

## INTEGRATED MANAGEMENT OF KARNAL BUNT OF WHEAT

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### ABSTRACT

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Karnal bunt incited by *Neovossia indica* is one of the most important disease of wheat crop. To develop an effective management practice against Karnal bunt of wheat. Integration of fungicidal seed treatment with foliar sprays of phytoextracts, bio-control agent and fungicide revealed that seed treatment with Tilt 25EC (0.1%) and few sprays of Tilt 25EC (0.1%), one at flag leaf stage followed by another at 50 per cent emergence of spikes and seed treatment of Tilt plus one spray of *L. camara* and one spray of Tilt 25EC gave cent per cent disease control under field conditions. Seed treatment with Tilt 25EC plus one spray of *T. viride* at flag leaf stage and another spray *L. camara* at 50 per cent emergence of spikes gave 95.84 per cent disease control. This is the first report concerning integration of fungicide seed treatment with foliar spray of bio-control agent and phyto-extract. It is cheaper and eco-friendly practice for the control of Karnal bunt of wheat.

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### INTRODUCTION

The incidence of Karnal bunt varies considerably from year to year due to its dependence on favourable weather during heading. It would be almost impossible to eradicate the fungus since spores can remain viable in the soil for a considerable time. The disease has historically caused minor overall yield and quality losses in countries where it occurs. Significant yield or quality losses are typically localized, occurring in highly susceptible cultivars grown in fields with high inoculum density during seasons with unusually favourable weather. Most economic losses have come from the effects of quarantine rather than from losses in yield or quality. Approximately 70 countries place

quarantine restriction on movement of wheat from countries where Karnal bunt is known to occur (Lari *et al.* 2006). The certification standard in India is zero where the disease incidence is not found. However, where the disease is found the standard are 0.05 and 0.25% Karnal bunt incidence for basic and certified seed, respectively (Agarwal and Varma 1983). In Himachal Pradesh, zone-I is a hot spot for Karnal bunt.

### MATERIAL AND METHODS

A field trial on integrated disease management of Karnal bunt of wheat was conducted at Experiment farm of HAREC, Dhaulakuan. The trial was conducted in 1.5x 2.0m plots with row spacing of 25cm under

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irrigated condition with recommended package and practices. The experiment was laid out in a Randomized Block Design (RBD) with three replications using Karnal bunt susceptible variety UP-2338.

Various combinations of seed treatment and foliar sprays of botanical, fungicide and bio-control agent. In single spray treatments, spray was given at 50 per cent emergence of spikes. Whereas in double spray treatments, first spray was given at flag leaf stage and second at 50 per cent emergence of earheads. The plants were also artificially inoculated by spraying sporidial suspension (50,000 sporidia/mL) of pathogens with the help of Knapsack sprayer 48 hrs to the foliar sprays of different treatments. The data on seed germination, disease incidence and grains yield recorded after threshing are presented in Table 1. The detail of treatments used was as follow:

T<sub>1</sub> = Tilt (ST)

T<sub>2</sub> = *Lantana camara* (ST)

T<sub>3</sub> = *T. viride* (ST)

T<sub>4</sub> = Tilt 25 EC (ST) + one spray of Tilt 25 EC

T<sub>5</sub> = *L. camara* (ST) + one spray of Tilt 25 EC

T<sub>6</sub> = *T. viride* (ST) + one spray of *T. viride*

T<sub>7</sub> = Tilt 25 EC (ST) + two sprays of Tilt 25 EC

T<sub>8</sub> = *L. camara* (ST) + two sprays of *L. camara*

T<sub>9</sub> = *T. viride* (ST) + two sprays of *T. Viride*

T<sub>10</sub> = Tilt 25 EC (ST) + one spray of *L. camara* + one spray of Tilt 25 EC

T<sub>11</sub> = Tilt 25 EC (ST) + one spray of *T. viride* + one spray of *L. camara*

T<sub>12</sub> = Control

## RESULTS

A cursory of data indicated that all the treatment combinations gave significant reduction of disease incidence over check. However, seed treatment with Tilt 25EC + two foliar spray of same fungicides and Tilt 25EC (ST) + one foliar spray of *L. camara* + one foliar spray of Tilt 25EC resulted in cent per cent control of Karnal bunt and gave maximum grain yield. Tilt 25 EC (ST) + one foliar spray of *T. viride* + one foliar spray of *L. camara* was the next best treatment and resulted in 95.84 per cent disease control and differ significantly from the above mentioned treatments. However, no significant difference in grain yield was recorded in these treatments. Tilt 25EC (ST) + one foliar spray of Tilt 25EC at earheading stage ranked third and resulted in 89.92 per cent disease control followed by *L. camara* (ST) + one foliar spray of Tilt 25 EC (85.89%), *L. camara* (ST) + two foliar sprays of *L. camara*

(81.85%) and *T. viride* (ST) + two foliar sprays of *T. viride* (73.80%), and differed significantly from each other. Among the combined treatments, seed treatment with *T. viride* + one foliar spray of *T. viride* resulted least disease control. However, seed treatment with Tilt 25EC alone gave 47.03 per cent disease control followed by *L. camara* (43.13%) and *T. viride* (30.95%).

## DISCUSSION

Present results indicated that seed treatment with Tilt 25EC and sprays of same fungicides at flag leaf stage and 50% emergence of earheads gave 100 per cent control of disease. Similarly, seed treatment with Tilt 25EC and first foliar spray of *L. camara* at flag leaf stage followed by second spray of Tilt 25EC at 50 per cent emergence of earheads resulted in cent per cent control of disease and also significantly increase the yield. Aujla and Sharma (1990) reported 71.4 to 97.5 per cent disease control with Tilt 25EC. However, Goel *et al.* (2000) reported that a foliar spray of Propiconazole (Tilt 25EC) @ 250 and 500 mL/ha at boot leaf stage contained Karnal bunt upto 78 to 87 per cent in multilocation trials, respectively.

In the present findings, hundred per cent disease control and maximum yield was achieved due to the effect of seed treatment and two additional sprays of Tilt 25EC. Seed treatment and one foliar spray of Tilt 25EC resulted in 89.96 per cent disease control. These results are in confirmation with findings of Aujla *et al.* (1989b). Rattan (1988) and Singh (1999) also observed increase in grain yield (11 to 25 %) when the crop was sprayed with Tilt 25EC. Application of Tilt 25EC was found effective in Punjab (Aujla and Sharma 1990).

Beniwal *et al.* (1992) emphasized the importance of integration of various cultural practices, bio-control agents, botanicals, chemical means and host resistance in economic management of plant diseases. In the present study, integration of foliar spray of *L. camara* extract @ 250 mL/L with seed treatment and one foliar spray of Tilt 25EC (0.1%) resulted in cent per cent control of disease. Sharma and Basandrai (1999) also reported effectiveness of crude extract of *L. camara* against Karnal bunt. Sharma and Basandrai (2000) reported that seed treatment and foliar spray of *T. viride* gave significant control of Karnal bunt. In present findings seed treatment and foliar sprays of *T. viride* were also found effective and gave 73.80 per cent disease control. However, seed treatment with Tilt 25EC plus one spray of *T. viride* followed by another spray of *L. camara* resulted in 95.84 per cent

**Table 1.** Integrated management of Karnal bunt of wheat

Treatment	Dose	Germination(%)	Karnal bunt disease		Yield (qt/ha)
			Incidence (%)	Control (%)	
Tilt 25 EC (ST)	1mL/L	85.67(69.03)	13.14(3.45)	47.03(66.47)	37.50
<i>Lantana camara</i> (ST)	250mL/L	95.00(75.95)	14.11(3.62)	43.13(66.29)	36.53
<i>T. viride</i> (ST)	5g/kg	93.33(73.10)	17.13(4.05)	30.95(63.30)	35.49
Tilt 25 EC (ST)+one spray of Tilt 25 EC	1mL/L+1mL/L	91.00(73.01)	2.50(2.86)	89.92(71.46)	40.62
<i>L. camara</i> (ST)+one spray of Tilt 25 EC	250mL/L+1mL/L	86.67(69.39)	3.50(3.39)	85.89(67.91)	40.23
<i>T. viride</i> (ST)+one spray of <i>T. viride</i>	5g/kg+5g/L	92.00(73.56)	7.54(4.97)	69.76(56.61)	36.69
Tilt 25 EC (ST)+two sprays of Tilt 25 EC	1m/+1mL/L	85.67(68.63)	0.00(0.00)	100.00(89.96)	42.25
<i>L. camara</i> (ST)+two sprays of <i>L. camara</i>	250mL/L+250mL/L	89.00(72.32)	4.52(3.84)	81.85(64.76)	37.96
<i>T. viride</i> (ST)+ two sprays of <i>T. viride</i>	5g/kg+5g/L	91.33(73.10)	6.50(4.62)	73.80(59.18)	36.87
Tilt 25 EC (ST)+one spray of <i>L. camara</i> +one spray of Tilt 25 EC	1mL/L+250mL/L+1mL/L	90.33(72.76)	0.00(0.00)	100.00(89.96)	43.56
Tilt 25 EC (ST)+one spray of <i>T. viride</i> +one spray of <i>L. camara</i>	1mL/L+5g/L+250mL/L	86.00(66.07)	1.03(1.81)	95.84(78.42)	41.66
Control	-	90.00(72.89)	24.81(9.05)	-	34.84
CD (P=0.05)	-	4.24	0.12	0.83	2.43

ST= seed treatment

For artificial inoculation, sporidial suspension (50,000 sporidia/mL) were sprayed at ear emergence stage 48 hrs prior to be sprayed of fungicides.

In single spray treatment, spray was given at 50% emergence of ear head

In double spray treatments, first spray was given at flag leaf stage followed by another spray at 50% emergence of ear head

Figures in parenthesis values has given arc sine value

Commercial formulation of *T. viride* (Ecoderma)

disease control. Use of *L. camara* extract and bio-control agents *T. viride* (Ecoderma) along with seed treatment of Tilt 25EC has been integrated for the first time and seems to have considerable potential in the management of Karnal bunt of wheat under field conditions.

## CONCLUSIONS

In the present findings, hundred per cent disease control and maximum yield was achieved due to the effect of seed treatment and two additional sprays of Tilt 25EC. Seed treatment and one foliar spray of Tilt 25EC resulted in 89.96 per cent disease control.

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