abundant; 0.7 septate	Salmon colour	Apricot buff Conidia scattered	Absent	Thin
		35	Lacking	White; abundant; conidia abundant, mostly 0.3 septate	Salmon buff	Salmon buff, Conidia scattered	Absent	Thin
I	18	White	White abundant; conidia 0.2 septate	Cameo pink	Thulite pink	Absent	Absent	
	35	White	White; abundant 0.2 septate abundant	Coral pink and Apricot orange	Coral pink ocheroceous orange, wax yellow	Absent	Absent	

TABLE I—(Contd.)

Medium	Culture	Temperature series 0°C.	Aerial Mycelium		Surface of substratum		Sclerotia Stroma	Pinnoter
			10th day	21st day	10th day	21st day		
Steamed Rice	II	18	White	White abundant; conidia abundant 0.5 celled; mostly 0.5 septate	Salmon colour deep dark olive buff	Conidida thinly scattered	Absent	Absent
		35	White	White scanty (Bacterial contamination) conidia mostly 2.3 septate	Fresh ochre	Apricot buff, cream buff, orange at the bottom; Carnelian red at the top and Cinnamon buff	Absent Conidia abundant on the surface	Absent
Brown's Standard Agar	I	18	White	White scanty; conidia abundant; septate, mostly 2.3 septate	Unchanged	Unchanged, conidia scattered, 0.1 septate	Absent	Absent
		35	Lacking	Lacking	White	White, conidia, abundant septate; 0.3 septate	Absent	Absent
	II	18	White	White, scanty; conidia 0.5 septate, abundant	Lacking in colour	Lacking in colour, conidia thinly scattered	Absent	Absent
		35	Lacking	Lacking	Apricot buff	Apricot buff; abundant conidia, mostly 0.3 septate	Absent	Absent
Brown's Starch Agar	I	18	Lacking	Lacking	Unchanged	Lumsere blue; abundant conidia 1.2 septate	Absent	Thick
		85	Lacking	Lacking	Prussian blue	Dull purplish black; abundant conidia 1.2 septate	Absent	Absent
	II	18	White	White scanty conidia 0.5	Pale Salmon	Salmon; conidia, thinly scattered on the surface	Absent	Absent
		35	White	White scanty; conidia mostly 0.3 septate	Apricot orange	Apricot buff; conidia abundant	Absent	Absent

TABLE II

Showing the form of Conidia and Chlamydo spores observed on the 10th and 21st days of growth at two different Temperatures on Seven Different Medium

(5% Pot. dextrose, not shown as the data were similar to those in 2% potato dextrose.)

Medium	Culture	Temperature series 0°C.	Conidia in aerial mycelium	Conidia on the stromatal layer	Chlamydo spores
Potato cylinder	I	18°C.	Single, continuous and 1-3 septate; septate spores comparatively abundant; ovoid to spindle shaped, cylindrical, slightly curved; sometimes slightly vacuolate, apex rounded		Absent
	I	35°C.	Single, continuous, 1-3 septate. spores ovoid, spindle-shaped; cylindrical or slightly curved hyaline, abundant		do
	II	18°C.	Single, continuous, 1-5 septate; mostly 3 and 5 septate; ovoid to cylindrical microconidia; macroconidia straight or rarely curved; bluntly pointed ends; without a foot-cell	Spores scattered over the surface; surface slightly slimy	do
	II	35°C.	Single, continuous, predominantly septate; 1-5 septate mostly 3 septate; microconidia ovoid to cylindrical or curved; microconidia sickle-shaped, spindle-shaped cylindrical, straight with blunt ends slightly foot-celled base, curved spores with a fine curved point	Spores abundant on the slimy surface	do
Potato Dextrose	I	18°C.	Single, continuous (1-2 septate spores also seen) ovoid to spindle-shaped hyaline, abundant	Thinly scattered on agar surface predominantly continuous; ovoid to spindle-shaped; occasionally 1-3 septate; thin straight or slightly curved and rounded apex and bluntly pointed or slightly foot-celled base; separations indistinct, hyaline	do
	I	35°C.	do	do	do
	II	18°C.	Single, continuous and 1 septate; microconidia ovoid to spindle-shaped or straight cylindrical; macroconidia, curved, straight or slightly curved with bluntly pointed ends or finely pointed ends	Spores thinly scattered on the agar surface, rarely with slightly foot-celled base	do

TABLE II—(Contd.)

Medium	Culture	Temperature series 0°C.	Conidia in aerial mycelium	Conidia on the stromatal layer	Chlamydo- pores
Potato Dextrose	II	35°C.	Predominantly septate; straight with blunt ends; curved; slightly foot-celled base; mostly 0.3 septate; rarely 4.15 septate	Abundantly scattered over the surface; ovoid microconidia typically curved and straight 0.5 septate, frequently curved ends blunt or bluntly pointed with or without a foot-celled base; indistinctly septate	Absent
	I	18°C.	Single, continuous, rarely septate; ovoid cylindrical spindle-shaped; rounded apex and base; not abundant	Thinly scattered on Agar surface, mostly continuous rarely 1 septate; ovoid; cylindrical spindle-shaped rounded apex, base blunt without any foot cell; conidia comparatively not abundant	do
Oatmeal Agar	I	35°C.	Single continuous rarely 1.2 septate spores; ovoid cylindrical spindle-shaped hyaline, abundant	Thickly scattered on agar surface spindle-shaped; occasionally 1.3 septate straight, slightly curved apex blunt or rounded; septations indistinct; hyaline	do
	II	18°C.	Conidia 0.7 septate; mostly septate spores; 3.5 septate spindle-shaped elongated slightly pointed ends, curved, slightly foot-celled microconidia ovoid cylindrical rounded apex	Thinly scattered on the surface	do
	II	35°C.	Conidia 0.5 septate; mostly 0.7 septate ovoid to spindle-shaped, stout. thick and straight or narrow and slightly curved the ends blunt or finely pointed; hyaline, occasionally vaculate	Thinly scattered on the surface	do
	I	18°C	Single continuous, mostly occasionally 1 septate, rarely 2 septate, ovoid to spindle-shaped curved, straight cylindrical apex rounded; blunt abundant	Spores thinly scattered on the surface	do
Steamed Rice	I	35°C.	do	do	do
	II	18°C.	Conidia 0.5 celled. mostly 3.5 celled spindle-shaped, straight or slightly curved ends blunt or bluntly pointed, hyaline; occasionally vaculate	Spores thinly scattered on the surface	do
	II	35°C.	Conidia very irregularly shaped, mostly 0.3 septate; rarely 4.5 septate, spherical to ovoid and spindle-shaped with blunt ends	Abundantly scattered on the surface	do

TABLE II—(Contd.)

Medium	Culture	Temperature series 0° C.	Conidia aerial mycelium	Conidia on the stromatal layer	Chlamydo- spores
Brown's Starch agar	II	18°C.	Conidia very thin walled, 0.5 septate ovoid to spindle shaped, blunt or bluntly pointed ends	Conidia thinly scattered on the surface	Absent
		35°C.	Conidia 0.5 septate, mostly 0.3 ovoid to cylindrical, spindle-shaped, blunt or bluntly pointed	Conidia abundantly scattered over the surface	do
	I	18°C.	Single continuous, very rarely 1 septate ovoid to spindle-shaped occasionally curved, apex blunt abundant with or without foot-celled base		do
		35°C.	Single or false heads ovoid to cylindrical 1.2 septate; straight and slightly curved, apex rounded, without foot-cells, abundant hyaline		do
Brown's Standard Agar	I	18°C.	Single predominantly septate, 0.3 septate; mostly straight ovoid to spindle-shaped, occasionally slightly curved apex rounded or pointed very distinct septate, abundant	Single, continuous 1 septate occasionally 2 septate; spindle-shaped ovoid, rarely curved, apex rounded or pointed, septate distinct; abundant	do
		35°C.		Septate spores comparatively abundant; 1.3 septate ovoid, cylindrical furoid, curved to sickle-shaped apex blunt or bluntly pointed, base slightly foot-celled	do
	II	18°C.	Conidia thin-walled 0.5 septate; microconidia ovoid to spindle-shaped, septate spores curved with blunt or bluntly pointed ends	Spores thinly scattered on the surface	do
		35°C.		Single continuous or septate; 0.3 septate ovoid to cylindrical or spindle-shaped blunt to pointed ends, curved to sickle-shaped without foot cell-conidia typically like those of I in 18°C. and 35°C.	do

TABLE III

Showing the Percentage Occurrence of the different septate spores in the Seven Media of Culture I at 18° C. (after 23 days)

Medium	0 septate	1 septate	2 septate	3 septate
Potato cylinder ..	96	4	..	..
2% P.D. Agar ..	98	2	trace	trace
5% P.D. Agar ..	..	..	..	..
Oatmeal ..	98	2	..	..
Steamed rice, medium ..	98	2	trace	..
Brown's starch, medium ..	98	2	..	..
Brown's standard medium ..	98	2	..	..

TABLE IV

Showing the mean measurements in μ of length, the range in length of the Conidia of Culture I at 18° C. after 23 days

Medium	0 septate		1 septate		2 septate	3 septate
	Mean	Range	Mean	Range		
Potato cylinder	8.94	4-16	13.52	10-20		
P.D.A. 2% ..	7.28	4-12	15.86	8-24	18.4	32
Oatmeal ..	8.68	4-16	14.6	10-24	22.8	20
B.A. ..	8.4	4-16	18.0	12-24		
B.St. A. ..	6.4	2-12	13.52	10-20		
Rice ..	8.84	4-16	15.72	10-24	19	24
	8.1	2-16	15.4	8-24	20.1	25.3

TABLE V
Spore measurements of Culture II from larva of Epipyrops taken from twenty-three days old cultures kept at 18-20° C.

	0 septate		1 septate		2 septate		3 septate		4 septate		5 septate		6 septate		7 septate	
	L	B	L	B	L	B	L	B	L	B	L	B	L	B	L	B
Medium																
	2% Dextrose Agar															
Mean measurement	11.2	3.6	13.68	3.96	36.82	3.96	32.76	3.96	36.36	3.96	37.26	4.3	7			
Range	10.8 to 11.6	3.24 to 3.96	10.8 to 18.0	3.6 to 4.68	14.4 to 18.72	3.24 to 4.68	15.2 to 34.20	3.6 to 5.76	25.92 to 39.6	3.6 to 5.76	32.4 to 44.28	3.6 to 6.84				
Percentage occurrence	4%		7%		2%		63%		3%		21%					
Mean measurement	8.64	3.3	12.96	4.3	18.0	4.3	25.42	4.3	29.66	4.68	39.74	4.68	45.9	5.4	52.2	5.
Range	4.68 to 14.4	2.5 to 3.6	7.2 to 16.2	3.24 to 6.12	12.6 to 21.6	3.6 to 4.96	18.72 to 35.28	3.24 to 6.48	28.8 to 39.6	3.6 to 6.48	30.6 to 52.2	3.6 to 6.48	30.6 to 52.2	5.4	52.2	5.
Percentage occurrence	3.2%		7.6%		12.8%		66.4%		6%		3.2%		0.8%			
Mean measurement	9.0	3.24	13.5	3.96	30.2	3.96	24.5	3.96	30.096	3.96	35.64	3.96	45.72	4.32		
Range	7.2 to 10.8	2.88 to 3.6	12.6 to 14.4	2.88 to 4.68	17.64 to 25.2	3.24 to 4.32	36.36 to 17.28	2.88 to 4.32	19.8 to 38.88	2.88 to 4.68	23.04 to 51.12	3.6 to 4.68	45.72 to	4.32 to		
Percentage occurrence	2.7%		3.6%		5.8%		47.3%		13.3%		24.6%		2.7%			
Mean measurement	9.36	3.96	15.12	4.6	16.2	3.6	26.06	4.3	34.06	4.3	43.91	4.3				
Range	8.28 to 10.14	3.6 to 4.32	14.4 to 18.0	3.6 to 5.4	16.2 to ..	3.6 to ..	18.72 to 35.64	3.6 to 4.68	18.8 to 43.92	3.96 to 4.68	32.4 to 61.2	3.6 to 4.68				
Percentage occurrence	6.5%		9.5%		5.5%		44.2%		6.8%		27.5%					
Mean measurement	10.188	3.456	15.84	3.53	19.8	3.5	27.27	3.96	33.92	3.96	36.31	3.96	45.54	4.3		
Range	10.08 to 12.6	3.24 to 3.6	11.52 to 21.6	3.24 to 3.6	16.2 to 23.4	3.24 to 3.6	18.03 to 35.28	3.6 to 4.68	33.1 to 36	3.6 to 5.04	27.36 to 43.2	3.6 to 4.68	45 to 46.5	3.6 to 5.04		
Percentage occurrence	.46%		4.1%		9.1%		39.5%		10.9%		34.1%		1.8%			

TABLE VI

Mean measurement and percentage occurrence of Septate Spores in Culture. II

Septation	0	1	2	3	4	5	6	7
Percentage ..	3%	6%	7%	52%	8%	23%	1%	Trace
Mean length ..	9.59	14.25	18.2	27.2	28.82	38.38	45.72	52.2
Total Range ..	4.68 to 14.4	7.2 to 21.6	12.6 to 25.2	15.2 to 36.36	19.8 to 43.92	23.4 to 52.2	45.7 to 45.92	52.2
Mean Breadth ..	3.59	4.0	3.79	4.0 (4.09)	4.0 (4.09)	4.0 (4.21)	5.0 (4.68)	5.4
Total Range ..	2.5 to 3.96	2.88 to 6.1	3.2 to 4.9	3.2 to 6.48	2.88 to 6.48	3.6 to 6.8	4.32 to 6.8	5.4

TABLE VII

Measurement of spores taken directly from the diseased pupæ of Epipyrops

Septation of spores		0	1	2	3	4	5	6	7
1	Mean L	14.56	21.36	26.0	31.6	37.8	43.2	44	
2	Range in L	10-16	14-30.0	16-32	16-44	32-44	34-52	34-52	
3	Mean B	4.0	4.0	4.4	4.5	4.5	5.0	5.0	
4	Range in B	2.8 4.2	2.8 4.2	3.0 6.2	3.0 6.4	3.0 6.4	3.8 7.0	3.8 7.0	
Percentage occurrence of spores		14.6	21.5	14.6	34	6.7	6.5	1.3	0.6

TABLE VIII

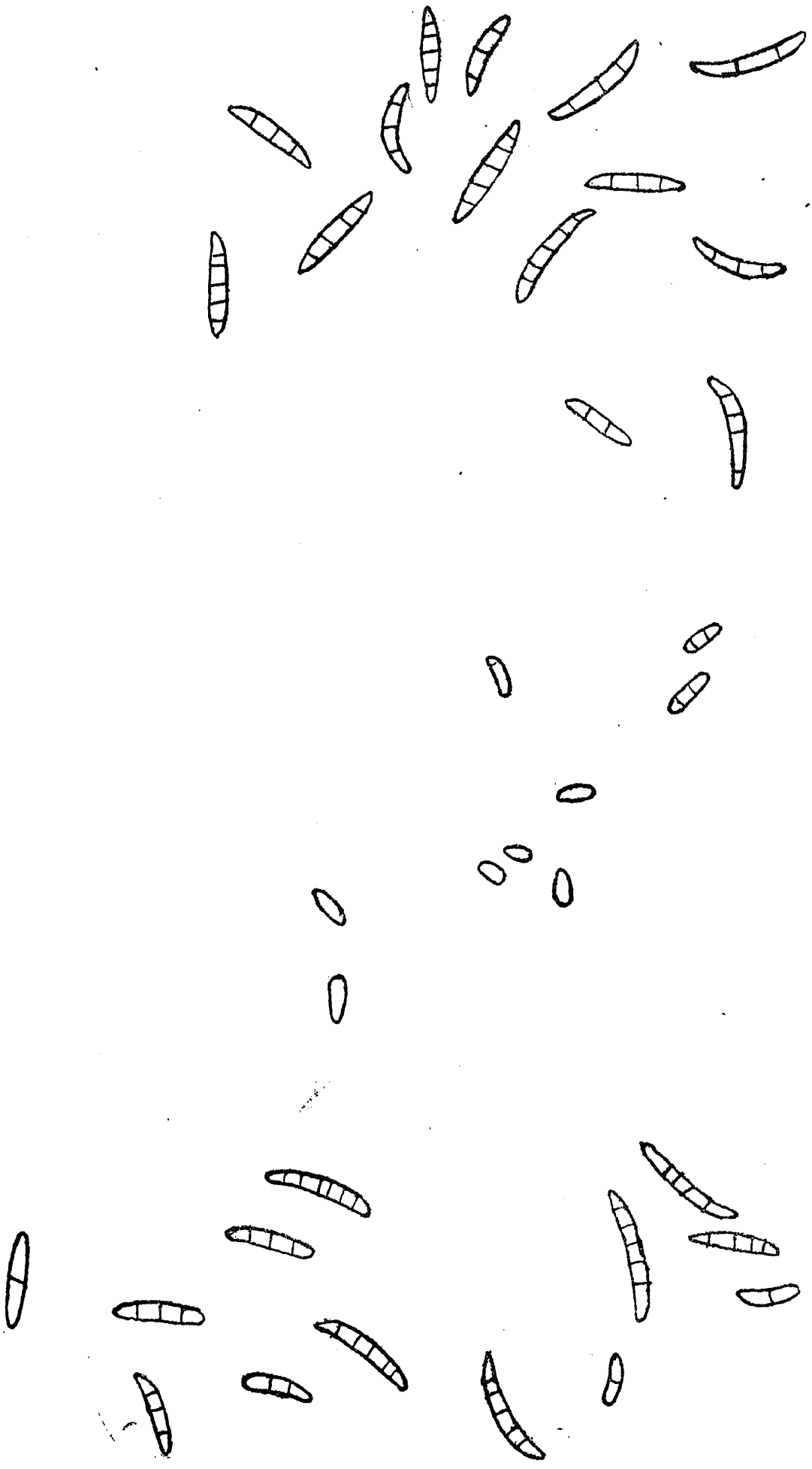
Table comparing the percentage Occurrence of septate spores, Mean length, Mean Range in length of spores of *Fusarium sp.* from Epipyrops and the Cultures, 1, 2 and *Fusarium moniliforme var. subglutinans*

Septation	0 Sep	1 Sep	2 Sep	3 Sep	4 Sep	5 Sep	6 Sep	7 Sep
(A) Percentage occurrence								
1 Spores from diseased larva ..	14.6%	21.5%	14.6%	34%	6.7%	6.7%	1.3%	0.6%
2 Spores from Culture I ..	97.7%	2.3%	Trace	Trace	..	..	..	..
3 Spores from Culture II ..	3%	6%	7%	52%	8%	23%	1%	Trace
(B) Mean length in μ								
1 Spores from diseased larva ..	14.56	21.36	26.0	31.6	37.8	43.2	44	..
2 Spores from Culture I ..	8.1	15.41	20.1	25.3	..	..	..	..
3 Spores from Culture II ..	9.59	14.25	18.2	27.2	28.2	38.8	45.72	52
4 <i>F. moniliforme</i> Sheld. var. <i>subglutinans</i> ..	9	17	..	32	..	50	..	..
(C) Mean range in length in μ								
1 Spores from diseased larva ..	10-16	14-30	16-32	16-44	32-44	34-52	34-52	..
2 Spores from Culture I ..	2-16	8-24	19-23	20-32	..	..	..	..
3 Spores from Culture II ..	5-14	7-22	13-25	15-36	20-44	23-52	45-52	..
4 <i>F. moniliforme</i> Sheld. var. <i>subglutinans</i> ..	7-12	14-20	..	25-48	..	43-53	..	..

The stroma is purple or pink in culture 1 (Ridgeway, 1912), while it is uniformly salmon or salmon buff in culture 2. The cultures agree closely with each other regarding the production and the characters of the microconidia. They are found generally thinly scattered on the agar surface or occasionally grouped together in false heads, predominantly continuous ovoid to spindle shaped; occasionally 1-3 septate, thin, straight or slightly curved with rounded apex, with bluntly pointed or slightly foot-celled base; the septations are indistinct and hyaline (Text-fig. B).

Abundant conidia are found in the aerial mycelium. The conidia are not produced in chains.

In addition to possessing microconidia as above described, culture 2 is also characterised by the production of predominantly septate spores. The spores produced in aerial mycelium are 0-5 septate, rarely 6-7 septate, rod to spindle-shaped, with blunt ends or ends tapering to a blunt point, or with the ends slightly curving and tapering, without foot-celled base or rarely with distinct or indistinct foot-cell (Text-fig. C).



A

B

C

[Figs. A-C.—Fig. A. Conidia of *Fusarium moniliforme* Sheld. var. *subglutinans*. *Wrand Rkg.* from pupa of *Epipyrops* ($\times 400$). Fig. B. Conidia of above from culture 1, producing only microconidia ($\times 600$). Fig. C. Conidia of above from culture 2, producing conidia as in nature ($\times 400$).

Chlamydo-spores are absent in both the cultures.

The conidia from the mycelium of the parasitised *Epiphyrops* are closely similar to those described under culture 2 (Text-fig. A).

TAXONOMY

According to Wollenweber and Reinking's key for the identification for the groups and sub-groups of the genus *Fusarium* the abundant micro-conidia and lack of macro-conidia in aerial mycelium and of chlamydo-spores, and nature of colours, place culture 1, in "Liseola".

Micro-conidia are not in chains. Blue sclerotia are absent. If the absence of blue sclerotia is recognized as a variable characteristic as Wollenweber (1935) does in the description of *F. moniliforme* Sheldon, then the other characters closely approximate to the above fungus. Further, the absence of conidia in fast chains brings it to *F. moniliforme* (Sheldon) var. *subglutinans* Wr. and Rkg. If the production of blue sclerotia is given more importance in distinguishing species, the fungus is brought down to *F. neoceras* Wr. et. Rkg. But the spores are not as long as those of *F. neoceras*, being little more in fact than half the length. Regarding culture 2, and the fungus from parasitised *Epiphyrops* the spores in the aerial mycelium are not those of "Liseola".

The spore characters place the latter in the section, "Lateritum" which is after all very close to "Liseola" and overlaps it as seen in the Key of Wollenweber (also Padwick, 1941). The key characters employed to distinguish the two sections is the production of micro-conidia in chains in the latter and their being not in chains in the former. In *F. moniliforme* v. *subglutinans* the conidia are not in chains, but the fungus belongs to "Liseola" and is described under the section by Wollenweber.

The presence of septate spores instead of microconidia raises an important issue. Wollenweber (1935) states that, "*F. moniliforme* is variable and occurs in forms which oscillate in the septation of the conidia, sometimes suddenly rising to develop highly septate sickle-shaped spores in sporodochia and pionnotes far surpassing the normal in number, then further relapsing to produce mostly the micro-conidia". Further, according to Subramaniam and Chona (1938) the fungus isolated from sugarcane suffering from 'wilt' in Bihar and identified as *Chephalsporium sacchari* Butler by Mcræ produced abundant macro-conidia typically like those of *F. moniliforme* in Holland. When the cultures were received in India, they produced only microconidia. Thus the variability in spore production of this fungus recorded in this paper is in conformity with the earlier observations mentioned above.

In comparing the data presented in Tables I and II, it will be seen that the two cultures agree closely with each other in the amount of growth, colour and amount of conidial production in all media except oatmeal and in the remarkable similarity in appearance and measurements of the 0-3 septate spores in Oatmeal, rice, and Brown's standard agar. In the above three media culture 2, produced mostly 0-3 septate spores.

Thus the fungus isolated from *Epipyrops* is identified as *F. moniliforme* Sheld. var. *subglutinans* Wr. and Rkg. [*Gibberella Fujikuori* (Sawada) Wr. var. *subglutinans* Edwards].

Parasitism of F. moniliforme var. subglutinans on Epipyrops

Experiment I.—Ten adults and nymphs of *Pyrilla* with *Epipyrops* larvæ were collected from the field, preserved in wire gauze chambers and fed on fresh sugarcane leaves. Using a small atomiser the parasites along with the hosts were sprayed upon with spore suspension from a fresh 20 days old culture of *F. moniliforme* var. *subglutinans*. The larvæ were not affected in any way even at the end of a week.

Experiment II.—Specimens of pupæ attached to the sugarcane leaves were collected and sprayed upon with spore suspension of the above fungus as in experiment I. A profuse salmon coloured mycelium developed on the pupæ within 48 hours. The fungus was re-isolated and identified as *F. moniliforme* var. *subglutinans*.

The fungus is a parasite of *Epipyrops* in its pupal stage only. It is not able to parasitise the larva. In nature also only pupæ have been found attacked by the fungus.

SUMMARY

1. A species of *Fusarium* was found parasitising pupæ of *Epipyrops* which in its larval stage is a parasite on *Pyrilla*, a pest of sugarcane.
2. A remarkable variability between the isolates of the fungus was noticed. One set of isolates produced only microconidia in culture, while the rest of the cultures produced both micro- and macro-conidia. In the natural state both the micro- and macro-conidia were present.
3. The morphological features are given in detail.
4. The conidial character bring the culture producing only the microconidia nearest to *F. moniliforme* (Sheld.) var. *subglutinans* but blue sclerotia, however, are absent. But as this is stated to be a variable character in literature the fungus is regarded as *Fusarium moniliforme* var. *subglutinans*.

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