Original Research Article

Bio-Assay of Fungicides against the *Neovossiaindica* Inciting Karnal Bunt of Wheat

ABSTRACT

When it comes to its use in various food and feed applications, wheat is the cereal that is farmed most frequently worldwide. It is utilized for feedstock and grain production in both developed and developing nations. In 2020–21, India is predicted to produce a record 109.24 MT of wheat, up from 107.86 MT in 2019–20. The illness has been continuously controlled with the use of chemical treatments, resistant cultivars, and cultural practices.Fungicides significantly improved seed germination in one year, with Tilt 250 EC and Folicur being most effective, with other fungicides also showing consistent efficacy.The study examined wheat seed that had been administered with different fungicides to prevent disease. The findings demonstrated that, in a single year, all fungicides considerably increased seed germination, with Folicur and Tilt 250 EC demonstrating the greatest efficacy. The effectiveness trend did not change.

Key Words: Fungicides, Karnal bunt, *Neovossiaindica,* Tilt 250 EC, Folicur

INTRODUCTION

Wheat is the most frequently farmed cereal in the world when it comes to its use in different forms of food and feed. It is used in both developed and developing countries for both grain production and feedstock. India is expected to produce a record 109.24 MT of wheat in 2020–21, up from 107.86 MT the previous year (2019–20). India is the world's second-largest producer of wheat, after China, with a record average productivity of 337 kg/ha. About 30 million hectares, or 14% of the world's total area, have been used to cultivate the crop, which has produced the largest output of 99.70 million tons of wheat, or 13.64% of global production, which has been used since prehistoric times in various processed farms.India can produce more wheat and now has an oversupply of it on hand. From a farmed area of 29.58 mha, India produced 99.70 million tons of wheat in 2017–18. Tilletiaindica, a heterothallic fungus also called Neovossiaindica, is capa`ble of causing partial or karnal bunt in wheat. Mitra first recorded it in Karnal, Haryana (Mitra, 1931).The majority of the endosperm along the longitudinal axis, together with the scutellum, are destroyed in severely afflicted kernels, leaving just the pericarp and the aleuronic layer, which gives the grains a "boat"-like look. This is most likely the reason the illness was given the moniker "bunt" (Bedi and Dhiman, 1982).A bad odor is released by recently harvested contaminated bread wheat grains, which is thought to be caused by trimethylamine (Joshi *et al.*, 1980).An integrated disease management (IDM) system, combining host resistance, regulatory measures, cultural practices, biosuppression techniques and chemical measures as its sub-systems to manage wheat disease. The folicur at 0.20% contaf at 0.10%, Tilt at 0.10% resulted in more than 90% Karnal bunt control as happened

during present investigation also (Sharma et al., 2005). In vitro sporidial generation has been reported to be inhibited by folicur, tilt, and Score 10 (prifenoconazole) (Kaur and Nanda, 2002).

MATERIALS AND METHODS

Bio-assayoffungicides:

Eightfungicides viz. Tilt 250, Folicur, Bavistin, Thiram, Vitavax,Contof, Benlate and Dithane m-45 were assessed for their efficacy againstNeovossiaindica.

Invitro test:

The experiment used the poison-food technique, incorporating fungicides in potato dextrose agar medium. A disc from a 7-day-old *N indica* culture was placed in petriplates containing the fungicides. Three replications were kept for each treatment, and the radial growth diameter and percent inhibition were calculated.

Screeningoffungicidesforcontrollingseedborneinfestation:

A trial of seed treatment was set up using plot culture. Using naturally infected seeds, the effectiveness of several fungicides against *Neovossiaindica* infection of Karnal bunt of wheat was assessed. As a control, untreated seeds were used. After five minutes of vigorous shaking and mixing, the fungicide-treated seed was sowed on a plot that had been filled with sterile soil. Plots of six rows each were employed for every treatment. It was noted what percentage of the seeds germinated.

Screeningoffungicidesforcontrollingthediseaseunderplotexperiment:

The trial involved sowning surface sterilized seeds of susceptible wheat variety K 9465 in autoclaved soil, using various fungicides for spray, and inoculating plants with fungus. The first spray was given 24 hours after inoculation, followed by 15-day intervals until crop immaturity, and disease intensity was determined 10 days later.

RESULTS AND DISCUSSION

BIO-ASSAY OF FUNGICIDES AGAINST THE *N. indica (in-vitro)*:

The effectiveness of eight fungicides from various groups was evaluated in vitro against *N. indica* using the food poisoning method. After solidification, a five-millimeter fungal disc was positioned in the center of each Petridish chemically impregnated PDA, and each treatment—including the control—was repeated three times. Five days after the fungus was incubated at 28+1°C, the radial growth of the fungus was measured. The results, which are shown in Table 1, indicate that all eight fungicides were found to be effective in reducing the mycelial growth of N. indica; however, Tilt 250EL and Folicur were the most effective, completely inhibiting the fungal growth. The remaining chemicals proved inhibitory to *N. indica* to varying degree and were placed in partially effective. These fungicides in the descending order of merit were Bavistin. Thiram, Vitavax, Contaf, Benlate and Dithane M-45. However, Bavistin and Thiram were at par.

Table 1: Effect of eight fumigates on the growth of N.*indicainvitro*

Sl. No.	Fungitoxicants	Dose in PPM	Av. Radial growth in mm.
1	Tilt 250 EC	3000	0
2	Folicur	2000	0
3	Bavistin	1000	2.62
4	Thiram	2800	2.66
5	Vitavax	1500	6.3
6	Contaf	2000	7.0
7	Benlate	2000	8.0
8	Bithane M-45	2500	15.6
9	Control	-	98.00
10	CD at 5% level	-	2.13

Screening of fungicides for controlling the disease (in field):

The fungicides found effective against the pathogen in-vitro, were further tested for controlling the disease under field conditions by seed treatment as well as foliar application. The results obtained are summarized in Table 2 and 3 respectively for seed treatment and foliar spray.

Control of the disease by spray fungicides:

The study analyzed wheat seed treated with various fungicides for disease control. Results showed all fungicides significantly improved seed germination in one year, with Tilt 250 EC and Folicur being the most effective. The efficacy trend remained consistent.

Table 2: Effect of Spray fungicides in controlling karnal bunt disease on wheat in field during 2020-21.

S. No	Treatment	Disease Intensity (%)2020-21	Percent in disease intensity over control 2020-21
1-	Tilt 250 EC	18.17	25.70
2-	Folicur	19.75	22.32

3-	Bavistin	21.25	19.16
4-	Thiram	22.38	16.87
5-	Vitavax	25.27	11.16
6-	Contaf	31.22	12.39
7-	Benlate	35.23	18.00
8-	Dithane M45	41.37	10.9
9-	Control	49.22	----

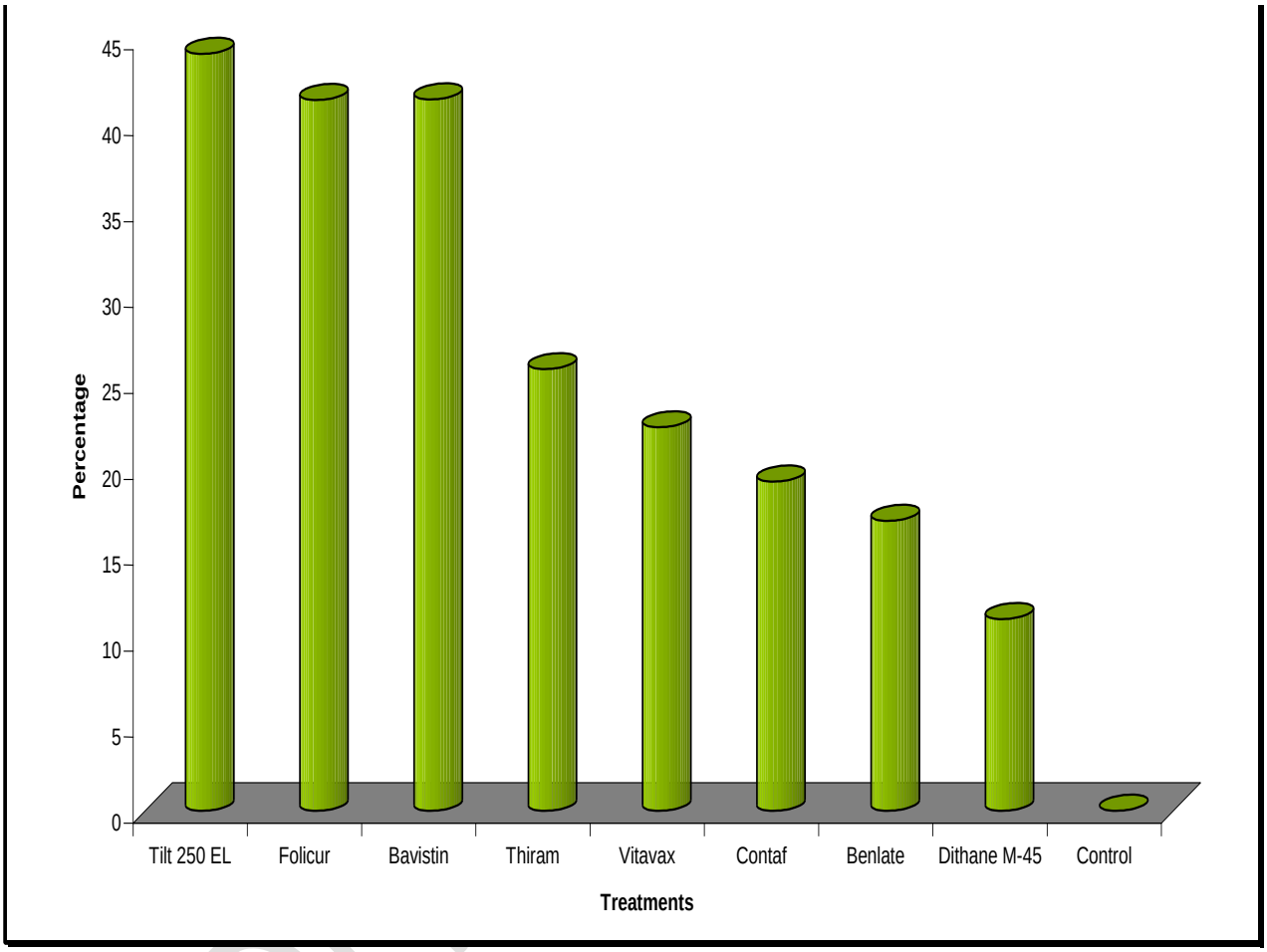

Fig 1. Effect of spray fungicides in controlling Kama! bunt disease on wheatin field during 2020-21

Disease control by seed treatment:

Wheat seed from diseased crops were treated with various fungicides, with Tilt 250 EC and Folicur being the most effective. Other fungicides were Bavistin, Thiram, Vitavax, Contaf, Benlate, and DithaneM-45. The efficacy of these treatments remained consistent.

Table 3: Effect of Seed Treatment with chemical on the germination of wheat seeds under plant condition during 2020-21.

S.No.	Treatment	Dose%	2020-21 Average Seed Germination
1.	Tilt 250 EL	0.2	80.16 (63.15)
2.	Folicure	0.2	78.85 (62.62)
3.	Bavistin	0.2	76.56 (61.04)

4.	Thiram	0.2	75.82 (60.55)
5.	Vitavax	0.1	71.12 (57.49)
6.	Contaf	0.05	68.52 (55.87)
7.	Benlate	0.2	56.22 (48.57)
8.	Dithane M-45	0.2	52.68(46.54)
9.	Control	-	43.32(41.16)

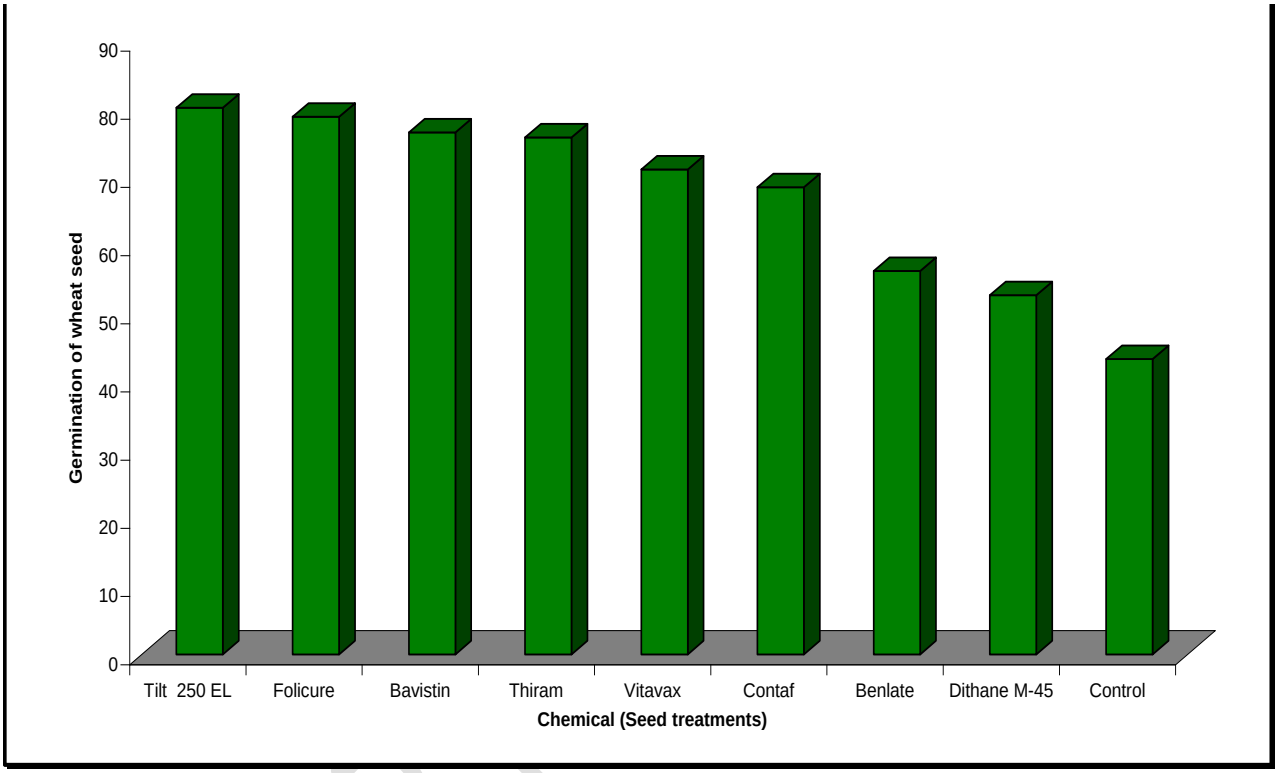

Fig 2. Effect of seed treatment with chemical on the germination of wheat seeds under pot conditions during 2020-21

Together with one untreated control, five fungicides were used: corboxin (Vitavax 75WP), propiconozole (Tilt 20EC), Subeej (Bavistin 25SD), Carbendazim (Bavistin 50WP), and Vitavax power (Cromp. Uni. Royal). Three concentrations of each of these five fungicides—0.1%, 1.0%, and 2.5%—were examined. After 15 days, the radial growth was assessed, and the percentage of radial growth inhibition was computed. Propiconazole (Tilt 20EC) was determined to be the most effective inhibitor of radial growth (Shukla *et al.*, 2018).

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