

Interaction of Varieties and Fungicides for Management of Wheat Fusarium Head Blight Disease

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Abstract

The production of wheat is subjected to diverse biotic and abiotic threats. Out of them, diseases are one of the important factors that limit the productivity of wheat. Fusarium head blight (FHB) or scab is one wheat disease caused by fungal pathogen of more than seventeen fusarium spp. up to seventeen fusarium species were identified from scabby wheat heads in the field and suggested as they have the potential to be the major threat for wheat production in the country. Therefore, the study was carried out to evaluate the effectiveness of variety by fungicide for management of fusarium head blight disease of wheat. Three Fungicides (Tilt, Rexdo and Bylaton) were evaluated for their efficiency to manage wheat fusarium head blight (FHB) on three wheat varieties (Digalu, Galama and Danda'a) with different resistance level for FHB. The treatments were planted at Kokate and Hosanna using randomized complete block design (RCBD) in three replications with factorial arrangement in 2016 and 2017. The response of wheat varieties to fusarium head blight disease under natural infestation was recorded in terms of disease incidence and severity and analyzed using SAS version 9.1. The result depicted that, Due to the sporadic nature of the FHB it was occurred only in 2016, with low intensity and the data is not enough to indicate the treatment effect. However, there is quantitative variation among treatments, the result of disease severity showed statistically non-significant. Therefore, the alternative use of fungicides of Tilt, Rex Due and Bylathon can minimize wheat yield loss due to fusarium head blight.

Keywords: Fusarium head blight; Severity; Fungicides; Wheat varieties

Introduction

The production of wheat is subjected to diverse biotic and abiotic threats. Out of them, diseases are one of the important factors that limit the productivity of wheat. Furthermore, the importance and distribution of diseases varies through time as the result of climate change and other bio-physical phenomenon. As the result of severe infection, crops face significant yield loss in quality and quantity. Occasionally due to diseases up to 90% grain yield losses may happen (Wiese, 1998). Fusarium head blight (FHB) is caused primarily by Fusarium graminearum Schwabe [teleomorph Gibberellae (Schwein.) Petch] and Fusarium culmorum (Wm.G. Smith) Sacc. (Chelkowskiet al. 2000). These pathogens infect spikes and reduce grain yield by decreasing grain number per ear, thousand-kernel weight (TKW), and grain weight per ear (Chelkowskiet al., 2000; Martin 2004). Besides yield losses, Fusarium spp. infection also decreases grain quality by causing mycotoxin contamination of grain (Charmleyet al. 1994; Jones and Mirocha, 1999; Salas et al., 1999). The principal mycotoxin is deoxynivalenol (DON), which threatens human and animal health (Joffe, 1978; D'Mello et al., 1999; G'oralet al., 2002).

In Ethiopia in 1987 wheat seeds produced and stored under various conditions, FHB were detected 35 to 63 percent of the samples with severity level of up to 17 percent. Whereas field survey of 1988, showed up to 85 percent infection in some state farms. Among cultivars under production during the survey high yielding cultivar Dashen, was very susceptible to FHB, while Enkoy exhibited significant resistance. In addition, up to Seventeen Fusarium species were identified from scabby wheat heads in the field and suggested as they have the potential to be the major threat for wheat production in the country (Eshetu, 1997). Therefore, this research was carried out to evaluate variety by fungicide for the management of fusarium head blight disease of wheat [1-9].

Materials and Methods

Description of the study areas

Hosanna site is found in Haddiya Zone which is located at 7034' 04" N and 37051'22" E at about 2306 meters above sea level (m.a.s.l). It receives an average annual rainfall of 1153 mm. The monthly average minimum and maximum temperatures are 10.30C and 23.0C, respectively. The dominant soil type is nitosol and slightly acidic. It belongs to the sub humid agro climatic zone (<http://mapcarta.com/> April, 2012). Whereas, Kokate is located at 6085'28"N and 37076'10"E at about 2156 meters above sea level (m.a.s.l). It receives an average annual rainfall of 1552.1 mm. The monthly average minimum and maximum temperatures are 13.60C and 24.20C, respectively. The dominant soil type is clay loam (Basaet al., 2019).

Experimental Procedures and Design

On the study three Fungicides (Tilt 0.5 l/ha, Rexdo 0.5 l/ha and Bylaton 2 l/ha) were evaluated for their efficiency to manage wheat fusarium head blight (FHB) on three wheat varieties (Digalu, Galama and Danda'a) with different resistance level for FHB. The treatments were planted at Kokate and Hosanna on RCBD of three replications with factorial arrangement in 2016 and 2017. The response of treatments to fusarium head blight under natural infestation condition was taken in terms of incidence and severity and the data was analyzed using SAS software (version 9.1) and means were separated at 5% of level of significance

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Table 1: Average percent of incidence and severity of fusarium head blight in wheat varieties treated with different fungicides and their grain yield per hectare at Hossana in 2016.

Variety	Fungicide	FHBI	FHBS	GY/ha in Kg
Digalu	without Fungicide	13.3a	8.3a	1653.8b
	Tilte	0.7a	3.3a	1669.8b
	RexDue	6.7a	3.3a	2173.1ab
	Bylathon	13.3a	11.7a	1908.1b
Galama	without Fungicide	10.0a	10a	4143.5ab
	Tilte	13.3a	6.7a	4872.1a
	RexDue	16.7a	15.0a	4285.0ab
	Bylathon	6.7a	3.3a	4281.5ab
Danda'a	without Fungicide	10.0a	8.3a	2109.8ab
	Tilte	15.0a	8.3a	3038.3ab
	RexDue	23.3a	23.3a	2641.5ab
	Bylathon	23.3a	10.0a	1784.0b
CV (%)		89.3	106.3	35.7

Note: FHBI: Fusarium Head Blight Incidence, FHBS: Fusarium Head Blight Severity, GY: Grain Yield

Result and Discussion

Due to the sporadic nature of the FHB it was occurred only in 2016, with low intensity and the data is not enough to indicate the treatment effect. However, there is quantitative variation among treatments, the result of disease severity showed statistically non-significant. The table below is to show the intensity of the disease at hosanna, in 2016 (Table 1).

Conclusion and Recommendation

Fusarium head blight severity as well as incidence has no significant difference among fungicide sprayed treatments; however there was relatively low grain yield was obtained on some Tilt, RexDue

and Bylathon sprayed treatments on Digalu wheat variety. However, there is quantitative variation among treatments, the result of disease severity showed statistically non-significant. Therefore, the alternative use of fungicides of Tilt, Rex Due and Bylathon can minimize wheat yield loss due to fusarium head blight.

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