

Original Research Article

<https://doi.org/10.20546/ijcmas.2019.811.277>

Evaluation of Different Fungi Toxicants against Yellow Rust Diseases on Bread Wheat (*Triticum aestivum* L.) in the Cold Arid Zone of Kargil, Ladakh (J&K), India

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ABSTRACT

A field experiment was conducted to determine the efficacy of different triazole fungicides against yellow rust of wheat caused by *Puccinia striiformis*. The experiment field was divided in three part one part sprayed with propiconazole. Five fungicide (propiconazole 10EC, tebuconazole 25 EW, difenconazole 25 EC, hexaconazole 5EC and azoxystrobin+ difenconazole) were used in the experiment. All the fungicide treatment significantly reduced the disease intensity by 6.1% to 9.5 % as compared to control (35.5%). The minimum disease intensity (6.1%) was recorded in treatment where propiconazole before disease appearance and azoxystrobin +difenaconazole after disease appearance was sprayed followed by propiconazole and tebuconazole with disease intensity of 7.8 %. Whereas 8.2 percent disease intensity was recorded in treatment where propiconazole was again sprayed after disease appearance followed by hexaconazole (9.3%). Whereas, maximum disease intensity was recorded where propiconazole and hexaconazole was sprayed.

Keywords

Fungicide,
Hexaconazole,
Cereals crop,
Yellow rust disease,
Propiconazole

Article Info

Accepted:
26 October 2019
Available Online:
10 November 2019

Introduction

Bread wheat (*Triticum aestivum* L.) is one of the most widely grown and most consumed food crops all over the world. It is the second most important cereals crop after rice and it

contributing substantially to the national food security by providing more than 50% of calories to the people. Wheat (*Triticum aestivum* L.) is a staple food of billions of people in the world, used to make flour for leavened, flat and steamed bread, cookies,

cakes, pasta, noodles, beer and alcohol (Habib and Khan, 2003). Annually, wheat is produced on 224.53 million hectares of land and 672.2 million metric tons of wheat is produced in the world (FAO, 2013). According to this report the world average wheat production is 2.99 tons /ha.

In Kargil District of Ladakh (J&K), wheat is the second most important crop after barley. However, the production and productivity of wheat is curtailed by various biotic and abiotic factors. Among the biotic factors, yellow rust disease is the most threaten and wheat production bottlenecks. Many part of District, particularly the cooler area, is now becoming hot spot for wheat rusts, where the periodic epidemics cause significant yield losses and reduction. Therefore, the present study was undertaken to check the best fungicide for controlling of yellow rust under cold arid zone of Kargil, Ladakh.

Materials and Methods

Bread wheat cultivar Krokhar (Local), highly susceptible to yellow rust (*Puccinia striiformis* f.sp. *tritici*W) disease was planted at yellow rust hot spot location; Stikchey (District Kargil) in plots of 2800m², during the year 2017 and 2018 and the experiment was laid in randomized block design (RBD) with three replications for each treatment. Seed rate of 240kg/ha was sown in 2nd week of April. Test fungicides, Propiconazole 25 EC(0.1%), Tebuconazole 10 EC (0.1%), Difenconazole (0.05%), Azoxystrobin + Difenconazole (0.05%), Hexaconazole 10EC (0.05%), Mancozeb+carbendazim (0.25%), Chlorothalonil (0.3%) and Mancozeb (0.3%), were used. The plot was first divided equally (700m²) into four parts and sprayed one part with sterile water and another three with Propiconazole, Chlorothalonil and Mancozeb

before the appearance of yellow rust respectively. Second fungicide were applied at 5% severity level of yellow rust (booting crop growth stage) and remaining 300m² was kept as check. Test and check fungicides were applied manually using Knapsack sprayer delivering 250 liter of water/ha. Rust severity was recorded in percentage using modified Cobb Scale (Peterson *et al.*, 1948).

Results and Discussion

In 2015-16 main cropping season yellow rust disease pressure was very high and excellent disease epidemics was developed to the level of creating significant difference among all experiment plots. Fungicide spray treatments significantly reduced the disease over control.

There was statistically significant difference between the test fungicides. In treatment T₁₁ (where Propiconazole @0.1% and Difenconazole @ 0.05% were sprayed) significantly reduced the disease intensity and incidence by 6.14% and 19.03 % respectively followed by treatment T₁₂ and T₉ by 7.59 and 8.77 respectively. The treatment T₁₀ and T₁₃, was not significantly difference. However, from visual field observation all the test fungicides showed comparable level of efficacy in controlling disease as compared to unsprayed plot. It is witnessed from the Table 1 that treatment T₂, T₄, T₇, T₁₄ and T₂₁ are at par with each other. Similarly there is no statistical difference among T₃, T₅ and T₂₄. T₁₈ and T₂₃ are also at par with each other. It is evident from Table 2 that T₁₇, T₂₀, T₂₆ and T₂₇ showed comparable level of efficacy in reduction of rust severity and incidence. Whereas, T₈, T₁₅, T₂₂ and T₂₈ showed disease intensity ranged from 29.17% to 33.16 % compared to the plot where only sterile water sprayed and control where disease intensity showed 39.17 and 41.09 respectively.

Table.1 Detail of the fungi toxicants evaluated under field conditions

Treatment No.	Treatment Code		Treatment Details
	First Spray(BD)	Second Spray(AD)	
T-1	P ₀	F ₀	Sterile water
T-2	P ₀	F ₁	
T-3	P ₀	F ₂	
T-4	P ₀	F ₃	
T-5	P ₀	F ₄	
T-6	P ₀	F ₅	
T-7	P ₀	F ₆	
T-8	P ₁	F ₀	
T-9	P ₁	F ₁	
T-10	P ₁	F ₂	
T-11	P ₁	F ₃	
T-12	P ₁	F ₄	
T-13	P ₁	F ₅	
T-14	P ₁	F ₆	Chlorothalonil@0.3%
T-15	P ₂	F ₀	
T-16	P ₂	F ₁	
T-17	P ₂	F ₂	
T-18	P ₂	F ₃	
T-19	P ₂	F ₄	
T-20	P ₂	F ₅	
T-21	P ₂	F ₆	Mancozeb @ 0.3%
T-22	P ₃	F ₀	
T-23	P ₃	F ₁	
T-24	P ₃	F ₂	
T-25	P ₃	F ₃	
T-26	P ₃	F ₄	
T-27	P ₃	F ₅	
T-28	P ₃	F ₆	
T-29	Check	-	-

BF- Before Disease, AD- After Disease

Table.2 Evaluation of different t fungicide efficacy against yellow rust disease of wheat

Treatment	Disease Intensity (%)	Disease Incidence (%)
T ₁	39.17	72.87
T ₂	20.60	37.60
T ₃	17.12	35.13
T ₄	21.47	35.22
T ₅	17.46	32.51
T ₆	19.60	36.20
T ₇	20.40	69.13
T ₈	32.36	57.73
T ₉	8.77	21.27
T ₁₀	9.20	17.19
T ₁₁	6.14	19.03
T ₁₂	7.59	15.36
T ₁₃	9.83	20.40
T ₁₄	22.48	39.40
T ₁₅	31.93	71.79
T ₁₆	15.33	35.11
T ₁₇	13.59	33.18
T ₁₈	15.07	33.07
T ₁₉	11.03	31.03
T ₂₀	13.64	32.23
T ₂₁	21.77	53.75
T ₂₂	33.16	73.06
T ₂₃	15.09	35.33
T ₂₄	17.49	35.11
T ₂₅	14.20	33.32
T ₂₆	10.62	33.01
T ₂₇	13.10	34.45
T ₂₈	29.17	52.87
T ₂₉ (Check)	41.09	75.29
CD(p=0.05)	2.64	2.54

Different studies from different part of the world reported yield increase in wheat due to fungicide application and growing yellow rust resistant variety. Hussain *et al.*, (2018) noted the yield of wheat in Kargil district increased by 7.73 q/ha in yellow rust resistant variety HD267. In 2009 Wegulo *et al.*, reported that up to 42% of yield loss by yellow rust was

prevented by applying foliar fungicide to wheat. Kelly (2001) and Alemu and Mideksa (2016) also reported that propiconazole significantly increased winter wheat yield by 77%. Ransom and McMullen (2008) showed that tebuconazole and propanconazole improved yield by 5.5 to 44.0%.

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How to cite this article:

Nassreen F. Kacho, Nazir A. Bhat, Nazir Hussain, and Kunzang Lahmo. 2019. Evaluation of Different Fungi Toxicants against Yellow Rust Diseases on Bread Wheat (*Triticum aestivum* L.) in the Cold Arid Zone of Kargil, Ladakh (J&K), India. *Int.J.Curr.Microbiol.App.Sci.* 8(11): 2390-2394. doi: <https://doi.org/10.20546/ijcmas.2019.811.277>