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Current status of stripe disease of barley caused (*Dreshlera graminia*) in Rajasthan and its management

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Abstract
Barley (*Hordeum vulgare* L.) is an ancient cereal grain used as feed for animals, malt for industrial uses and for human food. Barley is subject to various fungal, bacterial, viral and noninfectious diseases. Among the diseases of barley, the stripe disease caused by *Drechslera graminea* is most destructive seed borne disease. The present investigation was carried out for knowing the severity of the disease in major barley growing areas of Rajasthan during Rabi 2016-17 and 2017-18. The maximum disease incidence (36.28 and 38.07 per cent) was observed in Jaipur and lowest (9.25 and 7.77 per cent) in Bharatpur district in both years. The conidia produce on infected leaves spread through wind and cause inflorescences infection of healthy barley plants. The contaminated seeds in inflorescences are responsible for disease development in next generation. Therefore, seed treatment + foliar spray was applied for avoid the infection of *Drechslera graminea*. The seed treatment with carboxin + thiram (vitavax power) 1 gm/kg in combination with foliar spray of tebuconazole 0.1% and propiconazole 0.1% found best for stripe disease management while only seed treatment showed at par result with both treatments during both years.

Keywords: *Hordeum vulgare* L., *Drechslera graminea*, Survey, Seed treatment + Foliar spray, Seed borne

Introduction
Barley (*Hordeum vulgare* L.) is Rabi crop and considered fourth largest cereal crop in the world with a share of 7% of the global cereal production (Pal *et al.*, 2012) [7] and total production in 2015-16 season was 147.7 million tons (USDA FAS, PSD Online). In India, barley is cultivated on about 6.7 lakh ha area with the production of barley is 1.75 million tons in 2016-2017 (www.agricoop.gov.in). In Rajasthan, it covers 2.8 lakh ha area with the production of 9.0 lakh tons in 2016-17 (www.agriculture.rajasthhan.gov.in). Barley grain and straw is used as animal fodder and grain used as malt and human food. Several diseases such as rust, loose smut, covered smut, bacterial stripe and stripe disease are effect the production of barley every year. The stripe disease of barley caused by *Drechslera graminea* is a major disease causing losses as high as 70 to 72% under epiphytotic conditions (Yaduman *et al.* 2013) [9]. Mathur and Bhatnagar (1991) [6] reported up to 31.9 per cent loss occurred due to barley stripe. The disease is seed borne in nature and pathogen mycelium present on hull or pericarp of seed. The symptom of the disease appears on newly developed leaves. A white or yellow stripe on the leaf sheath is initial symptoms which gradually extends to the full length of leaf and become necrotic and in later stage the pathogen infect inflorescence. The infected ear head appear small and grains in infected ear show significant decrease in the seed viability. In recent years, the incidence of stripe disease is gradually increasing in all major growing areas of Rajasthan. Therefore, comprehensive survey was carried out to know the disease incidence in all major growing of barley and formulated best management strategy (seed treatment + foliar spray) through fungicides.

Material and methods
To appraise the area of stripe disease severity, the intensive roving survey was conducted in last week of February to first week of March during *Rabi* 2016-17 and 2017-18 in major barley growing districts (Jhunjhunu, Jaipur, Sikar, Dausa, Tonk and Bhartpur) of Rajasthan. In each district, three teshil were selected and in each teshil randomlly three villages and in each

Village three fields were selected for determining per cent disease incidence (PDI). Incidence (PDI) was calculated by using the formula given by Mathur and Bhatnagar (1991) [6].

$$PDI\ (\%) = \frac{\text{Total number of diseased plants}}{\text{Total number of plants observed}} \times 100$$

The field trials for management were conducted in Research farm of Rajasthan Agricultural Research Institute, Durgapura, Jaipur during *rabi* 2016-2017 and 2017-2018. The experiment was carried out in (3 x 2 m) = 6.0 m^2 size plots having three replications in a randomized block design. Cultivar RD-2035 was used and seeds were inoculated then treated with fungicides. Seeds were surface sterilized with sodium hypochlorite and washed meticulously and drenched in water overnight for easy penetration of pathogen. After overnight shocking seed were inoculated by plunging in active mycelial suspension of the pathogen (isolate Dg-03) and Soil inoculation was done by adding 1 gm mass inoculums in 10 gm soil and applied in furrow after thoroughly mixing, at the time of sowing to get maximum disease incidence. The Observations were recorded at maturity and PDI was calculated by following formula.

$$PDI\ (\%) = \frac{\text{Total number of diseased plants}}{\text{Total number of plants observed}} \times 100$$

The benefit: cost ratio (B: C ratio) was calculated by using existing prices of inputs and outputs on the basis of minimum support price (MSP).

$$\text{Benefit: cost ration} = \frac{\textit{Gross returns}\ (₹ ha^{-1})}{\textit{Cost of cultivation}\ (₹ ha^{-1})}$$

List of fungicides for seed treatment + foliar spray

Fungicides and biocontrol	Concentrations
***(Carboxin + thiram) seed treatment (used as standard check)	0.2%
***(Carboxin + thiram) seed treatment + tebuconazole foliar spray	0.1%* + 0.1%**
***(Carboxin + thiram) + propiconazole foliar spray	0.1%* + 0.1%**
***(Carboxin + thiram) + bavistin foliar spray	0.1%* + 0.1%**
***(Carboxin + thiram) + mancozeb foliar spray	0.1%* + 0.1%**

*Seed treatment, **Foliar spray, *** (Carboxin + Thiram = Vivavax Power)

Result and discussion

The comprehensive survey was carried out to know the distribution and importance of a particular pathogen from area to area during *Rabi* 2016-17 and 2017-18 and the mean average of disease incidence of both growing season was revealed that the highest disease incidence (36.28 % and 38.07 %) was recorded in Jaipur followed by Tonk district (26.65 % and 32.99 %) and lowest incidence (9.25 % and 7.77%) noticed in Bharatpur district followed by in Sikar district (16.66% and 15.54%). Similar results were recorded by Behar and Aulakh (1988) [1], Benbelkacem *et al.*, (2000) [2] and Kavak, (2004) [3]. Mathur and Bhatnagar (1991) [6] and Kumar *et al.*, (1998) [5] reported 31.9 to 21.6 per cent and 105.7 and 189.2 kg/ha economic losses in Rajasthan and Haryana. Leila Zare and Shahla Hashemi-fesharaki, (2013) [10] found barley stripe can cause 70 per cent yield losses which are directly proportional to percentage of infected plants.

The pooled data of field trial (seed treatment + foliar spray) revealed that, the treatment T_2 (carboxin+thiram) @ 0.1% and foliar spray with tebucanzole @ 0.1% found best treatment against stripe disease of barley and managed maximum disease incidence (9.22 %) and grain yield (52.82 q/ha) as well as fodder yield (63.83 q/ha). However, the treatment T_3 and T_1 found at par with treatment T_2, (Table. 2 & Fig. 2). Similarlly, Kumar, *et al.*, (2017) and Yadav and Gour (2007) recorded increased grain and fodder yields when carboxin (Vitavax 0.15%) was used for seed treatment and foliar spray (FS) with Tilt @ 1ml/ litre used for foliar spray. The combination of seed tratment and foliar spray of both fungicides significantly reduced disease incidence of stripe disease of barley and brown spot of rice after sowing in the field condition. The benefit: cost ratio was also calculated and higher B:C ratio (1:2.48) found in T_2 of seed treatment + foliar spray (Table 1). The incidence and area of stripe disease are increasing due to intensive use of susceptible cultivar, favourable environmental conditions, unawareness of farmers from the spread of disease and seeds were sown without a seed treatment.

Table 1: Disease incidence of stripe disease in major barley growing areas of northern Rajasthan during *Rabi* 2016-17 and 2017-18 (Mean of two year)

S. No	District	Teshil	PDI (%) 2016-2017	PDI (%) 2017-2018
1	Jaipur	Amber	*41.10 **(39.87)	*43.33 **(41.17)
		Bassi	36.28 (37.04)	34.44 (35.93)
		Jaipur	38.88 (38.57)	36.44 (37.13)
		Mean	36.28 (37.04)	38.07 (38.10)
2	Jhunjhunu	Jhunjhunu	27.77 (31.80)	21.10 (27.35)
		Chirawa	19.99 (26.56)	15.55 (23.22)
		Udaipurwati	21.10 (27.35)	18.88 (25.75)
		Mean	22.95 (28.62)	18.51 (25.48)
3	Dausa	Dausa	27.77 (31.80)	32.21 (34.58)
		Lalsot	25.55 (30.36)	33.33 (35.26)
		Mahwa	19.99 (26.56)	19.99 (26.56)
		Mean	24.43 (29.62)	28.51 (32.27)
4	Tonk	Tonk	27.77 (31.80)	31.10 (33.90)
		Niwai	22.21 (28.12)	33.33 (35.26)

		Malpura	29.99 (33.20)	34.55 (36.00)
		Mean	26.65 (31.08)	32.99 (35.06)
5	Sikar	Sikar	15.55 (23.22)	17.77 (24.93)
		Lachhmanghar	13.33 (21.41)	8.88 (17.34)
		Sri Madhopur	21.10 (27.35)	19.99 (26.56)
		Mean	16.66 (24.09)	15.54 (23.22)
6	Bharatpur	Bharatpur	6.66 (14.96)	3.33 (10.51)
		Kumher	11.11 (19.47)	7.77 (16.19)
		Nadbai	9.99 (18.43)	12.22 (20.46)
		Mean	9.25 (17.71)	7.77 (16.19)

Table 2: Effect of seed treatment and foliar application on stripe disease of barley during 2016-17 and 2017-18 (Pooled data)

Tn. No.	Treatments	PDI (%)	Yield q/ha	Fodder yield q/ha	Cost : Benefit Ratio
T_1	Carboxin+thiram (V.P) (0.2%)	*11.16 **(19.52)	51.06	61.70	1 : 2.45
T_2	Carboxin+thiram (0.1%) + Tebuconazole (0.1%)	9.22 (17.68)	52.82	63.83	1 : 2.48
T_3	Carboxin+thiram (0.1%) + Propiconazole (0.1%)	10.91 (19.29)	50.61	60.76	1 : 2.38
T_4	Carboxin+thiram (0.1%) + Bavistin (0.1%)	13.91 (21.90)	47.74	57.23	1 : 2.25
T_5	Carboxin+thiram (0.1%) + Mancozeb (0.1%)	14.88 (22.69)	45.79	56.01	1 : 2.16
T_6	Control	52.75 (46.58)	19.71	23.86	1 : 0.97
SEm ±		1.11	1.64	1.97	
CD at 5%		3.36	4.93	5.93	
C.V.		11.86	7.33	7.30	

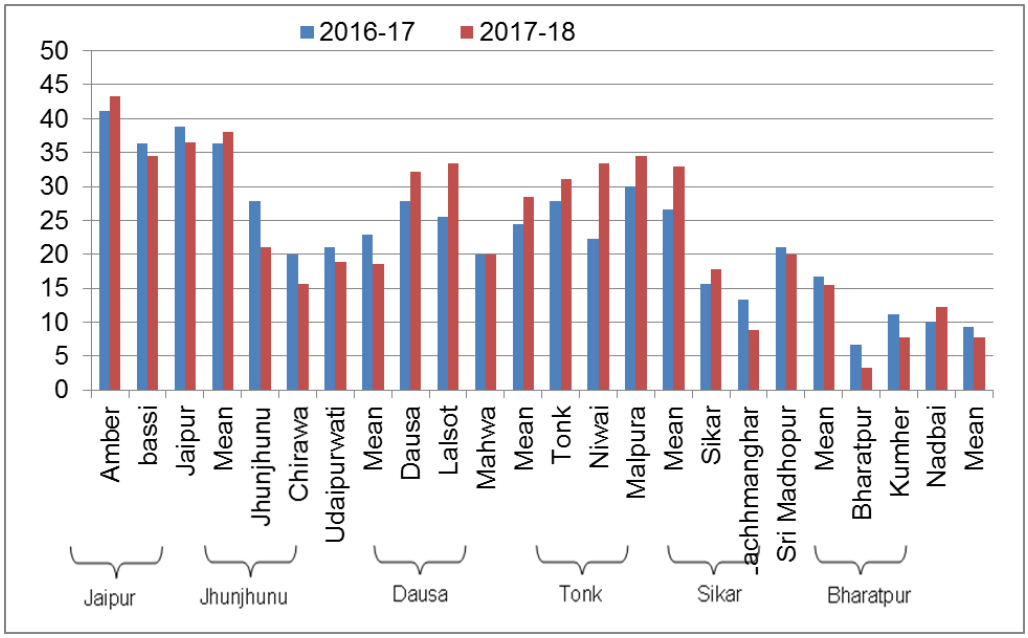

Fig 1: Disease incidence of stripe disease of barley in major barley growing areas of Rajasthan *Rabi* 2016-17 and 2017-18

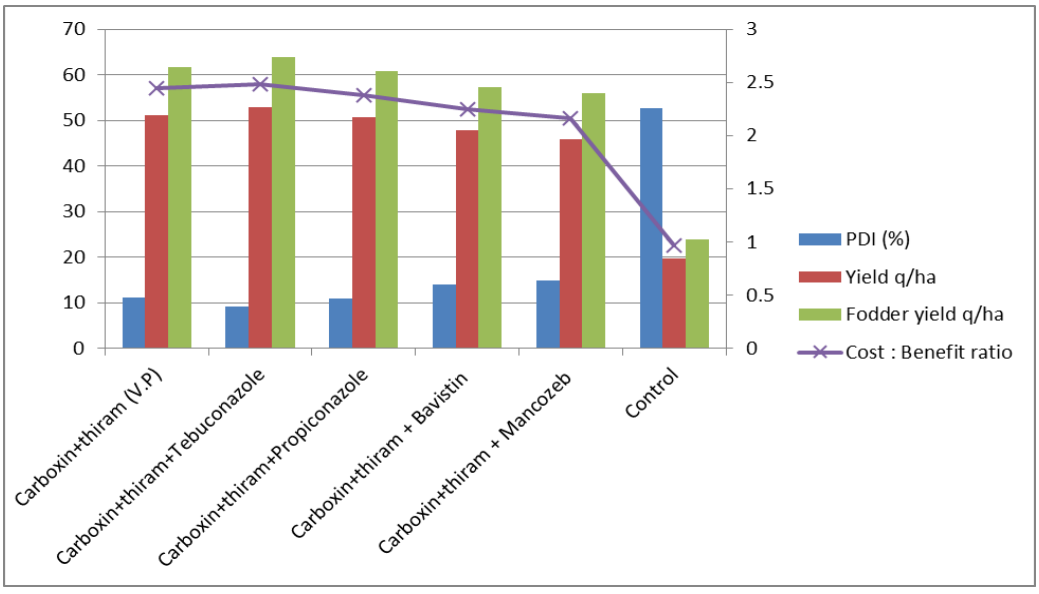

Fig 2: Effect of seed treatment and foliar spray on stripe disease of barley (Pooled)

References

1. Behar DS, Aulakh KS. Incidence of stripe disease of barley in Punjab. Plant Disease Research. 1988; 3:82-83.
2. Benbelkacem A, Boubekeur R, Boulif M. Barley yield loss caused by barley stripe disease (*Pyrenophora graminea*) in Algeria. Al Awamia. 2000; 101:53-65.
3. Kavak H. *Pyrenophora graminea* in field's sown-spring barley Angora in arid district of Turkey. Pakistan Journal of Biological Science. 2004; 7:1225-1228.
4. Kumar H, Ahmad S, Zacharia S, Kumar S, Ali A. Impact of different fungicides combination against brown leaf spot (*Drechslera oryzae*) of rice under the *in vitro* and *in vivo*. Journal of Pharmacognosy and Phytochemistry. 2017; 6:341-344.
5. Kumar V, Hooda I, Sindhan GS. Estimation of yield losses in barley due to *Drechslera graminea* the causal agent of barley stripe disease. Indian Phytopathology. 1998; 51:365-366.
6. Mathur AK, Bhatnagar GC. Barley stripe: its prevalence and yield loss in grain yield. J Mycol. Pl. Pathol. 1991; 21:280-282.
7. Pal D, Kumar S, Verma RPS. Pusa Losar (BHS 380) the first dual-purpose barley variety for northern hills of India. Indian Journal of Agricultural Sciences. 2012; 82:164-165.
8. Yadav SC, Gour HN. Management of leaf stripe disease of barley caused by *Drechslera graminea* using fungicides, botanicals and bioagent. Journal of Mycology and Plant Pathology. 2007; 37:457-459.
9. Yaduman Rao, Lal AA, Sobita Simon, Lakhveer Singh. Managment of brown spot (*Drechslera oryzae*) of rice. Ann. Pl. Protec. Sci. 2013; 21:450-451.
10. Zare L, Hashemi FS. Leaf Stripe of Barley Caused by *Pyrenophora graminea*, Occurrence in Barley Seeds in Iran. Intl J Farm & Alli Sci. 2013; 2:129-132.
11. *http://apps.fas.usda.gov/psdonline/psdHome.aspx.
12. *www.agricoop.gov.in
13. *www.agriculture.rajasthhan.gov.in