

## Interaction between Chickpea-Rhizobium and application of seed treating fungicides

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P. BHATTACHARYYA\* AND A. K. CHATTERJEE

*Pulses and Oilseeds Research Station, Berhampore, West Bengal*

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The interaction between chickpea (Mahamaya I)-*Rhizobium* with special reference to fungicidal (e.g. Thiram, Monosan and Brassicol) treatment on two locations namely Berhampore (*Rhizobium* populated soil) and Suki (*Rhizobium* free soil) were studied. Brassicol and Monosan slightly reduced the number of nodules but Thiram improved the nodule number at Berhampore. All the three fungicides had no inhibitory effect on the *Rhizobium*-chickpea association at Suki. It was also evident that Monosan and Brassicol when applied just before sowing on the gram seeds treated with *Rhizobium* had no significant inhibitory effect on the association and Thiram had no inhibitory effect at all.

**Key words :** Chickpea, *Rhizobium*, Interaction, Fungicides.

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Treatments of gram seeds with seed-treating fungicides is essential input for control of wilt disease. At the same time, seed treatment with *Rhizobium* is a common practice in pulse agronomy for getting higher yields. But sensitivity of legume-*Rhizobium* symbiosis to certain fungicides is well known. The inhibitory effect of certain fungicides on nodulation of leguminous crops was already reported (Gaur, 1980). So, the question often comes how many days before seeds will be treated with fungicides so that *Rhizobium* is not suffered. The objective of this study is to know whether there is any need to maintain specific time gap between Rhizobial treatment and fungicidal treatment on gram seeds, or not.

\*National Biofertiliser Development Centre, Government of India, Ministry of Agriculture, Department of Agriculture & Cooperation, CGO Complex II, B-204, Kamala Nehru Nagar, Ghaziabad, U. P.

## MATERIALS AND METHODS

The experiment was conducted in two locations-Berhampore and Suki. The plot size is 3 m x 1.2 m. The design is RBD with three replications, with 5 row numbers. In Berhampore, the date of sowing was 1.12.85 while the same at Suki was 28.11.85. The variety used was Mahamaya-I and the strain for *Rhizobium* was F-75. Seed treating fungicides like Thiram (Tetramethyl thiuram disulphide), Monosan (Phenyl mercuric acetate) and Brassicol (Penta chloro nitro benzene) were applied @ 3g/Kg of seed and the time gap between rhizobial treatment and fungicidal treatments were 0- day (just before sowing-JBS), 7 days, 15 days and 30 days. In each case, seed was treated with fungicides followed by *Rhizobium*. From the composite soil (mixture of all replications under individual treatment), the most probable number (MPN) count of rhizobia was measured following Vincent (1970). The estimation of leghaemoglobin content of nodules was made colorimetrically (Procter, 1963).

## RESULTS AND DISCUSSIONS

The experiment was conducted in two locations - Berhampore and Suki. Because most of the times, it is not possible to assess the adverse effect of seed treating fungicides on introduced strain of *Rhizobium* in traditional pulse growing area like Berhampore as there exists a good number of native rhizobial population which may develop considerable number of nodules as secondary infection when the toxicity of fungicides gradually becomes reduced (Bhattacharyya, 1982; Bhattacharyya and Sengupta, 1986). As such, for better understanding of the effect on introduced strain in field condition, similar study was undertaken separately in another location like Suki in non-traditional pulse growing track where the soil is almost free of native *Rhizobium*.

Perusal of the results presented in Table 1 revealed that although Brassical and Monosan applied irrespective of any time gap, slightly reduced the number of nodules at Berhampore, but the toxic effect is statistically inconsistent. This inconsistency is already explained as the soil contained sufficient number of native rhizobial population. On the otherhand, Thiram applied 30 DBS and 15 DBS improved the nodule number over both inoculated and uninoculated treatment sustaining earlier report (Fisher, 1976) where it was observed that Thiram had beneficial role on nitrogen fixation in white clover. None of the treatments both fungicides and *Rhizobium*, affected either adversely or beneficially, dry weight and leghaemoglobin content of nodules at Berhampore location.

It appeared from Table 1 that at Suki, *Rhizobium* inoculation significantly developed number, dry weight and leghaemoglobin content of nodules as

Table 1. Data\* showing the effect of fungicides on the *Rhizobium* and nodule formation in association with chickpea

S.No.	Treatment	L o c a t i o n							
		Berhampore		Suki		Suki			
		No of Rhizo- bium per g soil (MPN log 10)	Nodule No./ plant	Dry weight of nodule (mg/pl.)	Leghaemo- globin content (55600/mg nodules)	No. of Rhizo- bium per g soil (MPN log 10)	Nodule No./plant	Dry weight of nodules (mg/pl)	Legaemo- globin content (55600)/ mg nodules)
1.	*STW Rhizobium(R) alone	5.32	28	160	0.112	3.82	12	70	0.084
2.	STW Thiram(T) 30DBS*** + R	4.96	31	152	0.104	3.64	14	66	0.076
3.	STW Monosan(M) 30DBS + R	4.94	26	164	0.104	3.18	11	64	0.082
4.	STW Brassicol(B) 30DBS + R	5.14	25	160	0.116	3.24	12	72	0.082
5.	STWT 15DBS + R	4.85	30	168	0.102	3.65	12	68	0.094
6.	STWN 15DBS + R	5.10	29	158	0.105	3.39	11	66	0.086
7.	STW B 15 DBS + R	4.92	28	154	0.108	3.53	11	70	0.092
8.	STW T 7 DBS + R	5.18	27	152	0.112	3.21	11	71	0.096
9.	STW M 7 DBS + R	5.24	26	158	0.104	3.12	10	68	0.084
10.	STW B 7 DBS + R	4.98	24	160	0.108	3.16	12	64	0.088
11.	STW T JBS + R	4.96	28	158	0.106	3.12	12	65	0.084
12.	STW M JBS + R	5.10	28	162	0.104	2.96	8	47	0.082
13.	STW B JBS + R	4.98	26	160	0.106	2.68	9	58	0.076
14.	Uninoculated Control	5.24	29	164	0.108	—	—	—	—
	Mean		25.5	159.28	0.106		10.36	60.64	0.08
	CD (5%)		NS	NS	NS		7.0	26.38	0.03

\*Scored on 50 days of growth.

\*\*STW = Seed treated with ;

\*\*\*DBS = Days before sowing ;

JBS = Just before sowing ;

**Table 2.** Data\* showing the yield of chickpea under the effect of different fungicides on the *Rhizobium* chickpea association

Sl. No.	Treatment	Grain Yield ( Kg/ha )	
		Berhampore	Suki
1.	**STW <i>Rhizobium</i> (R) alone	2045	1220
2.	STW Thiram(T) 30DBS***+R	1993	1246
3.	STW Monosan(M) 30DBS+R	2020	1208
4.	STW Brassicol(B) 30DBS+R	2052	1196
5.	STW T 15 DBS+R	1990	1190
6.	STW M 15 DBS+R	2018	1224
7.	STW B 15 DBS+R	2024	1210
8.	STW T 7 DBS+R	1996	1222
9.	STW M 7 DBS+R	1900	1192
10.	STW B 7 DBS+R	2008	1198
11.	STW T JBS+R	2042	1256
12.	STW M JBS+R	2050	1240
13.	STW B JBS+R	1994	1196
14.	Uninoculated control	2004	980
	Mean	2016.5	1197
	CD(5%)	NS	102

\*Scored on 50 days of growth.

\*\*STW=Seed treated with ;

\*\*\*DBS=Days before sowing ;

JBS=Just before sowing ;

compared to uninoculated one which showed no nodules at all as the soil was completely free of *Rhizobium* of natural occurrence. Fungicides applied 30 DBS, 15 DBS, and 7 DBS produced no inhibitory effect on nitrogen fixing efficiency as is evident from the values of *Rhizobium* number, nodule number and its dry weight and leghaemoglobin content which were unaffected due to seed treatment with fungicides. Only Brassicol and Monosan applied JBS caused reduction in number as well as dry weight of nodules, although the effect was statistically non significant. Nevertheless, the effect of toxicity on the introduced strain was more clear at Suki as compared to Berhampore; This is due to absence of native *Rhizobia* at Suki, for which no secondary development was noted on nodulation. The toxicity was maximum with Monosan followed by Brassicol. Like Berhampore, the leghaemoglobin content was unaffected at Suki also

The benefit of *Rhizobium* inoculation on grain yield was obtained at Suki but not at Berhampore, although the yield is in general low at Suki as compared to Berhampore ( Table 2 ). There was not much variation in grain yield due to toxic effect of seeds, treating fungicides on *Rhizobium* treated gram seeds irrespective of any time gap, at both locations. This might be due to restricted dosage of

fungicides used. Although Monosan and Brassicol applied JBS as Suki produced little toxicity on nodule number and dry weight of nodules, but their application surprisingly showed no detrimental effect on leghaemoglobin content, the yield was also unaffected.

The data clearly indicated that seed treating fungicides like Monosan and Brassicol when applied JBS on the gram seeds treated with *Rhizobium* had little tendency to exert adverse effect on introduced chickpea *Rhizobium* strain in terms of nodulation. However, for safety point of view, it is better to maintain 7 days time gap between the treatment of *Rhizobium* and fungicides like Monosan and Brassicol on gram seeds. As Thiram is found not to produce any inhibitory effect either on nodulation or on grain yield, there is no need to keep any specific time gap in this regard.

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