

VARIATION IN RED ROT OF SUGARCANE CAUSED BY *Colletotrichum falcatum* IN TAMIL NADU

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ABSTRACT

Different isolates of *Colletotrichum falcatum* Went causing redrot disease of sugarcane were collected from South Arcot Vallalar District of Tamilnadu and examined for the variability of the pathogen. Of the six isolates evaluated, isolate VI differed from other five, in virulence, causing morphological and cultural characteristics. It physiologically differed from other Nellikuppam and Pagandni (South Arcot Vallalar District) isolates.

KEY WORDS: *Colletotrichum falcatum*, Red rot, Sugarcane, Variability

Redrot disease caused by *Colletotrichum falcatum* Went. is an important disease of sugarcane and is responsible for considerable yield loss (Martin *et al.*, 1961). Once established in an area, it is difficult to eradicate this pathogen. Variability and evolution of new races of pathogen has been main cause of breakdown of several sugarcane cultivars/varieties called resistant at the time of release, (Kirtikar, 1970). However, the reoccurrence of the disease in various places of South Arcot Vallalar, Thanjavur and Trichy districts in varieties like COC 671, COC 85061, COC 86062, COC 90063, COC 91061 and COC 92061 indicates the potential out break of the disease.

Physiological races are normally identified by the type of infection, as in the case of rust pathogen, but it is not always possible to obtain a very clear cut difference based on prevalence or severity of disease in many pathogens. Several epiphytotics of redrot have also been attributed primarily to the appearance of new light type strains (Rafay, 1950). Since, change in behaviour of pathogen under natural conditions appears to be a continuous process, it was considered to examine the phenomenon of variability among isolates drawn from different places in South Arcot Vallalar District in Tamilnadu.

MATERIALS AND METHODS

Morphological studies

Six single spore isolates of *C.falcatum* were isolated from affected cane varieties viz., CO 853, COC 671, COC 8001, COC 62198, COC 85061

and COC 92061 drawn from rural area of South Arcot Vallalar District. Their morphological characters, such as size and shape of conidia and size and shape of conidiophore, presence of setae were recorded in seven day old fresh cultures maintained at $28^{\circ}\text{C} \pm 2^{\circ}\text{C}$.

Variability

For this study, the canes of resistant variety viz., C 88011, three moderately resistant varieties viz., BO 91, COSi 86071 and COC 90063 and are moderately susceptible variety viz., BO 99 and remaining two susceptible varieties viz., COC 671 and COC 85061 were planted in randomized block design with three replications, in a plot size of five rows of five m length and 0.8 m between rows at the Sugarcane Research Station, Cuddalore, during 1992-93. Thirty, two budded setts per row were used for planting. Normal agronomical practices were carried out.

Twenty canes of different varieties were inoculated at the age of 7 months. One ml of spore suspension of different isolates were introduced to the bore hole, plug was replaced and sealed with plastic clay (to avoid aerial contamination). Two months after inoculation, the cane stacks were split open longitudinally and graded as per the international scale of 0-9 (Bhat and Srinivasan, 1961). Average of the total score was taken for assessing the grade and classifying the varieties into different categories.

RESULTS AND DISCUSSION

Physiological and cultural variations may serve as an aid in differentiation of races.

Table 1. Size of conidia, conidiophore and acervulus of six isolates of *colletotrichum falcatum**

Isolate	Conidial		Conidiophore		Acervulus		Setae number per Acervulus	Setae length (μ)
	Length (μ)	Width (μ)	Length (μ)	Width (μ)	Length (μ)	x Width (μ)		
Isolate I	32.63	6.69	47-65 (56)	8.65	72-83 (78.0)	x 45-62 (53.5)	3 - 6 (4.5)	94-134 (114)
Isolate II	30.79	7.22	34-68 (51)	9.00	71-83 (39.0)	x 42-58 (50.0)	4 - 7 (5.5)	98-156 (127)
Isolate III	30.62	7.44	48-72 (60)	9.00	72-85 (78.5)	x 48-93 (70.5)	5 - 8 (6.5)	86-168 (127)
Isolate IV	33.61	7.32	49-79 (64)	9.00	76-98 (87.0)	x 40-82 (61.0)	5 - 7 (6.0)	72-162 (117)
Isolate V	36.05	8.15	52-84 (63)	9.00	81-102 (91.5)	x 52-91 (71.5)	5 - 9 (7.0)	95-180 (137.5)
Isolate VI	37.65	8.46	56-92 (74)	9.25	92-118 (105.0)	x 54-98 (76.0)	6 - 12 (9.0)	101-192 (146.5)
Mean	33.55	7.55	61.50	8.98	86.17	63.75	6.42	128.17
CD	1.056	0.3923	5.21	0.46	4.06	6.80	2.58	16.77

* Mean of 20 microscopic fields

Variations in the conidial measurements like length and breadth between the isolates have been reported by several workers. In the present study also conidial length among the isolates varied from 30.62 μ to 37.65 μ and width from 6.69 μ to 8.46 μ . The size of conidia is bigger in the isolate VI than the other isolates. The structure is identical among the six isolates. There was no difference in the presence of oil globules in conidia of all the different isolates (Table 1). The measurement of conidiophores revealed that the maximum length of conidiophore (56- 92 μ) was observed in the isolate VI followed by the isolate V (52- 84 μ). The length

of the conidiophore was minimum in the isolate II (34-68 μ) followed by the isolate I (47-65 μ). The maximum width of conidiophore was recorded in the isolate VI (9.25 μ) followed by 9.00 μ in the isolate II to V and the minimum width of conidiophore was noticed in the isolate I (8.65 μ). The length of acervulus was maximum in the isolate IV. Number, length and breadth of setae of the isolate VI were markedly differed from the other isolates. In Czapek's Dox broth medium the isolate VI grew faster than the other isolates. Sporulation in this isolate continues for 8 months. In other isolates it terminates into 6 months (Table 2).

Table 2. Growth of six isolates of *Colletotrichum falcatum*

Days after inoculation	Mean radial growth in mm						Mean
	Isolate I	Isolate II	Isolate III	Isolate IV	Isolate V	Isolate VI	
1	2	3	3	4	5	5	3.67
2	4	5	6	9	12	14	8.33
3	6	8	8	15	26	28	15.17
4	10	13	14	18	36	37	21.33
5	16	18	19	23	45	46	27.83
6	24	35	26	35	66	69	42.50
7	38	39	41	45	77	81	53.50
8	53	56	57	63	85	85	66.50
9	69	71	77	74	85	85	76.83
10	85	85	85	85	85	85	85.00
Mean	30.7	33.3	33.6	37.1	52.2	53.5	
		SE	CD (P=0.05)				
Treatment		0.35	0.99				
Isolate		0.27	0.76				
Isolate Treatment		0.86	2.40				

Table 3. Reaction of different varieties to six isolates of *Colletotrichum falcatum* by plug method

Variety	Reaction in mean grades						Mean
	Isolate I	Isolate II	Isolate III	Isolate IV	Isolate V	Isolate VI	
BO 91	1.4 (R)	2.9 (MR)	2.0 (R)	3.4 (MR)	3.6 (MR)	4.0 (MR)	2.88
BO 99	1.6 (R)	4.4 (MS)	3.8 (MR)	5.2 (MS)	5.8 (MS)	6.4 (S)	4.53
COC 671	2.4 (MR)	7.4 (S)	3.4 (MR)	7.6 (S)	7.8 (S)	9.0 (HS)	6.27
COC 85061	2.8 (MR)	7.2 (S)	4.8 (MS)	7.7 (S)	7.9 (S)	9.0 (HS)	6.57
COSi 86071	1.4 (R)	3.6 (MR)	3.2 (MR)	3.8 (MR)	3.9 (MR)	5.2 (MS)	3.52
C 88011	1.1 (R)	1.4 (R)	1.2 (R)	1.5 (R)	1.7 (R)	1.9 (R)	1.47
COC 90063	2.2 (MR)	3.8 (MR)	3.3 (MR)	5.1 (MS)	6.0 (MS)	6.8 (S)	4.53
Mean	1.82	4.39	3.10	4.90	5.24	6.04	

	SE	CD (P=0.05)
Variety	0.36	1.01
Isolate	0.28	0.78
Isolate x Treatment	1.04	2.92

Evaluation of sugarcane clones with different isolates and host combinations was studied earlier. Generally an isolate drawn from certain locality proved more virulent when tried in that varied area (Singh *et al.*, 1954). Here the isolate VI was found more virulent in all test varieties than other isolates, except in C 88011 which showed resistant reaction to all the isolates (Table 3). The varieties *viz.*, BO 99, COSi 86071 showing resistant reaction of 0-2 grade to the isolate I became moderately resistant (BO 91) susceptible (BO 99) and moderately susceptible (COSi 86071) to the isolate VI when inoculated by the plug method.

The popular varieties COC 671 and COC 90063 showed moderately resistant reaction to the isolates I and III while others were highly susceptible to the isolate VI. The popular wet land variety COSi 86071 which showed moderately resistant reaction to the isolates II and III, IV and V become moderately susceptible to the isolate VI. The only entry which showed resistant reaction to all the isolates was C 88011. Similarly, other varieties grouped under moderately resistant, moderately susceptible and susceptible reaction to the isolates IV and V became moderately

susceptible, susceptible and highly susceptible respectively to the isolate VI. The popular commercial varieties *viz.*, COC 671 and COC 85061 which grouped into moderately resistant to susceptible to the isolates I to IV become highly susceptible to the isolate VI.

It is concluded that at least 2 strains of *C. falcatum*, the difference in their virulence are present in nature in South Arcot Vallalar District in Tamilnadu.

REFERENCES

- BHAT, W.R. and SRINIVASAN, K. (1961). Cane varieties answer the disease problem in sugarcane. *Indian Sugar* 11: 639-643.
- KIRTIKAR. (1970). Deterioration of sugarcane varieties due to diseases. I Workshop on Sugarcane Research, IISR, Lucknow, 15 to 19th January.
- MARTIN, J.P., ABBOTT, E.V. and HUGHES, E.G. (1961). *Sugarcane Disease of the World*, Vol. I, Elsevier Pub. Co., Amsterdam, 542pp.
- RAFAY, S.A. (1950). Another strain of *Physalospora tucumanensis*. *Curr. Sci.*, 15: 385-386.
- SINGH, H., SINGH, S. and SINGH, N. (1954). Varietal reaction to red rot disease of sugarcane in Punjab. *Proc. 9th ISSCT.*, 9: 1071-1077.

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