Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.5285

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **6 (2):** 1158-1162 (2018)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Reaction of Pearl Millet Genotypes against Downy Mildew Disease

Rajni Singh Sasode[1*], Pramod Kumar Fatehpuria[2], A. Patidar[3] and R. K. Pandya[4]

[1,2,3,4]Department of Plant Pathology, RVSKVV, Gwalior (M.P.) 474002

*Corresponding Author E-mail: rnikumujjain@gmail.com

Received: 23.07.2017 | Revised: 18.08.2017 | Accepted: 27.08.2017

ABSTRACT

Pearl millet (Pennisetum glaucum (L.) R.Br.) Popularly known as bajra is a major warm-season cereal, largely grown under rainfed conditions in India. Downy mildew incited by Sclerospora graminicola (Sacc.) Schroet is the most widespread and destructive disease of pearl millet in India. Out of 100 pearl millet lines, 35 remained free from downy mildew at 60 days after sowing, while 96.87 per cent disease incidence was recorded in 7042S. All the tested lines were significantly superior over ''7042S''. More than 10 per cent downy mildew was recorded in four lines viz., ICMB 92777, BRBL 4, JMSB 20143, 7042R at 60 days after sowing.

Key words: *Pearl millet, Sclerospora graminicola, Downy mildew, Screening*

INTRODUCTION

Pearl millet (*Pennisetum glaucum*) is a staple cereal grown on about 29 million ha in the arid- and semi-arid tropical regions of Africa, Asia and Latin America with India having the largest area of 9.3 million ha (http:// www.icrisat.org/PearlMillet/PearlMillet.htm).

In India, pearl millet is cultivated over an area of 79.52 lakh ha with the production of 87.96 lakh tones and the productivity is 1106 kg/ha. It occupies 1.87 lakh ha with an annual production 3.05 million tonns and productivity of 1698 kg/ha. Rajasthan ranks first with an area of 3.98 mha and annual production 38.7 million tons[1]. The important Pearl millet growing states of the country are Rajasthan, Gujarat, Maharashtra, Punjab, Uttar Pradesh, Tamil Nadu, Karnataka and Madhya Pradesh.

Pearl millet is attacked by many diseases however; economically important diseases include downy mildew, blast, rust, ergot and smut. Amongst various diseases affecting Pearl millet crop, Downy mildew [*Sclerospora graminicola*, (Sacc).Schroet] is a highly destructive and widespread disease in most pearl millet growing areas of Asia and Africa. Downy mildew of pearl millet was first reported by Butler in India and described it the disease of ill-drained lands where it developed into epidemics of severity[3]. The first symptoms of the disease was noticed in two weeks old seedling as chlorotic strips on the upper surface of the leaves which progresses from based to top, some produces malformed earhead (green ear). Structural variations has been observed in green ears.

Cite this article: Sasode, R.S., Fatehpuria, P.K., Patidar, A. and Pandya, R.K., Reaction of Pearl Millet Genotypes against Downy Mildew Disease, *Int. J. Pure App. Biosci.* **6(2):** 1158-1162 (2018). doi: http://dx.doi.org/10.18782/2320-7051.5285

In 1971, the disease appeared in an epidemic form in the Indian sub-continent resulting in the withdrawal of the most popular hybrid HB 3 which had contributed to a record harvest of 8 million tones. In 1970-71[2]. Subsequent to this epidemic, grain yield losses continued to occur quite frequently due to downy mildew epidemics in India[7]. Williams *et al.*[9] developed improved field screening technique for downy mildew resistance in pearl millet which is followed all over the world. Singh *et al.*[6] have registered five germplasm with stable resistance to downy mildew in crop science society of America. In the present study and attempt was made to screen 100 selected high yielding pearl millet genotype against downy mildew as per the procedure suggested by William *et al.*[9] and Singh and Gopinath[8] evaluation of genotype was done at 30 days at dough stage at sick plot.

MATERIAL AND METHODS

The present studies are conducted at Research Farm, College of Agriculture, Gwalior during *kharif* season of 2016. Gwalior is situated in Northern part of Madhya Pradesh at an elevation of 211.52 meters from mean sea level and lies between latitude and longitude 26º14' North and 78º15' East, respectively. A large quantity of infected leaves, malformed shoots and proliferated ears from downy mildew infected local susceptible and 7042 S pearl millet plants were collected at the time of harvest of previous crop and were sun dried. These were then chopped into small bits and were grind in the mixer to make it in the powder. Thereafter the powder was stored in the air tight container. Before the onset of first shower the powder was examined microscopically to make sure that it contained oospores. In general it was found that minimum 7-15 oospores were seen in the microscopic field under low power. After this inoculum (powdered debris containing oospores) was uniformly spread over experimental field at the time of field preparation. Downy mildew susceptible cultivar "local susceptible" was used as infector rows (Inoculum donor) with a view to develop maximum disease pressure. These rows were planted three weeks earlier than the test rows. The infector rows were sown at every ninth row throughout the entire length of the experimental field. The field was also surrounded by the infector rows. The test material of the respective trial was sown about three weeks after the sowing of infector rows. The indicator rows (local susceptible and 7042 S) were also planted along with the test rows to assess the level of disease pressure. 100 pearl millet lines will be screened against downy mildew in the downy mildew sick plots. In the RBD design the experiment is replicated twice with row length 4 meter, Fertilizer: N:P: K:: 80:40:20 and Spacing 50x10cm. The observations on total number of plants and plant affected by downy mildew were recorded at 30 days and 60 days (dough stage) after sowing.

RESULTS AND DISCUSSION

In the present study following symptoms of downy mildew were recorded on the downy mildew susceptible pearl millet hybrids and varieties planted in the downy mildew sick experimental field. A total of 100 pearl millet lines were evaluated in downy mildew sick field under infector rows systems to identify the downy mildew resistance lines. The downy mildew cultivars "7042S'' and local susceptible were also planted in between the test lines to measure the progress of downy mildew. It is obvious from the data presented in table 1, that out of 100 entries, 35 lines viz.,863B-P2, BKN-33, IARIB3, TNCR 22, BRBL-1, ICMB 02111, ICMB 07111, ICMB 09333, ICMR06444, J-2576, J-2563, ICMB93333, ICPHR-3, DMBRL-2, DMBRL-3, DMBRL-4, ICHPH-1, IABG-12-4, 700651, IP18292, H77/833-2-202, AIMP92901-P8, BKN-42, RVS-155-122, TNCR 17, TNCR 18, TNCR 23, DHLB 14 B, ICHPH-4, ICHPB-1, ICHPB-2, ICHPB-3, J-2576, J-2563, ICMB93333 remained free from downy mildew at 60 days after sowing, while 96.87 percent disease incidence was recorded in 7042S at 60 days after sowing, respectively. All the tested lines

were significantly superior over ‘‘7042S’’ and except four lines ICMB 92777, BRBL 4, JMSB 20143,7042R. More than 10 percent downy mildew was recorded in four lines *viz.* ,ICMB 92777(11.11),BRBL 4 (15.38), JMSB 20143 (11.11), 7042R(58.06) at 60 days after sowing, the other lines except 61 free lines showed less than 10% downy mildew. Under *Sclerospora graminicola* sick field condition, the disease show severe symptoms on highly susceptible cultivars (7042S), in that most of the infected plants were dried and died prematurely. Latake *et. al.*[4] evaluated ninety-three pearl millet genotypes grown in Dhule, Maharashtra, for resistance to downy mildew. Among the 25 genotypes form Dhule, 17 genotypes were highly resistant, whereas 6 were resistant to downy mildew. Among the 68 genotypes from Jodhpur, Rajasthan, 14 genotypes were highly resistant and 24 were resistant to the disease. Singh[6] and Wilson *et al.*[10] also evaluated several germplasm and reported a great degree of variation among the genotypes in respect of downy mildew incidence. While 7042 S (check) showed highest per cent downy mildew incidence at 60 days after sowing, respectively. Sharma[5] evaluated forty promising hybrids and varieties against downy mildew and reported that five entries *viz.*, PAC 931, 7688, Anmol, JBV 3 and Hybrid bajra AG Sun B-38 were completely free from downy mildew at 30 days after sowing, out of these five two entries viz., PAC 931 and JBV-3 were also free at 65 days after sowing, eighteen entries showed <5% downy mildew incidence while six entries showed >10% downy mildew incidence at 65 days after sowing. Present finding is also supported by Sharma[5] who reported < 5% downy mildew in Pusa 23, RHB 121, Raj 171 and ICTP 8203. Out of 100 pearl millet genotypes, 35 remained free from downy mildew while 96.87% downy mildew incidence was recorded in susceptible check “7042 S”. Most of the tested promising hybrids and varieties were free from downy mildew.

Table 1: Reaction of pearl millet material against downy mildew

S.No	Entry	DM incidence (%) at dough stage	S.No	Entry	DM incidence (%) at dough stage
1	P7-4	8.43 (16.85)	8	JMSB 20143	11.11 (19.46)
2	852 B	6.25 (14.42)	9	JMSB 20111	4.16 (11.68)
3	7042 R	58.06 (49.50)	10	BKN-109-149	2.77 (9.46)
4	ICMR01007	5.88 (13.94)	11	BKN 158	3.63 (10.94)
5	HHB-67-Improved	4.25 (11.83)	12	BKN-197- 216	2.70 (9.46)
6	HHB-67-Original	3.37 (10.47)	13	ICMB 09333	0.00 (0.0)
7	843-22B	0.86 (1.62)	14	ICMB 02111	0.00 (0.0)
15	AIMP92901-P3	4.00 (11.54)	40	BRBL-1	0.00 (0.0)
16	W-504-1-1	70.0 (56.79)	41	BKN-79	1.35 (6.55)
17	BKN-40	5.12 (13.05)	42	BKN-186-195	1.53 (7.04)
18	IARI B2	0.99 (1.72)	43	700651	0.00 (0.0)
19	IARI R1	9.09 (17.46)	44	IP18292	0.00 (0.0)
20	IARI H1	3.77 (11.09)	45	H77/833-2-202	0.00 (0.0)
21	TNCR 13	1.78 (7.49)	46	AIMP92901-P8	0.00 (0.0)
22	PIB 110	1.28 (6.29)	47	BKN-42	0.00 (0.0)
23	DHLB 8B	5.08 (12.92)	48	RVS-155-122	0.00 (0.0)
24	DHLBI 1074	2.24 (8.53)	49	TNCR 17	0.00 (0.0)
25	DHLBI 1013	2.47 (8.91)	50	TNCR 18	0.00 (0.0)
26	ICHPR 2	4.54 (12.25)	51	TNCR 23	0.00 (0.0)
27	J-2578	7.40 (15.79)	52	DHLB 14 B	0.00 (0.0)
28	J-2572	7.24 (15.56)	53	DHLBI 1035	0.00 (0.0)
29	JMSA 20141	2.06 (8.13)	54	R2-16453	0.00 (0.0)
30	P310-17	2.00 (8.13)	55	R3-15056	0.00 (0.0)
31	IP 18293	2.00 (8.13)	56	DMRBL-1	2.89 (9.63)
32	843 B	2.63 (9.28)	57	DMBRL-2	0.00 (0.0)
33	863B-P2	0.00 (0.0)	58	DMBRL-3	0.00 (0.0)
34	BKN-32	5.55 (13.56)	59	DMBRL-4	0.00 (0.0)

35	BKN-33	0.00 (0.0)	60	ICHPH-1	0.00 (0.0)
36	BKN-73	1.69 (7.27)	61	ICHPH-2	2.94 (9.81)
37	IARI B1	1.02 (5.74)	62	ICHPH-3	0.92 (1.72)
38	IARIB3	0.00 (0.0)	63	ICHPH-4	0.00 (0.0)
39	RVBP 1501	2.27 (8.53)	64	ICHPB-1	0.00 (0.0)
65	TNCR 22	0.00 (0.0)	83	ICHPB-2	0.00 (0.0)
66	PIB 213	2.38 (8.72)	84	ICHPB-3	0.00 (0.0)
67	PIB 956	2.17 (8.33)	85	ICPHR-1	6.66 (14.89)
68	DHLB 16B	1.42 (6.8)	86	ICPHR-3	0.00 (0.0)
69	DHLBI 967	1.09 (5.74)	87	ICPHR-4	3.22 (10.31)
70	R1-16455	1.07 (5.74)	88	J-2576	0.00 (0.0)
71	R4-15058	1.14 (6.02)	89	J-2563	0.00 (0.0)
72	R5-15060	1.85 (7.71)	90	ICMB93333	0.00 (0.0)
73	IP 11036	4.91 (12.79)	91	ICMB01333	1.42 (6.8)
74	ICMR06222	4.87 (12.66)	92	ICMB02444	1.33 (6.55)
75	IP 15256	5.66 (13.69)	93	ICMR06444	0.00 (0.0)
76	ICMB 97222- P1	4.34 (11.97)	94	ICMR 11003	1.35 (6.55)
77	ICMB 92777	11.11 (19.46)	95	ICMB 07111	0.00 (0.0)
78	IP 7846	5.55 (13.56)	96	IABG-12-3	1.75 (7.49)
79	BRBL 3	12.5 (20.70)	97	IABG-12-4	0.00 (0.0)
80	BRBL 2	6.66 (14.89)	98	IABG-12-5	4.25 (11.83)
81	BRBL 4	15.38 (23.03)	99	IABG-12-11	2.15 (8.33)
82	IP 21187	1.88 (7.71)	100	IABG-12-12	1.33 (6.55)
		7042S (Susceptible check)		96.87	
	Sem±	0.684			
	CD at 5 %	1.922			

Data are the mean of two replications.
Figures in parentheses are angular transformed values on which the statistical analysis is based.

Acknowledgement

The authors express thanks to Head, Department of Plant Pathology, College of Agriculture, RVSKVV, Gwalior (M. P.) for providing all the facilities to conduct work.

REFERENCES

1. Anonymous, All India Coordinated Pearl Millet Improvement Project. www.aicpmip.res.in. (2014).

2. Anonymous, All India Coordinated Pearl Millets Improvement Project Progress report. ICAR, Pune, Maharashtra, India (1972).
3. Butler, E.J., Some diseases of cereals caused by *Sclerospora graminicola*. *Mem. Agric. Indian Bot. Ser.,* **2:** 1-24 (1907).
4. Latake, S.B., Bhosale, D.M. and Chirame, B.B., Screening of pearl millet genotypes for their resistance to downy mildew. *J. Maharashtra Agric. Univ.,* **33(2):** 273-274 (2008).
5. Sharma, R., Studies on downy mildew of pearl millet with special reference to its management through eco-friendly approaches. M.Sc. (Ag) Thesis, JNKVV, Jabalpur (M.P.) (2005).
6. Singh, S.D., Source of resistance to downy mildew and rust in pearl millet. *Pl. Dis.*, **74:** 871-874 (1990).
7. Singh, S.D. and Singh, G., Resistance to downy mildew in pearl millet hybrid NHB-3. *Indian Phytopath.,* **40:** 178-180 (1987).
8. Singh, S.D. and Gopinath, R. A., Seedling inoculation technique for detection downy mildew resistance in pearl millet. *Plant Disease.,* **69:** 582-584 (1975).
9. William, R.J., Singh, S.D. and Pawar, M.N., An improved field screening technique for downy mildew resistance in pearl millet. *Pl. Dis*., **65:** 239-241 (1981).
10. Wilson, J.P., Sanogo, M.D., Nutsugah, S.K., Angarawai, I., Fofana, A., Traore, H., Ahmadou, I. and Muuka, F.P., Evaluation of pearl millet for yield and downy mildew resistance across seven countries in sub-Saharan Africa. *African J. Agric. Res.*, **3**(**5**)**:** 371-378 (2008).