Seed Research, Vol. 35(2): 265-267, 2007

Short Communication

Efficacy of Bioagents in Combination with Vitavax for the Control of Loose Smut of Wheat

R.C. SHARMA[1], J.C. DUHAN[2], O.P. SHARMA[3], J.P. SRIVASTAVA[4], R.C. RAI[5], DHARAM SINGH[6], K. VISHUNAVAT[7], H.S. CHEEMA[8] AND ASHOK GAUR

Coordinating Unit, National Seed Project, Divtsion of Seed Science and Technology, IARI, New Delhi 110 012
ramesh_pau@yahoo.com

In vitro studies on biocontrol of loose smut of wheat have shown significant antagonistic activity of various species of *Trichoderma, Gliocladium* and *Bacillus* against the pathogen, *Ustilago segetum* var. *tritici* [1, 2]. In view of the above, a coordinated experiment was planned to evaluate the efficacy of the bioagents either alone or in combination with Vitavax (Carboxin) under field conditions. The experiment was conducted for three crop seasons from 1999-2000 to 2001-02 on the artificially inoculated seed of wheat variety PBW 343 at eight coordinating centres viz. PAU, Ludhiana; CCS, HAU, Hisar; CSK, HPKV, Palampur; NDUA&T, Faizabad; RAU, Dholi; IARI, RRS, Karnal; GBPUA&T, Pantnagar and RRS, Durgapura and the results are reported in the respective annual reports of National Seed Project (NSP). Though, the data is not properly consolidated and analyzed but it gives an useful information about the efficacy of biocontrol agents against the control of loose smut, thus reproduced in Seed Research (Table 1).

The inoculated seed was prepared at PAU, Ludhiana and treated at RRS, Karnal. In all, eleven seed treatments viz. T_1 (*T. viride* @ 0.4%), T_2 (*T. harzianum* @ 0.4%), T_3 (*G. virens* @ fresh culture from 4 plates, 100 mm diameter, per kg seed), T_4 (*P. fluorescence* @ 0.4%), T_5 (*T. viride* @ 0.3% + Vitavax @ 0.125 %), T_6 (*T. harzianim* @ 0.3% + Vitavax @ 0.125 %), T_7 (*G. virens* @ 4 plates + Vitavax @ 0.125 %), T_8 (*P. fluorescence* @ 0.3% + Vitavax @ 0.125 %), T_9 (Vitavax @ 0.125%), T_{10} (Vitavax @ 0.250%), T_{11} (Water soaking for 4 hours followed by drying in the sun) and T_{12} (Control i.e. untreated seed) were given and seed was dispatched to respective centres for sowing in 2m x 1.7m plots with 4 replications of each treatment during *Rabi* 1999, 2000 and 2001. The loose smut incidence (based on number of tillers) was recorded after ear emergence.

All the four biocontrol agents showed some noticeable antifungal activity as compared to control treatment which varied from centre to centre (Table 1). *P. fluorescence* showed marginally higher activity than others. The bioagents are known to produce some antifungal compounds (antibiosis) which are imbibed by the seed and act on the pathogen resting in or on the seed [3, 4, 5, 6]. However, in the present case, the above said bioagents when directly applied for dressing with or without chemical treatment, did not provide the protection with half the dose of Vitavax [1, 2]. It is understandable from the fact that under laboratory evaluation, the bioagents were tested by placing them in direct contact of the seed. Thus, probably, the bioagents were not fully capable of producing the enough quantity of toxin within a short time (2-3 days) which can be imbibed by the seed to kill the pathogen in the embryo before it moves systemically to the growing point. However, multilocation field trials conducted by the

[1]PAU, Ludhiana; [2]CCS, HAU, Hisar; [3]CSK, HPKV, Palampur; [4]NDUA&T, Faizabad; [5]RAU, Dholi; [6]IARI, RRS, Karnal; [7]GBPUA&T, Pantnagar

Received February 2007 Revised May 2007 Accepted July 2007

Table 1. Evaluation of bioagents in combination with Vitavax for the control of loose smut of wheat

Centre	Year	Treatments												
		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	
		Trichoderma viride 0.4%	*T. harzianum* 0.4%	*Glyocladium virens*	*P. fluorescence*	T_1+Vitavax (0.3%+ 0.125%)	T_2+Vitavax (0.3% +0.125%)	T_3+Vitavax (4 plates +0.125%)	T_4+Vitavax 0.125%	Vitavax 0.125 %	Vitavax 0.250 %	Water soaking	Control	CD at 5%
Dholi	1999-2000	7.58	9.73	-	0.77	0.06	0.06	0.00	0.00	0.12	0.05	-	11.16	-
	2000-2001	18.00	23.05	17.82	17.75	0.44	0.16	0.16	0.27	0.68	0.09	16.00	24.48	-
	2001-2002	15.60	16.17	11.76	14.81	0.48	0.32	0.23	0.25	0.33	0.20	13.5	17.55	-
	Average	13.73	16.32	14.79	11.11	0.33	0.18	0.13	0.17	0.38	0.11	14.75	17.73	-
Pantnagar	1999-2000	-	-	-	-	-	-	-	-	-	-	-	-	-
	2000-2001	12.74	17.31	13.43	9.11	0.05	0.11	0.0	0.06	0.08	0.04	8.67	21.63	-
	2001-2002	12.97	8.92	1.10	0.00	4.01	4.40	4.71	1.99	1.83	0.62	3.71	11.50	-
	Average	12.86	13.12	7.27	4.56	2.03	2.26	2.36	1.03	0.96	0.33	6.19	16.57	-
Faizabad	1999-2000	4.76	5.91	-	0.11	0.51	0.49	0.00	0.00	1.17	0.21	-	6.13	-
	2000-2001	4.69	6.77	4.23	4.22	0.24	0.11	0.04	0.35	0.41	0.09	3.79	7.72	3.15
	2001-2002	10.78	9.98	7.32	13.13	0.07	0.02	0.08	0.10	0.22	0.00	8.34	12.09	5.37
	Average	6.74	7.55	5.78	5.82	0.27	0.21	0.04	0.15	0.60	0.10	6.07	8.65	4.26
Hisar	1999-2000	3.16	2.19	-	0.96	1.05	0.55	0.00	0.00	0.22	0.02	-	4.87	1.69
	2000-2001	5.87	5.42	4.66	4.63	0.08	0.25	0.00	0.11	0.32	0.04	4.37	6.63	1.53
	2001-2002	14.09	8.75	11.32	12.16	0.68	0.57	0.00	0.31	0.51	0.33	10.32	15.79	2.20
	Average	7.71	5.45	5.33	5.92	0.60	0.46	0.00	0.14	0.35	0.13	4.90	9.10	-
Ludhiana	1999-2000	7.43	7.70	-	6.06	0.41	0.57	0.02	0.08	0.88	0.27	-	8.26	2.13
	2000-2001	4.98	4.93	4.30	3.12	0.23	0.24	0.14	0.12	0.19	0.04	3.10	6.04	1.06
	2001-2002	18.41	16.57	16.48	14.34	1.29	1.53	1.29	1.33	1.26	0.16	16.40	18.56	2.40
	Average	10.27	9.73	10.39	7.84	0.64	0.45	0.48	0.51	0.78	0.16	9.75	10.95	-
Palampur	1999-2000	14.80	17.19	-	9.06	5.12	6.63	0.17	1.78	7.91	3.89	-	17.55	4.63
	2000-2001	6.43	8.68	8.38	7.48	1.13	0.21	0.53	1.44	1.11	0.07	1.78	8.81	2.74
	2001-2002	7.32	8.23	8.31	8.30	6.54	3.68	1.79	3.04	6.41	1.13	7.59	8.74	1.06
	Average	9.52	11.37	8.35	8.28	4.26	3.51	0.83	2.09	5.14	1.70	4.69	11.70	2.81
Karnal	1999-2000	7.35	6.44	-	1.98	0.27	0.86	0.11	0.07	0.55	0.11	-	6.47	1.19
	2000-2001	3.49	3.92	4.89	5.69	0.49	0.58	0.21	0.44	0.71	0.57	3.19	5.29	1.07
	2001-2002	-	-	-	-	-	-	-	-	-	-	-	-	-
	Average	5.42	5.18	4.89	3.84	0.38	0.72	0.16	0.26	0.63	0.34	3.19	5.88	1.13
Durgapura	1999-2000	-	-	-	-	-	-	-	-	-	-	-	-	-
	2000-2001	4.63	4.38	3.37	3.48	0.00	0.01	0.00	0.02	0.03	0.00	0.81	4.56	1.41
	2001-2002	13.52	12.84	13.28	11.67	0.38	0.49	0.12	0.00	0.00	0.00	7.14	14.50	4.39
	Average	9.07	8.61	8.32	7.57	0.19	0.25	0.06	0.01	0.01	0.00	3.97	9.53	-

Directorate of Wheat Research, Karnal revealed that the control of loose smut could be possible when infected seeds were first soaked in the culture filtrate of *T. viride* strain TV5-2 followed by the chemical treatment of seeds with half dose of Vitavax [7]. It was emphasized that seed soaking in culture filtrate pre-activated the fungus and suppressed the mycelial growth due the activity of antifungal metabolites of the biocontrol agent. Nevertheless, the present study shows that the control of loose smut with direct seed treatment of bioagents is not effective.

REFERENCES

1. GOUTAM MONDAL, K.D. SRIVASTAVA & R. AGGARWAL (1995). Antagonistic effect of *Trichoderma* spp. on *Ustilago segetum* var. *tritici* and their compatibility with fungicides and biocides. *Indian Phytopath.*, **48**: 466-470.
2. AGGARWAL, R., K.D. SRIVASTAVA, D.V. SINGH, P. BAHADUR & S. NAGARAJAN (1992). Possible biocontrol of loose smut of wheat (*Ustilago segetum* var. tritici). *Indian J. Biocontrol.*, **6**: 111-112.
3. BAKER, K.F. & R.J. COOK (1974). Biological Control of Plant Pathoens. W.H. Freeman, San Francisco, 433 pp.
4. OOKA, T., Y. SHIMOJIMA, T. AKIMOTO, I. TAKEDA, S. SENOH & J. ABE (1966). A new antibacterial peptide 'Suzukacillin'. *Agril. Biol. Chem.*, **30**: 700-702.
5. MEYER, C.E. & F. REUSSER (1967). A polypeptide antibacterial agent isolated from *Trichoderma viride*. *Experimentia*, **23**: 85-86.
6. KRISOSHCHEKOVA, T.G. & V.S. MISHCHENK (1990). The effectiveness of trichodermin. *Zashchita Rastenii* (Moskova), **11**: 22 (Ru.).
7. ANONYMOUS (1996). Biological control of loose smut. Directorate of Wheat Research Progress Reports of the Coordinated Experiments, 1995-96, *Crop Protection*, **V**: 66-67.