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Morphological characterization of *Exserohilum turcicum* on different isolates causing turcicum leaf blight of maize in Manipur

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Abstract

Maize is an important cereal crop across India as well as in Manipur state. It has wider diversity of soil and climate. In India it contributes 30% of economy. Maize prone to many diseases among them Turcicum leaf blight which is caused by *Exserohilum turcicum* has importance because of losses caused by the disease. Seven isolates were collected from different districts of Manipur viz. Bishnupur, Churachandpur, Imphal East and Imphal West for characterization of morphological variations. Conidial shape of all isolates was elliptical and curved having fusiform tip. Septation of was ranging from 3-7 and average septation was recorded as 6.09. The maximum conidial length was 93.83µm, width was 15.73 µm for ET6 and minimum conidial length and width was 76.96 µm and 11.33 µm respectively for ET2. The average fresh weight and dry weight of mycelial mat was 3.67gm and 0.355mg. Maximum fresh weight and dry weight recorded as 4.55 gm and 0.422 mg for ET6 and minimum fresh weight and dry weight recorded as 3.21gm and 0.308mg for ET2. These studies may useful for further studies on *E. turcicum* for disease management of Turcicum leaf blight of maize.

Keywords: Morphological characterization of *Exserohilum turcicum*, maize

Introduction

Turcicum leaf blight is potentially an important foliar disease in the areas where temperatures drop at night while the humidity is high. The disease is known to affect maize from seedling stage till harvest. Loss in grain yield will be more if it occurs at flowering, silking and grain filling stages. Lesions produced on the leaves of susceptible plants are normally large (4 -20 cm long and 1-5 cm wide), elliptical in shape and greyish green to tan in colour, in conditions of high relative humidity, lesions may be covered with masses of dark conidia of the fungus. The conidia are olive grey and spindle shaped with 1-9 septations. These conidia spread through air and germinate on the plant surfaces and penetrate directly in to plant cells. Turcicum blight injures or kills the leaf tissues and thereby reduces the area of green chlorophyll which manufactures food for the plant. If considerable leaf area is killed, the vigour and yields are reduced. If much of the green area is killed, starch formation is restricted and the kernels become chaffy. The blighted leaves are not suitable for fodder because of the lowered nutrition value.

Initially the disease starts with small elliptical spots on the leaves, greyish green in colour and water soaked lesions. The spots turn greenish with age and get bigger in size, finally attaining a spindle shape. Individual spots are usually ¾ inch wide and 2 to 3 inch long. Spores of the fungus develop abundantly on both sides of the spot. Heavily infected field gives a scorched appearance (Chenulu and Hora, 1962) ^[1]. The disease is recognised by long elliptical grayish or tan lesions. When fully expanded, the spots may be 1½× 6 inches in size. These lesions appear first on the lower leaves and as the season progresses, the lesion number increases and all the leaves are covered. The plants look dead and grey. So in order to develop resistant cultivars in maize against TLB and for high yielding, it is needed to characterize *Exserohilum turcicum* which is causative agent of Turcicum leaf Blight of maize using cultural and morphological variations.

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Materials and Methods

Study area

The study was carried out in Imphal East, Imphal West, Bishnupur, Churachandpur districts of Manipur state of the north eastern India.

S. no	District	Location	Isolate Identified	Isolate Designation
1	Imphal East	Andro	<i>E. turcicum</i>	ET1
2	Imphal East	Andro	<i>E. turcicum</i>	ET2
3	Imphal west	Ireosamba	<i>E. turcicum</i>	ET3
4	Bishnupur	Bishnupur	<i>E. turcicum</i>	ET4
5	Bishnupur	Senapathi	<i>E. turcicum</i>	ET5
6	Churachandpur	Churachandpur	<i>E. turcicum</i>	ET6
7	Bishnupur	Loktak	<i>E. turcicum</i>	ET7

Sample collection and isolation of pathogen

Diseased maize leaves were obtained from different regions of Imphal East, Imphal West, Bishnupur and Churachandpur. The leaves were first washed by tap water then sterile distilled water followed by surface sterilisation in 5% sodium hypochlorite. For isolation of pathogen Julius *et al.*, (2017) [3] method is followed. The diseased portion of leaf along with healthy portion of leaf is cut in to 3-5 mm size bits, surface sterilisation was done with 5% sodium hypochlorite solution for one minute and followed by washed in sterile distilled water. These sterilized leaf bits were dipped in potato dextrose agar (PDA) aseptically and incubated for 12 days at 25 °C in the incubator.

Morphological characterization of the pathogen

Twelve days old cultures of all isolates of pathogen were prepared in to temporary slides in water mount by using cotton blue. By using ocular micrometer on pre calibrated compound microscope conidial length, width, and septation was measured.

Results and Discussion

Morphological characterisation

Twelve days old PDA cultures of seven isolates were subjected to analysis for morphological characterisation. Temporary slides were prepared in water mount using cotton blue. Different morphological characters like length width septation of coni $SEm \pm dia$ were observed on a precalibrated compound microscope on a ocular micrometer. The results were shown as conidia in all isolates were curved and elliptical in shape with fusiform tip. Septation:

Conidia maximum septa were observed were eight and minimum septa were three and average number of septa observed were 6.09.

Conidial length and width

The maximum conidial length and width observed was 93.83 μm and 15.73 μm for isolate ET6, minimum length observed was 76.96 μm for isolate ET1 and minimum width observed for the isolate ET1 i.e 11.33 μm . Maximum conidial size was observed was ET6 that is 1516.97 μm .

Fresh weight and dry weight

The average fresh weight and dry weight of the mycelium of seven isolates measured and among all isolates were observed as 3.67 gm and 0.355 mg respectively. The maximum fresh weight and dry weight was 4.55 gm and 0.422mg for isolate ET6 and minimum fresh and dry weight was 3.21 gm and 0.308mg for isolate ET2. Similar morphological characters were observed by Harlapur *et al.*, (2007) [2] who observed variation in various morphological characters like colony

characters, colony radial growth etc. on *E. turcicum*. These findings are also similar with works of Khedekar (2009) [4] and Rashmi (2015) [6] and Kuchanur *et al.*, (2019) [5].

Table 1: Showing morphological variations of *E. turcicum* spore (length, width, diameter, colour, shape of spore):

S. No	Isolate	Size of conidia (L×B in μm)	No. of septa	Colour of conidia
1	ET1	82.83333×12.16	3-5	Brownish
2	ET2	76.96667×11.33	3-6	Brownish
3	ET3	81.58333×12.83	3-7	Brownish
4	ET4	81.66667×11.5	2-5	Brownish
5	ET5	85.93333×13.83	3-8	Brownish
6	ET6	93.83333×16.16	2-7	Brownish
7	ET7	91.86667×15.26	3-6	Brownish

Table 2: Showing average length of the spore length of *E. turcicum*:

Isolate	R1	R2	R3	Total	Mean
ET1	81	83	84.5	248.5	82.83333
ET2	72.9	79.5	78.5	230.9	76.96667
ET3	81	82.5	81.25	244.75	81.58333
ET4	81	82.5	81.5	245	81.66667
ET5	86.4	85.2	86.2	257.8	85.93333
ET6	94.5	93.5	93.5	281.5	93.83333
ET7	91.8	92.1	91.7	275.6	91.86667
Total	588.6	598.3	597.15	1784.05	594.6833

$SEm \pm$	0.750784
CD1%	1.635959

Table 3: Showing *E. turcicum* spore width:

Isolate	R1	R2	R3	Total	Mean
ET1	11.5	11.25	11.25	34	11.33333
ET2	12.5	12	12	36.5	12.16667
ET3	13.5	12.5	12.5	38.5	12.83333
ET4	11.5	11.5	11.5	34.5	11.5
ET5	14.5	13.5	13.5	41.5	13.83333
ET6	16.2	16.1	16.2	48.5	16.16667
ET7	15.5	15.2	15.1	45.8	15.26667
Total	95.2	92.05	92.05	279.3	93.1

$SEm \pm$	0.279029
CD at 1%	0.608004

Table 4: Showing fresh weight of *E. turcicum* on potato dextrose broth culture:

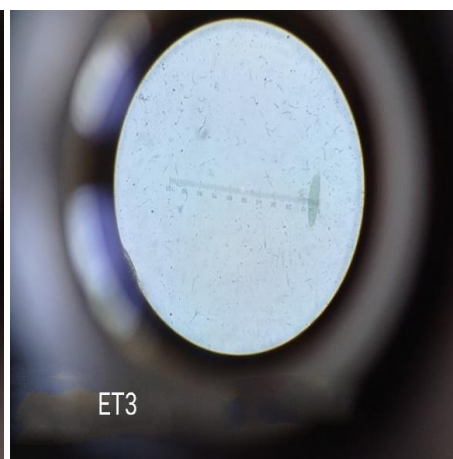
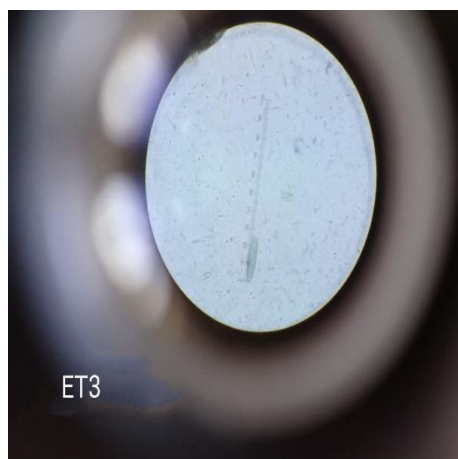
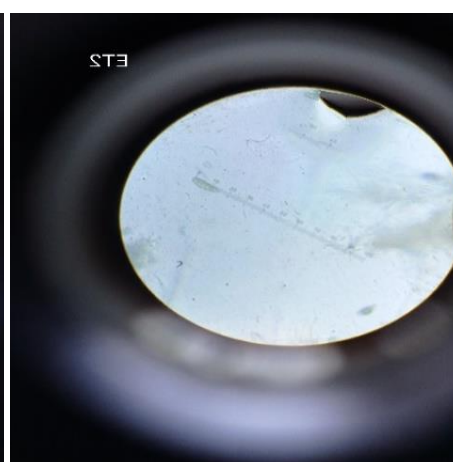
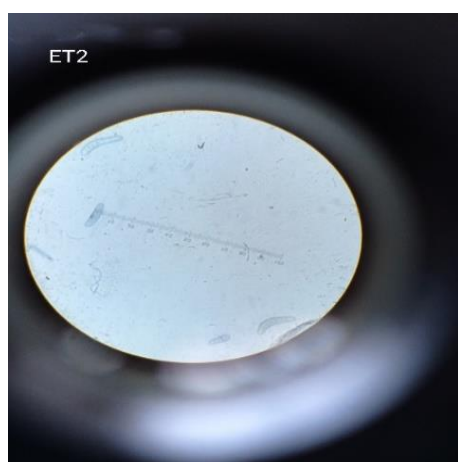
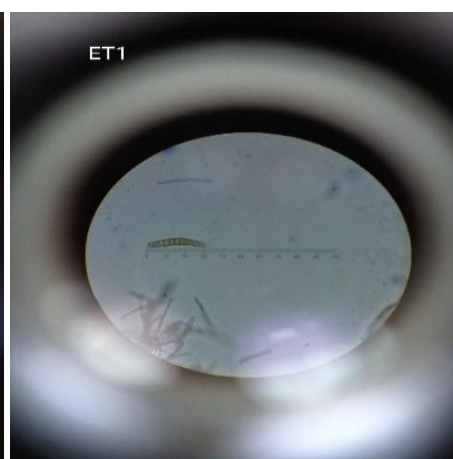
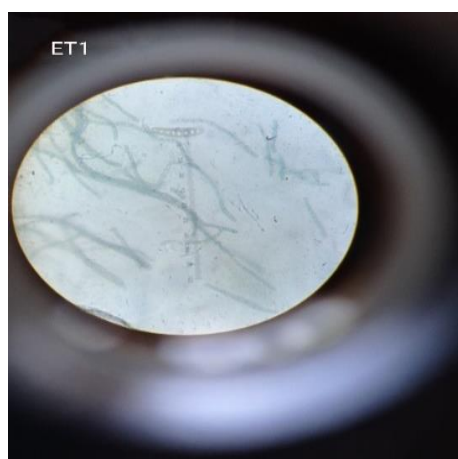
Isolate	R1	R2	R3	Total
ET1	3.36	3.34	3.32	10.02
ET2	3.18	3.21	3.25	9.64
ET3	3.51	3.42	3.56	10.49
ET4	3.99	3.96	3.95	11.9
ET5	3.28	3.21	3.19	9.68
ET6	4.78	4.68	4.51	13.97
ET7	3.98	3.91	3.78	11.67
Total	26.08	25.73	25.56	77.37

SEm±	0.060369
CD at 1%	0.131545

Table 5: Showing dry weight of *E. turcicum* on potato dextrose broth culture:

Isolate	R1	R2	R3	Total
ET1	0.326	0.321	0.319	0.966
ET2	0.302	0.321	0.302	0.925
ET3	0.312	0.317	0.321	0.95
ET4	0.376	0.366	0.356	1.098
ET5	0.329	0.366	0.356	1.051
ET6	0.428	0.421	0.419	1.268
ET7	0.391	0.396	0.39	1.177
Total	2.464	2.508	2.463	7.435

SEm±	0.007884
CD at 1%	0.017179



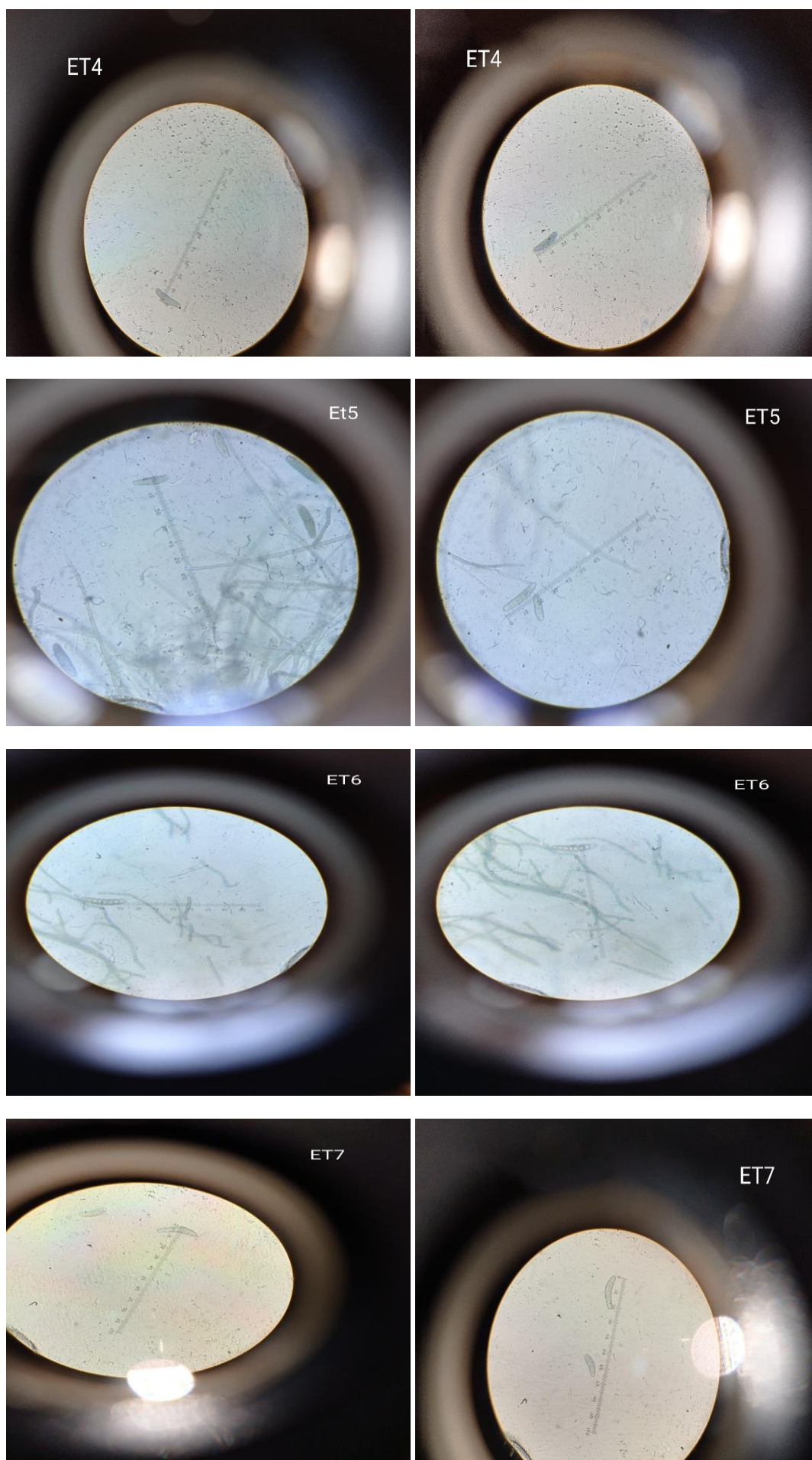


Plate 1: Showing Length Width Septation Isolates ET1, ET2, ET3, ET4, ET5, ET6, ET7 Respectively of *E. turcicum* conidiospore

Conclusion

It was concluded that maximum conidial length and width observed was 93.83 µm and 15.73 µm for isolate ET6 and maximum sporulation was observed in isolates ET6 then after ET4 which attributes virulence factor (Harlapur *et al.* 2007 and Rashmi 2015) ^[2, 6].

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