

Influence of Seed Dressing on Pearl Millet Downy Mildew

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ABSTRACT

Downy mildew (*Sclerospora graminicola*) was observed as most destructive biotic constraint in disease susceptible pearl millet cultivars. The pearl millet seed dressing with Apron @ 6 g/kg seed significantly reduced the incidence of downy mildew in moderately susceptible hybrids. It also increased the grain and fodder yield but this increase was not significant.

Key words: Apron, Downy Mildew, Pearl Millet.

INTRODUCTION

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is one of the assured *Kharif* crop domesticated in the annual rainfall of 150 mm to 1000 mm in India. 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 1106 kg/ha¹. It is being grown in Madhya Pradesh as sole crop for grain and fodder purposes. It occupies 1.87 lakh ha. With an annual production 3.01 million tones and productivity of 1698 kg/ha¹. It has variety of uses for the consumption of human being such as chapatti, breads, snacks, cakes, beverages and pre digested weaning food besides poultry feed and fodder for cattle. Several diseases of pearl millet caused by fungi, bacteria, virus and nematodes have been reported by different workers, out of them downy mildew incited by *Sclerospora graminicola* (Sacc.) Schroet is the most wide

spread and destructive disease of pearl millet in India. The downy mildew pathogen was first reported on pearl millet in India in 1907³. 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 1970-71². Subsequent to this epidemic, grain yield losses continued to occur quite frequently due to downy mildew epidemics in India (Singh *et al.*, 1987). The pathogen exists between susceptible crops as oospores in plant debris in the soil and on the seed. The oospores are the source of primary inoculum. Whether or not the pathogen survives as mycelium in seed and is transmitted by seed is in controversy⁶. Plants become systemically infected where environmental conditions are favorable for the disease.

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Sporangia are produced in large numbers in the "downy mildew" growth of the pathogen on leaves growing from systemically infected plants. Secondary spread is achieved quickly through sporangia which give rise to zoospores. In later stages, systemically infected plants show various degrees of malformation normally called 'green ear'. Abundant oospores are formed in infected leaf tissues and inflorescences. The pathogen is monogenic and soil borne hence, the identification of downy mildew resistant line and their utilization in resistance breeding programme to evolve the resistant material with good agronomic traits is most effective way for the management of the disease. Apart from this use of botanicals, bio-agents, and other non chemical management approaches may also serve as an alternate line for the eco friendly management of the disease under field condition. In the light of above a fact following studies is proposed.

$$\text{Downy mildew incidence (\%)} = \frac{\text{Downy mildew infected plants}}{\text{Total number of plants}} \times 100$$

Treatments

Chitosan @ 2.5 g/kg seed

Bacillus pumilus (INR-7) @ 8 g/kg seed

Bacillus pumilus (INR-7) 8 g/kg seed +
Chitosan @ 2.5 g/kg

Pseudomonas fluorsescens@ 8 g/kg seed.

Apron (6 g/kg)

Control (Untreated)

Chitosan is a linear polysaccharide composed of randomly distributed B (1-4) linked D-glucosamine R, N-acetyl-D-glucosamine.

RESULT AND DISCUSSION

The data reveals that at 20 days after sowing, the pearl millet seedling with Apron absolutely checked the downy mildew and it was significantly superior over control in which 0.84% downy mildew incidence was recorded. The bio-agent "*Bacillus pumilus*" seed

MATERIAL AND METHODS

Field trials were conducted in infected sites during the *kharif* season of 2015- at Research Farm, College of Agriculture, Gwalior with moderately resistant pearl millet hybrid "B 2301" by using two bio-agents (*Bacillus pumilus* and *Pseudomonas fluorescens*) a natural product "Chitosan" and recommended fungicides "Apron 35 SD". The data on disease incidence was recorded at 10 days interval starting from 20 days after sowing till 90 days after sowing and the data are summarized in table 1 and depicted in fig 2. The total number of plants were recorded at the time of thinning i.e. fifteen days after sowing, while the number of downy mildew infected plants were recorded at 30 and 60 days after sowing then the Downy mildew incidence per cent was calculated with the help of following formula.

treatment was also significantly superior over control where as chitosan and seed dressing of *P. fluorescens* where statistically at par with control. At 30, 40, 50, 60, 70, 80, 90 days after sowing, the downy mildew incidence in Apron treatment was 0.65, 1.30, 1.70, 2.49, 3.52, 6.10, 7.68 percent respectively which in control it was 3.82, 5.01, 5.59, 6.59, 9.86, 16.41, 20.59 percent respectively. *Bacillus pumilus* seed dressing alone and in combination with chitosan also significantly checked the incidence of downy mildew. Seed dressing with *P. fluorescens* also reduced the incidence of downy mildew but in most of the observations it was at par with control. Chitosan was not found effective. The Apron seed dressing also gave maximum grain (2345 kg/ha.) and fodder yield (9148 kg/ha.) but the overall effect of the treatment on grain and

fodder yield was found non significant, Raj *et al.*¹⁰, Pandya *et al.*^{7,8}. At 30, 40, 50, 60, 70, 80, 90 days after sowing, the downy mildew incidence in Apron treatment was 0.65, 1.30, 1.70, 2.49, 3.52, 6.10, 7.68 percent respectively while in control it was 3.82, 5.01, 5.59, 6.59, 9.86, 16.41, 20.59 percent respectively. *Bacillus pumilus* seed dressing alone and in combination with chitosan also significantly checked the incidence of downy mildew. Seed dressing with *P. fluorescens* also reduced the incidence of downy mildew but in most of the observation it was at par with control. Chitosan was not found effective. The present finding is supported by Sharathchandra *et al.*¹² who used a commercially developed aqueous Chitosan formulation Elexa in different concentrations viz., 1:5, 1:10, 1:15, 1:19 and 1:25 as seed soaking treatment to pearl millet for 3, 6 and 9 h duration for its

effect on downy mildew and reported that Elexa is a good downy mildew disease management commercial formulation. Patidar⁹ reported significant control of pearl millet downy mildew by seed dressing with *Bacillus pumilus* in combination with Apron (3 g/kg seeds), and Apron seed dressing alone (6 g/kg seeds). The full dose of Apron alone was more effective than its half dose in combination with *Bacillus pumilus* at tillering stage of the crop, but at dough stage the combined treatments was more effective than the Apron alone in respect of disease and yield both. Pearl millet seed dressing with Apron 35 SD @ 6 g/kg seed, *Bacillus pumilus* (INR 7) and chitosan significantly checked the incidence of downy mildew at 30 and 60 days after sowing¹¹ similar finding is found by Mani and Hepziba⁴, Manjunatha *et al.*⁵.

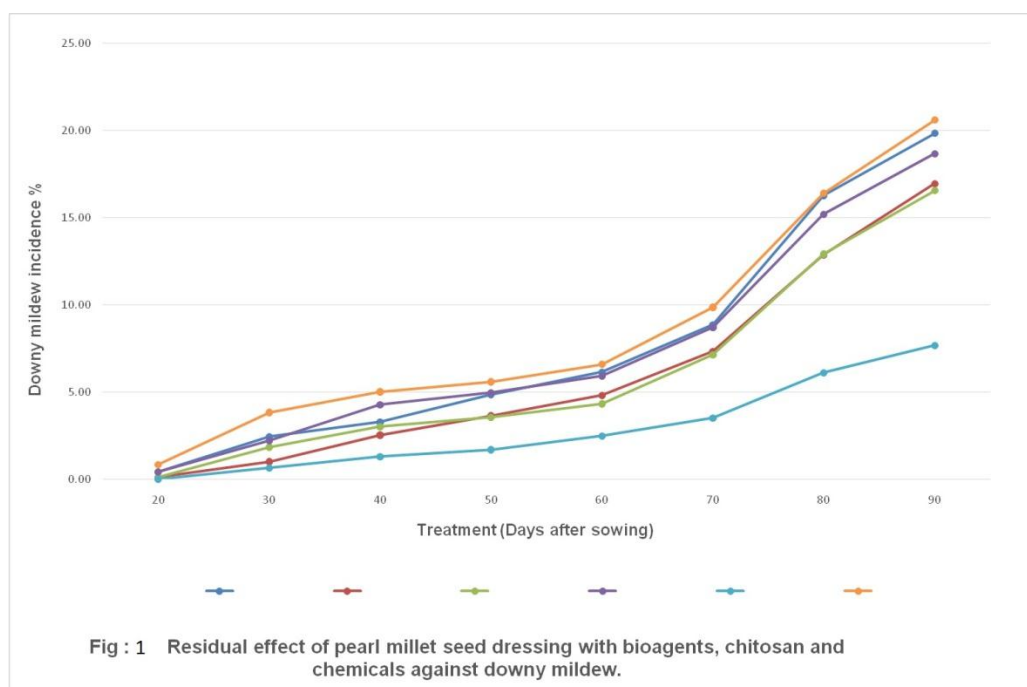


Table 1: Influence of pearl millet seed dressing with bio-agents, chitosen and recommended chemical against progressive development of downy mildew

Treatments	Downy mildew incidence %									Yield kg/ha.	
	at 20 DAS	at 30 DAS	at 40 DAS	at 50 DAS	at 60 DAS	at 70 DAS	at 80 DAS	at 90 DAS	Grain	Fodder	
T1 - Chitosan	0.44	2.45	3.30	4.87	6.15	8.86	16.27	19.83	2071	8553	
T2 - <i>Bacillus pumilus</i> (INR 7)	0.12	1.01	2.53	3.65	4.80	7.33	12.87	16.95	2196	8793	
T3 - <i>Bacillus pumilus</i> (INR 7)+ Chitosan	0.12	1.85	3.01	3.55	4.33	7.14	12.90	16.54	2241	8938	
T4 - <i>Pseudomonas fluorescens</i> (pf 1)	0.42	2.21	4.27	4.96	5.92	8.70	15.19	18.66	2185	8563	
T5 - Apron 35 SD (6 g/kg)	0.00	0.65	1.30	1.70	2.49	3.52	6.10	7.68	2345	9148	
T6 - Untreated control	0.84	3.82	5.01	5.59	6.59	9.86	16.41	20.59	2091	7930	
SE(m) ±	0.166	0.451	0.445	0.435	0.601	0.526	0.751	0.878	113.05	337.61	
SE(d) ±	0.235	0.637	0.629	0.616	0.851	0.744	1.063	1.242	159.88	477.46	
CD at 5%	0.502	1.358	1.341	1.312	1.813	1.586	2.264	2.646	340.70	NS	

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