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STUDIES ON THREE ISOLATES OF HELMINTHOSPORIUM ROSTRATUM DRECHSLER FROM SORGHUM IN INDIA.1"2

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INTRODUCTION

Sorghum is an important cereal both for

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staple food and fodder in many rural areas of India. A new leaf spot disease of the crop caused by H. rostratum was reported during 1964 (Mahendra Pal and Suryanaryana) from India, but no detailed investigation of the pathogen was carried out. During the course of survey the authors observed the disease from three distant localities viz., Shamshabad (ISV 53) and Amberpeth (ISV71) in Hyderabad and Chianki (Bihar) (ISV 62). To study the range of variability within the isolates and find out whether there is any physiologic specialization within the pathogen,

comparative studies were made.

MATERIALS AND METHODS

Collections were made from the localities mentioned above in para 1. The pathogen was isolated from the leaves of sorghum (putting them under moist chamber aseptically for four days) by single sporing directly from the slides with the help of sterilized needles on PDA slants aseptically. Slides were prepared and the spore measurements were done under microscope. For testing the viability of spores in culture the inoculated slants were left at room temperature and the spore germination observed at monthly intervals.

For studying the effect of temperatures, petriplates containing 20ml. of sterilized potato-dextrose agar were inoculated with 2mm. discs of 7-10 day old cultures grown on PDA and kept at different temperatures ranging from 20-40°C. Colony growth was measured at 24 hour intervals upto 144 hours.

The isolates were also grown in 100ml. flasks for pH studies. 25ml. of sterilized Richard's medium (pot. nitrate 10.0g., pot. dihydrogen phosphate 5.0g., magnesium sulphate 2.5g., sucrose 50g., ferric chloride 0.02g., and distilled water 1000ml.) was added into flask after adjusting to different pH and incubated after autoclaving and inoculation at 31+1°C for different periods viz., 8 days and 15 days after which the mycelial mat was taken out, dried and weighed on Whatman's filter paper no. 42. The filter paper with mycelial mats were taken out, dried at 80°C and weighed at 24 hours intervals till constant weight was obtained.

Munsell color standards were used for recording the color of the mycelium and the culture filtrates.

Pathogenicity tests were carried out by

spraying a spore-cum-mycelial suspension from 7-10 days old culture of the fungus on seedlings and incubating them in humid chambers for 48 hours. Seedlings were raised in 10 cm. pots under usual method fo cultivation for 15 to 21 days before spraying the fungal suspensions.

Observations were recorded after 15 days and the disease rated on 0-10 basis considering all types of spots (Fig. 1).



Fig. 1. Showing various types of spots on *sorghum* vulgare leaf from Amberpath.

RESULTS

Morphology.—The spore measurements of the three isolates have been presented in table 1.

From the above table it is concluded that Chianki (Bihar) isolate ISV 62 has the longest conidia, followed by ISV 71 Amberpeth and ISV 53 Shamshabad (Hyderabad) isolate. Statistical analysis of the length of conidia showed that the isolates are significantly different from each other.

Viability.—The percentage of viability of spores of the three isolates grown on PDA slants and stored at room temperatures

was recorded at monthly intervals.

TABLE I

SPORE SIZE AND SEPTATION OF THREE ISOLATES OF HELMINTHOSPORIUM ROSTRATUM

Isolates	*Spores in µ		Septation	
Isolutes	Length	Breadth		
ISV 53	41.04-73.44	15.12-21.6	5-8	
	(55.34)	(17.99)	(6.06)	
ISV 62	50.00-153.00	11.00-22.0	0 5-11	
	(92.30)	(16.68)	(8.40)	
ISV 71	46.00-102.00	12.00-18.0	0 3-9	
	(66.72)	(15.92)	(6.66)	
*Range and average of 100 spores;				
C.D. at $5\% = 5.71$; Barring at 5%				
=ISV	V 62 ISV 7	1 ISV 53		
92.30	66.72	55.34		

months in culture media when their percentages were of germination 1%, 2.75% and 5.33% respectively. The germination capacity fell rapidly after 4-5 months of keeping.

Temperature requirements.—The growth of the three isolates at different temperatures was studied on PDA. The temperature range was kept from 20° to 40°C.

From the results it was concluded that the isolates ISV 53 (Shamshabad) Hyderabad, ISV 62 (Chianki) Bihar and ISV 71 (Amberpeth) Hyderabad grew at temperature range of 20-40°C, but the growth rate at 40°C was very poor. The optimum temperature for the growth of isolates, ISV 53 and ISV 71 was 30°C and that of ISV 62 was 32° C.

pH requirements.—The dry mycelial

TABLE II

EFFECT OF DIFFERENT PH ON THE COLORATION OF THE CULTURE FILTRATES OF THE THREE ISOLATES OF HELMINTHOSPORIUM ROSTRATUM

Initial pH after autoclaving	*Color designation of culture filtrates after 15 days			
	ISV 53	ISV 62	ISV 71	
3.90	Moderate orange yellow 10 YR 8/10 weaker	Colorless	Pale orange yellow	
5.20	Brilliant greenish yellow 7.5 Y 9/8 weaker	Colorless	7.5 YR 9/4 Moderate orange	
6.10	Brilliant greenish yellow 7.5 Y 9/8	Colorless	yellow 7.5 YR 8/8. Brilliant yellow 2.5 Y	
6.80	Colorless	Brilliant greenish yellow 7.5 Y 7/8	9/9. Pale orange yellow	
7.80	Colorless	Colorless	7.5 YR 9/4.	
8.70	Colorless	Colorless	Light orange 5YR 8/7 Moderate orange	
9.80	Moderate orange yellow 10 YR 8/10	Brilliant greenish yellow 7.5 Y 9/8 weaker	yellow 7.5 YR 8/8 Pale orange yellow 7.5 YR 9/4 Stronger.	

•Average of three replications.

The results indicated that the spores of isolate ISV 53 could survive for 10 months, ISV 62 for 12 months and ISV 71 for 8

weight of the three isolates, viz., ISV 53, ISV 62 and ISV 71 was determined at different pH varying between 3.90-9.80 after autoclaving.

From the results it was observed that all the isolates could grow in a wide range of pH i.e. 3.90-9.80 but the optimum pH for growth differed with different isolates. respectively.

Pigmentations.—The three isolates were grown at different pH and the color of the culture filtrates was noted after 15 days to see if there were any differences between the

TABLE III

VARIETAL	REACTION OF	SORGHUM	VULGARE T	O THREE	ISOLATES	OF
HELMINTHOSPORIUM ROSTRATUM						

Varieties	Sources	*Severity in nos. and reaction of varietes			
		Shamshabad ISV 53	Chianki ISV 62	Amberpeth ISV 71	
G-1	Cotton Specia- list, Guntur.	7.88 VS	1.43 MR	2.37 MR	
G-2	,,	4.02 MS	1.37 MR	2.47 MR	
G-3	,,	4.47 MS	4.17 MS	5.70 S	
G-4	,,	5.47 S	4.10 MS	2.50 MR	
N-1	"	2.43 MR	1.39 MR	5.23 S	
N-2	"	4.63 MS	2.62 MR	6.93 S	
N-3	**	4.50 MS	3.62 MS	8.72 VS	
N-4	,,	3.10 MS	1.65 MR	7.94 VS	
N-5	"	5.02 S	4.22 MS	6.15 S	
N-6	,,	5.23 S	2.16 MR	5.28 S	
N-7	"	3.15 MS	3.24 MS	8.52 VS	
N-8	••	3.17 MS	2.24 MR	2.75 MR	
N-9	,,	2.03 MR	0.33 R	3.39 MS	
N-10	,,	2.04 MR	1.13 MR	5.00 MS	
N-11	,,	1.14 MR	3.73 MS	3.74 MS	
N-12	,,	5.14 S	4.22 MS	3.24 MS	
Local Mahewa	Mahewa village U.P.	3.23 MS	4.17 MS	9.50 VS	

*Average of three replications.

Isolates mean 3.96 2.49 5.41 Immune -0(1)Resistant -0-1 (R) Mildly resistant 1.01-3 (MR) Mildly suseptible 3.01-5(MS) Suseptible 5.01-7(S) Very suseptible 7.01-10 (VS) C.D. at 5%=0.31 (var.), 0.14 (Isolate) and 0.55 (var isolate) Barring at 5% for isolate ISV 71 ISV 53 **ISV 62** 2.49 5.41 3.96

The isolate ISV 53 grew best at the pH range 6.10-7.80, ISV 62 at 6.80-7.20 and ISV 71 at 6.10-8.20 and maximum yield was 390mg., 553.20 mg., and 433.33 mg.

isolates. The data are presented in table II.

The culture filtrate of isolate ISV 53 gave brilliant greenish yellow 7.5 y 9/8

after autoclaving.

From the results it was observed that all the isolates could grow in a wide range of pH i.e. 3.90-9.80 but the optimum pH for growth differed with different isolates. respectively.

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N-8	.,	3.17 MS	2.24 MR	2.75 MR	
N-9	,,	2.03 MR	0.33 R	3.39 MS	
N-10		2.04 MR	1.13 MR	5.00 MS	
N-11		1.14 MR	3.73 MS	3.74 MS	
N-12	**	5.14 S	4.22 MS	3.24 MS	
Local Mahewa	Mahewa village U.P.	3.23 MS	4.17 MS	9.50 VS	

*Average of three replications. 3.96 5.41 Isolates mean 2.49 Immune -0(1)Resistant -0-1 (R) Mildly resistant 1.01-3 (MR) Mildly suseptible 3.01-5(MS) Suseptible 5.01-7(S) Very suseptible 7.01-10 (VS) C.D. at 5%=0.31 (var.), 0.14 (Isolate) and 0.55 (var isolate) Barring at 5% for isolate ISV 71 ISV 53 **ISV 62** 3.96 2.49 5.41

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color with the maximum mycelial weight (390.0mg.,) isolate ISV 62 produced brilliant greenish yellow color 7.5Y 7/8 with the maximum mycelial weight 553.20 mg. and isolate ISV 71 showed brilliant yellow hue 2.5Y 9/9 with the maximum mycelial weight 433.33mg., on the 15th day of its growth. Thus it is observed that in pigmentation and mycelial weights also there are differences in isolates.

Pathogenicity.—To find out whether there were differences in pathogenicity, seedlings three weeks old of 17 varieties of Sorghum vulgare Pers. commonly grown in southern India were inoculated separately with spore cum mycelial suspension of each isolate, during Sept.-October, 1968, incubated in moist chamber for 48 hours and placed in wire house in open.

Observations were taken after fifteen days of incubation. The data are presented in table III.

From the table III it is concluded that all the varieties were susceptible except G-2, N-1, N-8, N-9, N-10 and N-11 which were less susceptible. There were thus differences in susceptibility. Data on varietal reaction was subjected to statistical analysis and it was observed that the differences between the isolates were highly significant.

In host range studies also, the isolate from Bihar (ISV-62) could infect the maize seedlings whereas the isolate from Hyderabad could not produce any symptoms on maize.

SUMMARY AND DISCUSSION

Helminthosporium rostratum.—isolated from sorghum from three different locations showed differences, the Bihar isolate ISV 62 was distinctly different from the Hyderabad isolate in spore characters. The former was longer (average 92.30μ) having rostrate distal end with golden yellow coloration. The later two isolates ISV 53 (55.34u average) and ISV 71(66.72u average were shorter in size without rostrate ends and were elliptical in shape with brown to fuliginous coloration. The statistical analysis of the three isolates showed that the differences between the isolates were quite significant. Bhowmick (1966) studied the three isolates of maize and also found that the isolates differed significantly.

In viability tests, the spores differed in their ability to survive. The Bihar isolate survived in PDA slants when kept at room temperatures for about a year whereas the isolates from Shamshabad and Amerpeth both from Hyderabad upto ten months and eight months respectively.

In temperature and pH studies, both the isolates from Hyderabad showed no differences whereas Bihar isolate had different temperature and pH requirement. The two isolates from Hyderabad gave optimal radial growth at 30°C, whereas the Bihar isolate (ISV 62) at 32°C.

Again both the isolates from Hyderabad (viz., ISV 53 and ISV 71) yielded optimal mycelial weight at initial pH 6.10, though the final pH for both the isolates were 7.60 and 8.20 respectively. On the other hand the Bihar isolate gave optimal mycelial weight at pH 6.80 - 7.20. Pigmentation of the cultural filtrates also differed in isolates at different pH. At the optimal growth point the isolate ISV 53 gave brilliant greenish yellow 7.5Y 9/8 color, ISV 62 brilliant greenish yellow 7.5Y 7/8 and ISV 71, brilliant yellow 2.5Y 9/9 after 120 hours. The Bihar isolate (ISV 62) remained colorless in strictly acidic sides, whereas the Hyderabad isolates (ISV 53 and ISV 71) were colored.

Further, the Bihar isolate could infect the maize seedlings whereas the Hyderabad isolates did not. Considering the varietal reaction results of sorghum against the three isolates, the differences between the isolates were quite significant. Bhowmick (1966) working with 3 isolates from Maize, I from (sorghum), 3 from Sudan grass and three from Johnson grass found that the plants developed leaf lesions regardless of isolates used on Ganga-1 maize seedlings.

The Bihar isolate is thus similar to the sorghum isolate of Bhowmick (1966) but the rest two isolates from Hyderabad are different. Apparently three physiologic forms seem to be present on this host in nature.

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ECOLOGY OF JALORE DISTRICT IN WESTERN RAJASTHAN¹

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ABSTRACT

Ecology of Jalore district in western Rajasthan has been described. Environmental factors like the climate, soils and biotic features have been given. The vegetation has been mainly classified into spinous formations, edaphic formations and psammophytic scrub formations. These formations have been sub-classified as Desert thorn forest on low and medium altitudes (hills and sand dunes), mixed xeromorphic thorn forests on the plains, riverain thorn forest on riverbeds, halophytic scrub on shallow, saline depressions, psammophytic scrub formations on medium and low sand dunes and hummocks.

INTRODUCTION

Vegetation and plant communities can give us a correct picture of the ecological conditions since vegetation is a combination of various plant communities of different aspects and composition, each being the result of combined effect of all environmental factors and closely connected with the particular ecological conditions of the station in which they grow. The vegetation survey, as well as the study on the spot of the relative ecological conditions is a part of the integrated survey of natural resources in western Rajasthan on block level (Anonymous 1965, 1966, 1967), which

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