Int.J.Curr.Microbiol.App.Sci (2019) Special Issue-9: 209-213

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-9 pp. 209-213**
Journal homepage: http://www.ijcmas.com

Original Research Article

Studies on Morphological Variability of *Exserohilum turcicum* (Pass.) Leonard and Suggs. Causing Turcicum Leaf Blight of Sorghum

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A B S T R A C T

Among the eight isolates (Et1-Et8) tested for morphological variability, Maximum size of conidia was observed in Et7, Et8 isolates and recorded 58.31µm × 11.10 µm followed by Et2 (49.98 µm ×16.66 µm) and Et5 (47.20 µm × 8.33 µm). Minimum size of conidia was observed in Et6 (33.32 µm × 16.66 µm) from Gabbur. Although some of the isolates produced length wise bigger conidia their width was very small. Conidia of maximum number of isolates were having the septa of 4-5 (Et1, Et3, Et4 and Et6) and 5-6 (Et2, Et5 and Et 6) with protruding hilum. It is interesting to note that the isolate Et8 from Raichur local had maximum of 4-7 septa.

Keywords

Morphological variability, Turcicum leaf blight, *Exerohilum turcicum*

Introduction

Sorghum (*Sorghum bicolor* Linn. Moench) ranks fifth and popularly known as Jowar, is the major cereal consumed in India a r wheat, rice, maize and pearl millet. The world production of grain sorghum is 70.83 million tons from 44.8 million ha area of land (Faostat, 2014). India is major producer of sorghum, ranks fifth after, wheat, rice, maize and pear millet cultivated in 6.16 million hectares in both *kharif* (2.26m.ha) and *rabi* (3.89m.ha) with an annual production of 5.44 million tons of grain with productivity of 8.44 kg per hectare (Indiastat, 2015).

In India the sorghum is cultivated in Maharashtra, Karnataka and Andhra Pradesh as rainfed crop to an extent of 85 per cent (4.93m.ha). In Karnataka sorghum production is about 1.32 million tons in an area of 1.04 million ha with the average productivity of 1180 kg per ha. The sorghum is the main food crop of Hyderabad-Karnataka region and occupies an area of 5.6 lakh hectares with production of 5.5 lakh tons and productivity of 1122kg per ha (Anon., 2014-15).

As the *rabi* sorghum produces the white pearly grains which is mainly used for food in India for the preparation of roti. It is also an important animal feed (swine, poultry and

cattle) used in countries like U.S., Mexico, South America and Australia. Sorghum, as a food, feed and bio fuel crop with excellent drought resistance compared to other cereals, is considered as a "failsafe crop" (Burke *et al*., 2010). Sorghum grain is a principal source of energy, protein, vitamins and minerals for the poor people living in the semi-arid tropics. It is nutritionally superior to rice because of its high mineral and fiber content. Starch (60-75%) is the main component of sorghum grain, followed by proteins (7-15%), non-starch polysaccharides (2-7%) and fat (1.5-6%).The average energetic value of whole sorghum grain flour is 356 kcal/100gm (Dicko *et al*., 2006). Sorghum is a good source of vitamins, notably the B vitamins (thiamin, riboflavin, pyridoxine and niacin) and the liposoluable vitamins A, D, E and K. Unique property of sorghum grain makes it well suited to prepare various food items such as porridge, unleavened bread, cookies, cakes, couscous and malted beverages, *etc*.

Even though the crop is robust and versatile, it has faced drawbacks in terms of yield and reduction in acreage due various diseases. The major diseases that affect sorghum include downy mildew, turcicum leaf blight, anthracnose and sorghum smuts (covered kernel smut, loose smut, long smut and head smuts). Turcicum leaf blight (TLB) is one of the most destructive foliar diseases of maize and sorghum. It can cause yield reduction more than 50 % in susceptible varieties and is favoured by mild temperatures and humid weather conditions with heavy dews (Bergquist, 1986). The disease occurs as long elliptic tan lesions that develop on lower leaves and progress upwards. Susceptibility to *Exserohilum turcicum* is reported to decrease with crop maturity (Frederiksen, 1980). Hence studies on morphological varability of the pathogen and host are important for documenting virulent isolate of the pathogen and resistant source.

Materials and Methods

To study morphological characteristics eight isolates (Et1-Et8) collected from different locations of Raichur, Kalaburagi and Vijayapura districts of North Karnataka were used for studying variability in morphological characteristics. The details of 8 isolates of E. turcicum used for the study are given in Table 1.

To carry out the study 20 ml of medium was poured in to the Petri plates for solidification. Five mm discs of different isolates of *E. turcicum* were placed at the centre of the each plate. These plates were incubated at 27 ± 2 ^{0} C for 10 days. Morphological character such as size of conidia and number of septa were recorded by mounting cultures of different isolates of *E. turcicum* grown on PDA media on glass slide and observing under compound microscope. Size of conidia was measured by using stage and ocular micrometer under compound microscope.

Results and Discussion

Morphological variability of *E. turcicum* isolates

All the eight isolates of *E. turcicum* were grown on PDA and after ten days of incubation the morphological characters were studied.

All most all the isolates showed variation in the morphological characters such as the size of conidia, and septations. The observations on morphological characters such as size of conidia and septations are presented in the Table 2.

Size of conidia

Observations on size of the conidia of *E. turcicum* isolates were taken at microscopic magnification of 10X.

Maximum size of conidia was observed in Et7, Et8 isolates and recorded 58.31µm × 11.10 µm followed by Et2 (49.98 µm ×16.66 µm) and Et5 (47.20 µm × 8.33 µm). Minimum size of conidia was observed in Et6 (33.32 µm × 16.66 µm) from Gabbur. Although some of the isolates produced length wise bigger conidia their width was very small. These results are in similar with findings of Harlapur *et al.*, (2007) who observed variation in morphological and cultural characters of 16 isolates of *E. turcicum.* He also studied colony character, colony diameter, mycelial dry weight, spore germination and sporulation. Similar variation in the isolates of the pathogen in different location by the Khedekar (2009) and Hulagappa (2012).

Number of septa

Conidia of maximum number of isolates were having the septa of 4-5 (Et1, Et3, Et4 and Et6) and 5-6 (Et2, Et5 and Et 6) with protruding hilum. It is interesting to note that the isolate Et8 from Raichur local had maximum of 4-7 septa. These results are in similar with findings of Harlapur *et al.*, (2007) who observed variation in morphological and cultural characters of 16 isolates of *E. turcicum.* He also studied colony character, colony diameter, mycelial dry weight, spore germination and sporulation. Similar variation in the isolates of the pathogen in different location by the Khedekar (2009) and Hulagappa (2012).

Variability among the isolates may be attributed to long term influence of weather conditions of particular location and ability of the pathogen to adopt to the varieties developed for a specific situation. Highly virulent isolates exhibited higher infection type on the host, whereas less virulent isolates were unable to produce more infection as compared to virulent isolates. Thus, it is a clear indication of the existence of different strains / virulence within *E. turcicum.*

Table.1 The details of 8 isolates of *E. turcicum* used for the study

Sl. No.	Place of collection	Designation of isolates
1	Hitinhalli	Et1
2	Jevoor	Et2
3	Malked	Et3
4	Sannur	Et4
5	Polkamdaddi	Et5
6	Gabbur	Et6
7	Chittapur	Et7
8	Raichur local	Et8

Table.2 Morphological variations in different isolates of *Exserohilum turcicum* on PDA

Sl. No	Location	Isolate No.	Colony character	No. of septa	Size of conidia µm (10X)	
					Length	Breadth
1.	Hitinhalli	Et1	Poor growth, blackish, slightly raised growth colony	4-5	41.65	13.88
2.	Jevoor	Et2	Moderate growth, whitish gray, slightly raised cottony growth colony	5-6	49.98	16.66
3.	Malked	Et3	Moderate growth, grayish black, slightly raised growth colony	4-5	44.42	8.33
4.	Sannur	Et4	Excellent growth, blackish, slightly raised growth colony	4-5	38.87	8.33
5.	Polkamdaddi	Et5	Moderate growth, grayish black, slightly raised cottony growth colony	5-6	47.20	8.33
6.	Gabbur	Et6	Excellent growth, grayish black, slightly raised growth colony	4-5	33.32	16.66
7.	Chittapur	Et7	Good growth, grayish, slightly raised cottony growth colony	5-6	58.31	11.00
8.	Raichur local	Et8	Good growth, grayish, slightly raised growth colony	4-7	58.31	11.00

* Mean of three replications

++++ - Excellent, > 20 conidia per microscopic field, +++ - Good, 15-20 conidia per microscopic field, Et - *Exserohilum turcicum* ++ - Fair, 10-15 conidia per microscopic field, + - Poor, < 10 conidia per microscopic field

In conclusions, maximum number of *E. turcicum* isolates was having the septa of 4-5 and 5-6 with protruding hilum. Interestingly an isolate Et8 from Raichur local having 4-7septa. Maximum size of conidia (58.31 µm × 11.00 µm) was recorded in Et7, Et8 of Chitaapur and Raichur local respectively followed by Et2 of Jevoor (49.98 µm ×16.66 µm).

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