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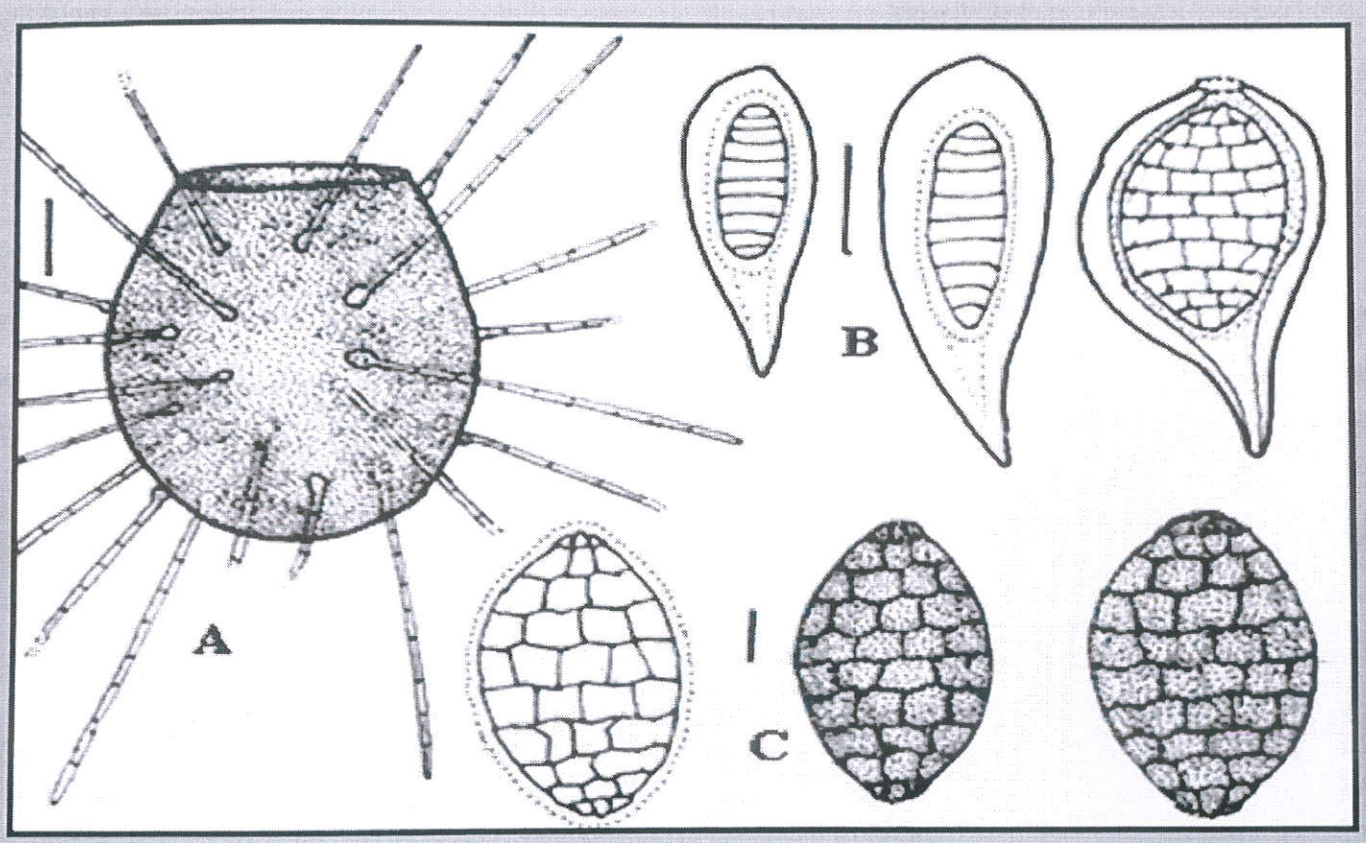

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MORPHOLOGICAL VARIABILITIES OF *COLLETOTRICHUM FALCATUM* ISOLATES

Archana R. Mukhedkar, S. P. Surve and U. N. Bhale*

Department of Botany, Shikshan Maharshi Dnyandeo Mohekar Mahavidyalaya Kalam Dist. Osmanabad 413507,Maharashtra, India
Department of Botany, Kohinoor Arts, Commerce and Science College Khultabad, District Aurangabad, 431101, Maharashtra, India
Research Laboratory, Department of Botany, Arts, Science and Commerce College, Naldurg, Tq. Tuljapur, Osmanabad 413602,Maharashtra, India

ABSTRACT

Thirty isolates of *Colletotrichum falcatum* responsible for red rot of sugarcane were isolated from seven sugarcane varieties from different localities during 2018-2019 and the resulting cultures were maintained on suitable media. Length of conidia ranged from 10 to 30 µm, while width from 4 to 12 µm. The conidia of all isolates were falcate shaped with hyaline colour at the base. On cultural media, growth of fungus was in the form of colony having 60-90 mm diameter. The colonies exhibited various colours *viz.*, greyish, greyish white, white orange and white brown. The margin of the colony was smooth and irregular. All isolates were with well sporulation. The isolates from different region of Maharashtra and Karnataka were, however, culturally and morphologically dissimilar with respect to their mycelial growth, conidial size as well as colour and texture of the colonies.

Key words: Red rot, *Colletotrichum falcatum*, *Saccharum officinarum*, cultivers

Introduction

Red rot of sugarcane is the most threatening disease, the symptom of which varies largely depending on susceptibility of sugarcane cultivar, pathogen virulence and environment. The pathogen shows great diversity in virulence, as numerous isolates occur in nature, which have been classified on the basis of differential host-pathogen interaction. The causal organism (*Colletotrichum falcatum*) for red rot has been included in the genus *Glomerella tucumanesis, the* perfect stage of which is known as *Physalospora tucumanensis.*

The genus *Colletotrichum* show wide variation in morphological characteristics (Prema et al., 2011).Viswanathan et al. (2003) also reported variations of mycelial growth, mycelial dry matter production, mycelial color, texture, topography, acervuli initiation, sporulation, spore germination, appresorium formation and shape of the appresorium in *C. falcatum*. Present investigations was undertaken to study the morphological and cultural variability among the isolates of *C. falcatum* causing red rot of sugarcane.

Material and Methods

Thirty red rot diseased samples were collected from different localities of Maharashtra and Karnataka states. Seven host (sugarcane) varieties e.g Co 7114, Co 8371, Co 86032, Co 8011, Co C671, Co 740, Co 8014 were included in this survey. The survey was conducted during 2018 - 2019.

Cane stalks of sugarcane varieties, exhibiting red rot symptoms, were collected and pure cultures of the pathogen were obtained for further cultural and morphological studies following Rangaswami (1958) and

Abbas et al. (2010) and sub-cultured as described by Goh (1999). Culture morphology viz. conidia, colony colour, substrate colour, margin of colony etc., were determined by growing the isolates on potato dextrose agar (PDA) medium (Zakaria and Bailey, 2000) Size, colour and shape of the conidia were observed microscopically and recorded. In order to study growth-rate of the pathogen the colony diameter was measured frequently.

Results and Discussion

Thirty isolates of *C. falcatum* were isolated (Table 1). The isolates exhibited variation with respect to colony, substrate colour, margin, colour, topography, colony diameter and sporulation with different colony colours viz., white, greyish white, whitish orange, light grey, black (Table 2).

The length of conidia ranged from 10 to 30 µm among the isolates studied. Highest length of conidia was observed in Cf7 isolate. Width of the conidia ranged from 4 to 12 µm. Highest width of conidia was observed in the cultivars Cf7 and Cf16. Conidia of all the isolates were falcate/sickle shaped with round apical end tapering towards the base (Table 3).

Morphological diversity among four isolates of *C. falcatum* has been reported earlier by Abbas et al., (2010). Malathi et al. (2011) also reported morphological variation among the isolates. The variety Co c671 showed more susceptibility, while variety Co 86249 was found to be resistant to all of the isolates.

Sutton (1992) reported that the conidial size of *C. falcatum* ranged between 15.5 and 26.5 µm, while the width from 4 to 5 µm. Kalaimani (1995) also reported variation in the length and width among six isolates of *C. falcatum*. Mishra and Behera (2009) revealed the *significant* variation in the size of the conidia of *C. falcatum*. Bharti et al. (2014) reported variability in radial growth and morphology of the pathogen.

Thus considerable variation was observed among the isolates of *C. falcatum. All isolates showed sporulation, indicating high virulence.*

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Table 1: Isolates *Colletotrichum falcatum* from different localaties.

S.N.	Isolates	Cultivar	Locality	District	State
1	Cf1	Co7114	Wai	Satara	Maharashtra
2	Cf2	Co8371	Baramati	Pune	Maharashtra
3	Cf3	Co86032	Aurangabad	Aurangabad	Maharashtra
4	Cf4	Co8011	Gangapur	Aurangabad	Maharashtra
5	Cf5	Co8011	Chirner	Raigad	Maharashtra
6	Cf6	Co 7114	Osmanabd	Osmanabad	Maharashtra
7	Cf7	Co 8371	Naldurg	Osmanabad	Maharashtra
8	Cf8	CoC671	Hinglajwadi	Osmanabad	Maharashtra
9	Cf9	Co 8371	Dhangarwadi	Osmanabad	Maharashtra
10	Cf10	CoC671	Dhangarwadi	Osmanabd	Maharashtra
11	Cf11	Co8011	Solapur	Solapur	Maharashtra
12	Cf12	Co86032	solapur	Solapur	Maharashtra
13	Cf13	Co8011	Madha	Solapur	Maharashtra
14	Cf14	Co740	Angar	Solpaur	Maharashtra
15	Cf15	Co86032	Barshi	Solapur	Maharashtra
16	Cf16	Co86032	Kalmb	Osmanabad	Maharashtra
17	Cf17	Co86032	Karanjkalla	Osmanabad	Maharashtra
18	Cf18	Co740	Shiradhun	Osmanabad	Maharashtra
19	Cf19	Co86032	Kumta	Latur	Maharashtra
20	Cf20	Co86032	Wadhwana	Latur	Maharashtra
21	Cf21	Co 7114	Yengunda	Gulbarga	Karnataka
22	Cf22	Co C671	Sangam	Bidar	Karnataka
23	Cf23	Co 7114	Bawalgao	Bidar	Karnataka
24	Cf24	Co740	Ekamba	Bidar	Karnataka
25	Cf25	Co 8014	Kamalnagar	Bidar	Karnataka
26	Cf26	Co 8371.	Dapka	Bidar	Karnataka
27	Cf27	Co86032	Bidar	Bidar	Karnataka
28	Cf28	Co 7114	Holsamudra	Bidar	Karnataka
29	Cf29	Co740	Kauta	Bidar	Karnataka
30	Cf30	Co86032	Bhalki	Bidar	Karnataka

Cf- *Colletotrichum falcatum*

Table 2: Morphological and Cultural characters of different isolates of *C. Falcatum.*

S.N.	Isolates	Colony Colour	Substrate colour	Margin	Topography	Colony Diameter(mm)	Sporulation
1	Cf1	white	light grey	irregular	raised fluffy growth	90.00	+++
2	Cf2	white orange	pinkish	irregular	raised fluffy growth	90.00	+++
3	Cf3	white brown	white	smooth	mycelium flat	90.00	+++
4	Cf4	white grey	light grey	irregular	raised fluffy	90.00	+++
5	Cf5	white	white	smooth	mycelium flat	85.50	++
6	Cf6	white pink	grey	smooth	mycelium flat	89.50	++
7	Cf7	whitish orange	orange	irregular	raised fluffy growth	90.00	+++
8	Cf8	white orange	light grey	irregular	mycelium flat	90.00	+++
9	Cf9	white orange	white velvety	irregular	mycelium flat	90.00	+++
10	Cf10	white	yellowish	irregular	mycelium flat	90.00	+++
11	Cf11	white	black	irregular	raised fluffy growth	90.00	+++
12	Cf12	white orange	light orange	irregular	mycelium flat	60.00	++
13	Cf13	white	white	irregular	mycelium flat	90.00	+++
14	Cf14	whitish pink	light grey	irregular	mycelium flat	90.00	+++
15	Cf15	white brown	black	irregular	mycelium flat	90.00	+++
16	Cf16	white brown	light grey	irregular	raised fluffy growth	90.00	+++
17	Cf17	grey	black	irregular	raised fluffy growth	90.00	+++
18	Cf18	white orange	pink	smooth	mycelium flat	81.06	++
19	Cf19	white	White brown	irregular	mycelium flat	74.00	++
20	Cf20	light grey	grey	irregular	raised fluffy growth	90.00	+++
21	Cf21	white orange	white	irregular	raised fluffy growth	90.00	+++
22	Cf22	white	grey	irregular	raised fluffy growth	70.00	++
23	Cf23	white orange	white	irregular	raised fluffy growth	90.00	+++
24	Cf24	light grey	grey	irregular	raised fluffy growth	90.00	+++
25	Cf25	white	white	irregular	raised fluffy growth	90.00	+++
26	Cf26	white orange	brown	irregular	raised fluffy growth	90.00	+++
27	Cf27	white	grey	irregular	raised fluffy growth	90.00	+++
28	Cf28	white orange	pink	smooth	mycelium flat	87.00	+++
29	Cf29	grey	black	irregular	raised fluffy growth	60.00	++
30	Cf30	bhalki	pink	irregular	raised fluffy growth	90.00	+++

Cf- *Colletotrichum falcatum*, + Poor sporulation: 1-10 spores / microscopic field (100X); ++ Medium sporulation: 11-50 spores/ microscopic field (100X), +++ Good sporulation: More than 100 spores/ microscopic field (100X).

Table 3: Conidial characters of C. Falcatum.

Sr no	Isolates	Conidial size	Conidial Colour	Conidial Shape
1	Cf1	10 x 5	Hyaline	Falcate
2	Cf2	13 x 6	Hyaline	Falcate
3	Cf3	10 x4	Hyaline	Falcate
4	Cf4	10 x 6	Hyaline	Falcate
5	Cf5	10 x 5	Hyaline	Falcate
6	Cf6	11 x 6	Hyaline	Falcate
7	Cf7	30 x12	Hyaline	Falcate
8	Cf8	11 x 6	Hyaline	Falcate
9	Cf9	10 x 5	Hyaline	Falcate
10	Cf10	12 x7	Hyaline	Falcate
11	Cf11	10 x 6	Hyaline	Falcate
12	Cf12	12 x 6	Hyaline	Falcate
13	Cf13	10 x 7	Hyaline	Falcate
14	Cf14	10 x 5	Hyaline	Falcate
15	Cf15	10 x 5	Hyaline	Falcate
16	Cf16	26 x 12	Hyaline	Falcate
17	Cf17	10x x 6	Hyaline	Falcate
18	Cf18	10 x 5	Hyaline	Falcate
19	Cf19	11 x 6	Hyaline	Falcate
20	Cf20	11 x 5	Hyaline	Falcate
21	Cf21	11 x 7	Hyaline	Falcate
22	Cf22	13 x6	Hyaline	Falcate
23	Cf23	10 x7	Hyaline	Falcate
24	Cf24	10 x 4	Hyaline	Falcate
25	Cf25	11 x 7	Hyaline	Falcate
26	Cf26	12 x 6	Hyaline	Falcate
27	Cf27	10 x 6	Hyaline	Falcate
28	Cf28	10 x 4	Hyaline	Falcate
29	Cf29	11 x 6	Hyaline	Falcate
30	Cf30	10 x 5	Hyaline	Falcate