ISSN : 2348-8069 Int.J.Adv. Res.Biol.Sci.2014; 1(6):59-64

International Journal of Advanced Research in Biological Sciences

www.ijarbs.com

Research Article

Efficacy of fungicides used for controlling black point disease in wheat crop

Mazher Farid Iqbal[1], Muzzammil Hussain[2], Muhammad Anjum Ali[3], Rab Nawaz[4] and Zeeshan Iqbal[5]

[1]Research Officer Adaptive Research Station, Sialkot
[2]Senior Subject Matter Specialist (Agronomy) Adaptive Research Farm, Gujranwala
[3]Director General Agriculture (Ext. & A. R.) Punjab-Lahore
[4]District Officer Agriculture (Extension) Hafizabad
[5]Department of Livestock Management, University of Sargodha-Sargodha
*Corresponding author: *mazherfareed2004@gmail.com*

Abstract

The study was conducted to evaluate the efficacy of fungicide i.e T-2 (propiconazole @ 500 ml/ha), T-3 (Metiram @ 625 g/ha) T-4 (Difenaconazol @ 325 ml/ha) and T-5 (Propineb @ 1250 g/ha) used for controlling black point (*Bipolaris sorokiniana*) of wheat at Adaptive Research Farm, Gujranwala during Rabi 2010-11; 2011-12 and 2012-2013 compared to T-1 (Control). Minimum grain infection was recorded in metiram (10.51%) followed by difenaconazol (22.50%); propiconazole (28.07%) and Propineb (27.50%) compared to untreated control (49.02%) during 2011-12. Metiram (11.05%) showed significant effect followed by difenaconazole (24.47%); propineb (27.41%) and propiconazole (29.55%) however the highest disease was recorded in control (50.18%) during 2011-12. However significantly minimum infection on grain was recorded by metiram (9.32%) followed by difenaconazole (21.82%); propiconazole (23.03%) and propineb (25.06%); compared to control (48.07%) during 2012-13. During 2010-11, 1000 grain weight of Metiram (47.33g) was statistically non significant with difenaconazole (44.21g), showed significant difference with propineb (42.79g) compared to control (37.20g). During 2011-12 maximum weight was recorded by metiram (46.38g) differed statistically with difenaconazole (42.09g); propiconazole (42.05g) and propineb (40.67g) compared to (36.68g). During 2012-13 statistically significant difference in 1000 grain weight was recorded by metiram (44.28g); however difenaconazole (41.73g), propiconazole (40.64g) and propineb (40.07g) were non significant with each other compared to control (36.00g). Non significant effect in yield (t/ha) was recorded in Metiram (4.73) with difenaconazole (4.42) but differed statistically with propiconazole (4.31); propineb (4.28) compared to control (3.72) during 2010-11. On 2nd year of study showed statistically significant result in metiram (4.57) compared with all other treatments; however difenaconazole (4.37), propiconazole (4.37) and propineb (4.07) did not differed statistically with each other but differed statistically with control (3.60) during 2011-12. Significantly highest yield was recorded in metiram (4.47) compared to rest of the treatments; however difenaconazole (4.29), propineb (4.01) and propiconazole (3.99) showed statistically non significant with each other but showed statistically significant effect in control (3.60) during 2012-13. Maximum economic return was recorded in metiram (Rs. 20425/ha) followed by difenaconazol (Rs. 16520/ ha), propiconazole (Rs. 13200/ha) and propineb (Rs. 9550/ha). At the end it was concluded that all the fungicides were involved for controlling disease but metiram gave maximum control against black point followed by difenaconazole and propiconazole. However using pathogen free seed is best option to control this disease.

Keywords: Foliar, Fungicides, *Bipolaris sorokiniana*, Wheat, Punjab-Pakistan

Introduction

Wheat (*Triticum aestivum* L.) is staple food in Pakistan and all over the world. It was grown on an area of 15896 (000) per hectare with annual production of 17853 thousand tonnes and average grain yield 2.78 t/ha (Anonymous, 2007). Wheat grains are susceptible to the infection during grain filling or at milking stage

(Paradeshi et al., 2008). Black point disease caused by pathogen (*B. sorokiniana*) is a saprophyte and survives as thick walled conidia; pathogen penetrates both externally by conidia and internally by mycelium in the seed (Reis, 1991). However primary source of inoculums is through infected seed (Shaner, 1981). When diseased seeds germinate; the perennating organs of the causal organism become active. So that it germinated completely in four hours, and then appressoria forms at the juncture of epidermal cell wall after eight hours and hyphae from initially infected cells enter adjacent cells in 24 hours, which results in the granularisation of the host cytoplasm. Then fungus is transmitted into plumules and coleoptiles tips with an efficiency reaching upto 87% (Reis and Forcelini, 1993). Symptoms appeared when the eaves remain wet for more than 18 hours with temperature greater than 18˚C (Couture and Sutton, 1978). Under favorable environmental conditions, hyphen produces conidiophores, which emerge out through stomata. The emerging conidiophores produce conidia, which are transmitted by rain splashes and wind, thus building up polycyclic epidemics. Conidia on germination produce germ tube, which is surrounded by thick mucilaginous substrata. This mucilaginous substratum enables the germinating conidia to remain adhered to the host surface. The germ tube then swells to produce appresorium from which infection hyphae are developed. The infection hyphae then enter into the host tissue either through stomata or by rupturing epidermis. After entrance in the host tissue, the infection hypha divides rapidly and ramifies along the intercellular spaces of the mesophyll tissue. Black point disease is characterized by a brown-black discoloration of the embryos of the wheat (Culsha et al., 1988). The disease reduces the quality of bread wheat causing economic losses to producers (Rees et al., 1984). Black point disease incidence exceeding 10% results in downgrading of the grain (Canadian Grain Commission, 1983). Black pointed grains affected adversely on the quality of the wheat flour (Lorenz, 1986; Wang et al., 2003). Therefore the study had been planned to evaluate the best fungicide used for controlling black point disease wheat (Sehar-2006) at Agro-Ecological Zone of Adaptive Research Farm, Gujranwala-Pakistan.

Materials & methods

The study was conducted to evaluate the best one fungicide i.e T-2 (Propiconazole @ 500 ml/ha), T-3 (Metiram @ 625 g/ha) T-4 (Difenaconazol @ 325 ml/ha) and T-5 (Propineb @ 1250 g/ha) used for controlling black point disease of wheat at Adaptive Research Farm, Gujranwala during Rabi 2010-11; 2011-12 and 2012-2013 compared to T-1 (Control). The experiment was conducted by Randomized Complete Block Design with three replications having net plot design of 30x60 ft^2 area. Wheat variety (Sehar-06) was cultivated @ 50 kg/ha in well prepared soil and recommended dose of DAP & SOP was applied with tractor drawn rabi drill. Urea was broadcasted @ 4.5 bags/ha at 35 & 80 DAS after irrigation. Clodenophop @ $300gha^{-1}$+ (Bromoxynal +MCPA @ $500mlha^{-1}$) was sprayed in the field keeping in view that 100L water sprayed in the field. Zinc Sulphate 21% was broadcasted in the field @ $25kgha^{-1}$ after 1st irrigation. The crop was sprayed at booting stage grain infection (%) data was recorded at crop threshing by counting infected & healthy grains and % infection was calculated (Ahmad et al., 2011). No any type of fungicide was sprayed against any disease on wheat crop. 1000 grain weight (g); yield (t/ha) and economic analysis data recorded according to the method (Kahloon et al., 2012). All the agronomic and plant protection measures were kept constant in all treatments sprayed with particular fungicides to avoid biasness.

Results and Discussion

Grain infection (%)

Figure-1 depicted that minimum grain infection was recorded in metiram (10.51%) followed by difenaconazol (22.50%); propiconazole (28.07%) and Propineb (27.50%) compared to untreated control (49.02%) during 2011-12. On the other hand metiram (11.05%) showed significant effect during 2011-12 followed by difenaconazole (24.47%); propineb (27.41%) and propiconazole (29.55%). The lowest infection was recorded in control (50.18%). However minimum infection was recorded by metiram (9.32%) followed by difenaconazole (21.82%); propiconazole (23.03%) and propineb (25.06%); the lowest infection was recorded by control (48.07%). These results were in accordance to researchers reported that different fungicides were sprayed at different growth stages of wheat (Dhruj and Siddiqui, 1994). The result showed that spraying of fungicides at dough stage was found best for controlling black point during humid climatic conditions (Couture and Sutton, 1978). Maximum disease was recorded in control, suggested that using pathogen free seed is best option to control this disease (Panna et al., 2009). Application of fungicides at or after head emergence could reduce the incidence of black point (Wang et al., 2003). These results were also in accordance to researchers who suggested that use of late fungicide application targeted to control black point disease of wheat (Ellis et al., 1996). However foliar application of fungicides effect on this disease (Paradeshi et al., 2008). These results were contradictory to scientists reported that black point disease associated with a number of air borne fungi called Alternaria species and Cladosporium species (Las, 2006). Some researchers had a view point that results of black point disease were unclear and contradictory (Rees et al., 1984). In a range of studies, black point had been associated with some species of fungi called *Alternaria; Bipolaris; Fusarrium; Cladosporium and Sclerotium* (Özer,2005; Conner et al., 1996; Sisterna and Sarandon, 2005). However in several studies the cause of black point had been associated with extreme environmental conditions (heavy rain, high humidity and extreme temperature) during the grain filling duration (Mak et al., 2006; Sadasivaiah et al., 2004).

1000 grain weight (g)

From the figure (2), 1000 grain wt. (g) was recorded in Metiram (47.33) are statistically non significant with difenaconazole (44.21) but showed significant difference with propineb (42.79); propiconazole (42.10); compared to control (37.20) during 2010-11. During 2011-12 maximum 1000 grain weight was recorded by metiram (46.38) showed significant difference with difenaconazole (42.09); propiconazole (42.05) and propineb (40.67) compared to control (36.68). Statistically significant difference in 1000 grain weight was recorded by treatment metiram (44.28); however difenaconazole (41.73), propiconazole (40.64) and propineb (40.07) showed non significant effect in result with each other compared to control (36.00) during 2012-13.

On the other hand statistically non significant effect in 1000 grain weight was recorded within blocks by metiram (47.33; 46.38; 44.28) during these three years but in difenaconazole (44.21) during 2010-11. However difenaconazole (44.21; 42.09; 41.73), propiconazole (42.10; 42.05; 40.64) and propineb (42.79; 40.67; 40.07) were showed non-significant result with each other during rabi 2010-11; 2011-12 and 2012-13 compared to control (37.20; 36.68; 36.00). These results were in accordance to (Rehman et al., 2010; Ellis et al., 1996; Kumar et al., 2002; Clarke, 2004).

Yield (tha^{-1})

From table (1) data showed non significant effect in yield (t/ha) was recorded in Metiram (4.73) with difenaconazole (4.42) but differed statistically with propiconazole (4.31); propineb (4.28) compared to control (3.72) during 2010-11. Statistically significant effect in result was recorded by metiram (4.57) compared to other treatments; however difenaconazole (4.37), propiconazole (4.37) and propineb (4.07) showed non significant result with each other but differed statistically with control (3.60) during 2011-12. Significantly highest yield was recorded by metiram (4.47) compared to all other treatments. On the other hand difenaconazole (4.29), propineb (4.01) and propiconazole (3.99) did not differed statistically with each other but differed with control (3.60) during 2012-13. Within blocks metiram (4.51; 4.57; 4.47) and difenaconazol (4.42) showed non significant effect with each other during three successive years. However difenaconazole (4.42; 4.37; 4.29), propiconazole (4.31; 4.37; 3.99) and propineb (4.28; 4.07; 4.01) did not differed statistically with each other but differing with control (3.72; 3.67; 3.60). These results are contradictory to (Rehman et al., 2010) and in accordance to (Mak et al., 2006).

Economic analysis

From the table (1) maximum economic return was recorded in metiram (Rs. 20425/ha) followed by

Figure 1: Effect of different fungicides for controlling black point infection in grain (%) during Rabi 2010-11; 2011-2012 and 2012-2013.

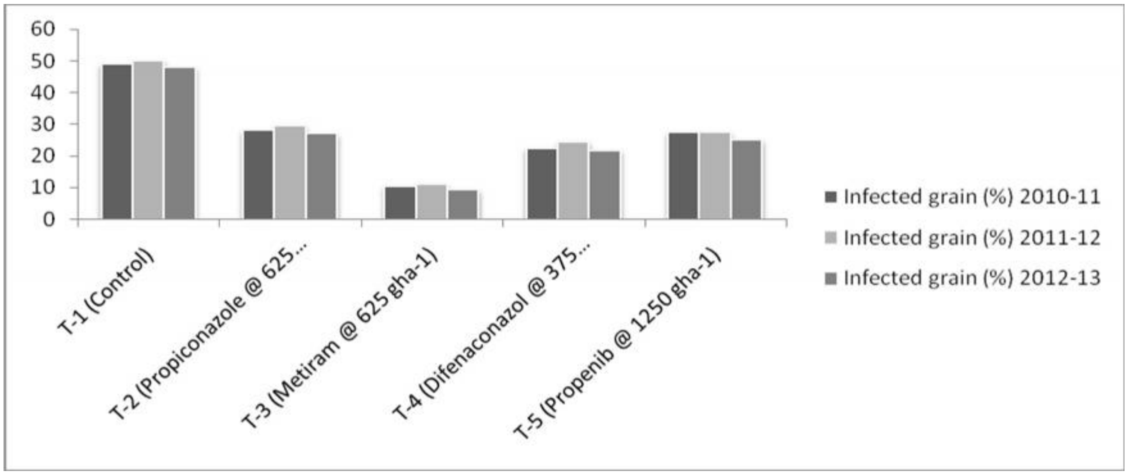

Figure 2: Effect of fungicides for controlling black point disease and its effect on 1000 grain wt. (g)

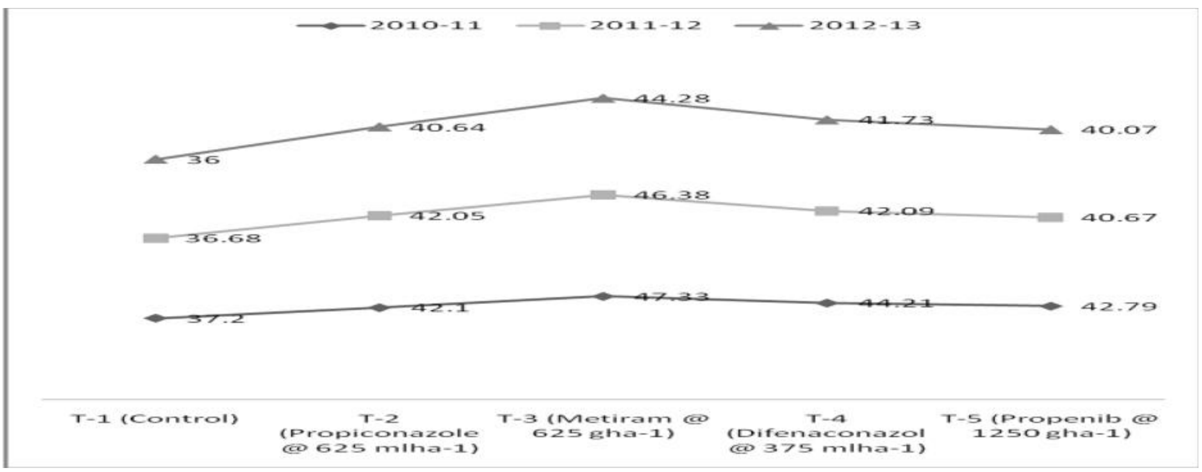

Table 1: Grain Yield and Economic Analysis of wheat crop as affected by black point disease

Treatments	**Yield (t/ha)**			**Avg. yield (t/ha)**	**Increase in yield over control (t/ha)**	**Additional Income (Rs/ha)**	**Extra cost of labour/fungicide (Rs/ha)**	**Net Profit (Rs/ha)**
	2010-11	2011-12	2012-13					
T-1 (Control)	3.72c	3.67c	3.60c	3.66c	-	-	-	-
T-2 (Propiconazole @ 625 ml/ha)	4.31b	4.37b	3.99b	4.22b	0.56	14000	800	13200
T-3 (Metiram @ 625 g/ha)	4.51a	4.57a	4.47a	4.51a	0.85	21250	825	20425
T-4 (Difenaconazol @ 375 ml/ha)	4.42ab	4.37b	4.29b	4.36b	0.7	17500	980	16520
T-5 (Propenib @ 1250 g/ha)	4.28b	4.07b	4.01b	4.12b	0.46	10525	975	9550
LSD	0.472	0.392	0.312	0.217				

Calculation based on wheat @ Rs. 25000/tone difenaconazol (Rs. 16520/ha), propiconazole (Rs. 13200/ha) and propineb (Rs. 9550/ha). The method of economic analysis was in accordance to Kahloon et al., (2012).

Conclusion

At the end it is concluded that all the fungicides were involved for controlling disease but metiram gave maximum control against grain infection followed by difenaconazole and propiconazole at milking stage to overcome the problem. However using pathogen free seed is best option to control this disease in agro-ecological zone of Gujranwala.

References

Ahmad, S. G., V. K. Garg, A. K. Pandit, A. Anwar & A. Saleem. 2011. Disease incidence of paddy seedling in relation to environmental factors under temperate Agro-climatic conditions of Kashmir Valley. J. Res. Dev., (11):29-38.

Anonymous, 2007. Economic survey of Pakistan. Govt. of the Punjab Finance Division, Economic Advisors wing, Islamabad, Pakistan.

Canadian Grain Commission, Official Canadian Grain grading guide. 1983. Canadian Grain Commission, Winnipeg, Manitoba, 24 pp.

Clarke, M.P., M.J. Gooding and S.A. Jones. 2004. The effects of irrigation, nitrogen fertilizer and grain size on Hagberg falling number, spesific weight and black point of winter wheat. J. Sci. Food Agric., (84): 227-236.

Conner, R. L., S. F Hwang and R. R. Stevens. 1996. Fusarium proliferatum: a new causal agent of black point in wheat. Can. J. Plant Path., (18): 419-423.

Couture, L. and J. C. Sutton. 1978. Control of spot blotch in Barley by fungicides application timed according to weather factors. Phytoprot. (59): 65-75.

Culshaw, F., R.J. Cook, N. Magan and E.J. Evans. 1988. Black point of wheat. HGCA Research Review No. 7, Home-Grown Cereals Authority, London, UK, 43 pp.

Dhruj, I. U. and M. R. Siddiqui. 1994. Prevalence and fungi associated with black point of wheat in six wheat zones in India. Ann. Plant Prot. Sci., (2): 64-67.

Ellis, S., M. Gooding and A. Thompson. 1996. Factors influencing the relative susceptibility of wheat cultivars (T. aestivum L.) to black point. Crop prot., (15):69-76.

Kahloon, M. H., M. F. Iqbal, M. Farooq, L. Ali, M. Fiaz and I. Ahmad. 2012. A Comparison of Conservation Technologies and Traditional Techniques for Sowing of Wheat. The J. Anim. Plant Sci., (3): 827-830.

Kumar, J., P. Schafer, R. Huckelhoven, G. Langen, H. Baltruschat, E. Stein, S. Nagarajan and K.H. Kogel. 2002. Bipolaris sorokiniana, a cereal pathogen of global concern: Cytological and molecular approaches towards better control. Molec. Plant Path., (3):185-195.

Las, C. N. M. Black point Guide A-415 New Maxico State University. 2006. N. M. S. U., U. S. Department Agri. Pp, 7-8.

Lorenz, K. 1986. Effects of black point on grain composition and baking quality of New Zealand wheat. N. Z. J. Agri. Res., (29): 711-718.

Mak, Y., R.D. Willowa, T.H. Roberts, C.V. Wrigley, P.J. Sharp and L. Copeland. 2006. Black point is associated with reduced levels of stress, disease and defence-related proteins in wheat grain. Molec. Plant Path., (7):177-189.

Özer, N. 2005. Determination of the fungi responsible for black point in bread wheat and effects of disease on emergence and seedling vigour. Trakya Univ. J. Sci., (6): 35-40.

Panna, R., F. M. Aminuzzaman, M. R. Islam & M. H. M. B. Bhuyan. 2009. Evaluation of Some Physical Seed Treatment against (Bipolaris sorokiniana) associated with Wheat seeds. Int. J. Sus. Crop Prod., 4(6):40-44.

Paradeshi, B. M., K. D. Mhaske, G. Bhoite, T. Bhangale & P. N. Rasal. 2008. Effect of foliar fungicides on Black Point of Wheat. Agri. Sci. Digest., 28(3):227-228.

Rehman, M. A., S. J. Hossain, M. B. Hossain, M. R. Amin and K. K. Sarkar. 2010. Effect of variety & culture method on the yield & yield attributes of wheat. Int. J. Sus. Crop Prod., 5(3):17-21.

Rees, R. G., D. J Martin, D. P. Law. 1984. Black point in bread wheat; effects on quality and germination, and fungal associations. Aust. J. Exp. Agri. Anim. Husb., (24): 601-605.

Reis, E. M., 1991. Integrated Disease Management: The changing concept of controlling head blight and spot blotch. Wheat in heat stressed environments: Irrigated, Dry Areas and Rice- Wheat Systems. CIMMYT, Mexico DF., pp 165-177.

Reis, E. M. and C. A. Forcelini. 1993. Transmissao de *Bipolaris sorokiniana* de sementes para orgaos radiculares e aereos do trigo. Fitop. Brasil., (18): 76-81.

Sadasivaiah, R.S., S.M. Perkovic, D.C. Pearson, B. Postman and B.L. Beres. 2004. Registration of AC Andrew wheat. Crop Sci., (44):696-697.

Shaner, G. 1981. Effect of environment on fungal leaf blights of small grains. Ann. Rev. Phytopath., (19): 273-296.

Sisterna, M.N. and S.J. Sarandon. 2005. Preliminary studies on the natural incidence of wheat black point under different fertilization levels and tillage systems in Argentina. Plant Patho. J., (4):26-28.

Wang, H., M. R. Fernandez, T. N. McCaig, Y. T. Gan, R.M. DePauw, and J.M. Clarke. 2003. Kernel discoloration and downgrading in spring wheat varieties in western Canada. Can. J. Plant Patho., (25):350-361.

.