Indian J. mycol. Res., 3 (1 & 2), 24–28 (1957)

STRAINS OF *COLLETOTRICHUM FALCATUM* WENT IN WEST BENGAL

By S. B. CHATTOPADHYAY and ARATI SARKAR

State Agricultural Research Institute, Government of West Bengal

To study the possibility of existence of different strains of *Colletotrichum falcatum* in West Bengal, a large number of isolates were made. They were divided into six distinct morphological groups. Cultural studies on six different media did not show any variation in morphological and growth characters, except that two strains showed slightly lower rate of growth. Pathogenicity studies showed the existence of at least three distinct strains in respect of virulence.

Introduction

Colletotrichum falcatum Went (Perfect stage, *Glomerella tucumanensis* Arx and Muller), the causal organism of Red-rot disease of sugarcane has been found to be very variable in nature. Existence of strains of different morphological, cultural and pathogenic behaviour has been noted in nature by Abbott (1933) and Chona (1958).

In West Bengal, the Red-rot disease of sugarcane is fairly prevalent, and the disease has been observed to appear with virulence periodically. So, it has been considered necessary to study in detail the existence of strains of *C. falcatum* occurring in West Bengal.

Material and Methods

The fungus was isolated from a large number of infected sugarcane (stems and leaves) collected from time to time from different localities in West Bengal. Small bits of plant tissues taken from affected lesions were dipped in 0.1% Mercuric chloride solution for one minute, washed twice in sterilized distilled water, transferred to *potato-dextrose-agar* slants and incubated at 30°C. The cultures were purified by taking single conidial culture, and the stock cultures were maintained in *potato-dextrose agar* slants at 20°C.

Preliminary cultural study of all the different isolates of *C. falcatum* revealed the presence of *six* distinct morphological races or strains. These are termed here, for convenience, as A, B, C, D, E and F. Detailed cultural and pathological studies have been undertaken with these strains.

For pathological studies three varieties of sugarcane, *viz.*, Co.313, Co.419 and Co.453 were used. The inoculation experiments were conducted in the laboratory and in the field by adopting "plug" method. The surface of the cane was washed thoroughly with water and then sterilized with rectified spirit. Each cane was then bored in the middle of one internode by inserting a sterilized borer up to the middle and a plug of tissue was taken out. A bit of 10 to 15-days-old culture of *C. falcatum* was then inserted through the bore with a sterile scalpel, and the plug was replaced in position. The place of inoculation was then tied well with moist absorbent cotton. The linear spread of the lesion in each cane was measured by splitting it after 20 days of inoculation.

Cultural Study

For detailed cultural studies, the strains were grown on six different media, *viz.*, *potato-dextrose-agar*, *potato-sucrose-agar*, *oat-meal-agar*, *cane-leaf-decoction-agar* (Abbott, 1938), *cane-juice-agar* and *Czapek-dox-agar*. For this purpose, Petri dishes (10 cm. diameter), each containing 20 c.cm. of the medium, were inoculated at the centre with mycelial bits of 7-days-old culture from *potato-dextrose-agar* slants. The inoculated Petri dishes were then incubated at 30°–31°C. The diameter of each colony was measured along two directions at right angles to each other. The average growth in diameter was then noted in terms of millimeter. In each case, Petri dishes were used in triplicates and the average reading of the three was taken. Conidial measurements were taken from 15 to 20-days-old cultures. Both length and breadth of the conidia were first measured, but when it appeared that in the breadth there was no appreciable variation, only the length was measured. The average of 100 measurements was recorded in each case.

The distinguishing cultural characters of the *six* strains are given in Table 1.

Table 1. *Cultural characteristics of the strains of* C. falcatum *at 30°–31°C.*

Strains	Average length of conidia (μ)	Range of conidial length (μ)	Average rate of growth in diameter (cm.)						Cultural characters
			P.D.A.	P.S.A.	O.M.A.	C.L.A.	C.J.A.	C.D.A.	
A	21.8	15.2—26.6	71	74	75	75	78	70	Mat floccose, adpressed at places, ash-grey in colour. Conidial acervuli relatively few.
B	25.8	20.9—32.0	63	63	74	74	63	62	Mat thin and adpressed, light ashy white in colour. Conidia as in A.
C	25.3	20.9—34.2	75	73	75	75	73	73	Mat floccose, cream to ochre coloured. Acervuli with pinkish conidial mass in moderate frequency.
D	27.5	22.8—36.1	67	61	64	63	65	70	Mat floccose, ashy white in colour. Slimy masses of conidia in moderate frequency.
E	22.4	18.0—28.0	74	74	77	78	76	72	Mat dull white, translucent, sparse, cottony. Numerous conidia both in dark grey acervuli and in pinkish masses.
F	23.6	20.0—28.0	70	73	75	77	75	71	Puff-like fluffy mat, dull white in colour with pinkish tinge at places. Conidia mostly in pinkish masses appearing mainly at the centre of the Petri dish.

The strains grew equally well in all the media but variation was noted in the strains B and D, which showed slower rate of growth than the rest. Similar observations of almost equal rate of growth were reported by Abbott (1938), Ramkrishnan (1941), and Chona and Hingorani (1950). The range of spore length lies within the measurements described by Abbott (1938) as 16–48μ with an average of 25.1μ.

Pathogenicity Tests

Three varieties of cane, *viz.*, Co.313, Co.419 and Co.453 were selected. Cane cuttings of same size (30″ long) and age were taken. They were inoculated in the way described before. For each strain inoculations were performed on 10 cuttings of each variety. Inoculated canes of the same variety were then tied into a bundle and incubated in a moist chamber at 20°C. Separate chambers were used for the bundle of each variety. Cuttings used as control were kept in a separate chamber. They were also treated in the same way except that they were not inoculated with the fungus. After 20 days of incubation the canes were split lengthwise and the lesions were found to spread in all of them but the control remained sound and healthy. Linear spread of the lesions in the affected canes were measured. Re-isolations of all the strains from the respective cane-hosts also confirmed the pathogenicity. The results obtained aregiven in Table 2.

Table 2. *Data of virulence-tests with cut canes of Co.*313, *Co.*419 *and Co.*453 *varieties inoculated in the laboratory by isolates of six strains of* C. falcatum.

	Linear spread of lesions in cm. (average of 10 readings)		
Strains	Co.313	Co.419	Co.453
A	13.1	12.0	14.0
B	16.0	13.5	18.4
C	12.2	12.0	11.5
D	14.2	10.5	14.0
E	17.5	16.4	18.5
F	15.0	13.7	18.4

The same experiment was also conducted simultaneously in the field with standing canes of the same three varieties. Plants were inoculated at the age of 6 months. Controls were also maintained properly and 10 replications were set up for each isolate. Two months after inoculation the canes were split lengthwise to expose the lesions due to all the strains. In each case identity of the fungus was confirmed by re-isolation. The controls behaved as in the previous experiment. Linear spread of the lesion measured in terms of centimetre is given in Table 3.

Table 3. *Data of virulence-tests carried on standing canes of Co.*313, *Co.*419 *and Co.*453 *varieties by isolates of six strains of* C. falcatum.

Linear spread of the lesions in cm. (average of 10 readings)

Strains	Co.313	Co.419	Co.453
A	11.7	11.0	11.5
B	14.9	15.0	11.7
C	11.7	12.4	7.0
D	13.9	11.7	13.7
E	34.7	15.6	33.8
F	18.2	15.4	20.7

Data of these two experiments explain in themselves the pathogenic variation existing among these *six* strains of *C. falcatum*. The strains vary in pathogenicity from a low to a high degree. Taken as a whole, strain A may be regarded as moderately weak, and strain E as the most virulent. Strain F may also be distinguished as less virulent than strain E. The remaining three strains are intermediate in pathogenicity. Variation is also noticed among the different varieties of canes in their susceptibility.

Discussion

All the isolates studied in the present paper belong to the 'light race' of Abbott (1938) who first classified the flora of *C. falcatum* into two morphological groups, *viz.*, 'light race' with profusely sporulating light coloured loose mycelia, and 'dark race' with sparsely sporulating dark compact mycelia. Strains of the light race, in general, were reported to be more virulent than those of the dark race. Chona (1958) also presented similar reports while working with the isolates collected from eastern parts of Uttar Pradesh. No dark race has yet been obtained in the isolates collected in West Bengal, and therefore, comparative studies in regard to virulence of these two morphological groups have not been possible.

It thus appears that altogether *three* virulent strains of *Colletotrichum falcatum*, all belonging to 'light race', are now present in West Bengal.

Further collection of diseased samples and isolation of the Red-rot organism are still in progress, and fresh studies will again be conducted with the new lot of isolates to find out the appearance of any new virulent strain in West Bengal. Moreover, in consideration of the frequent outbreak of the disease in West Bengal, varietal susceptibility tests are also being conducted with a view to finding out resistant varieties of sugarcane suitable for growth in this State.

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(Received for publication 9 September 1958)