FLORA AND FAUNA

2016 Vol. 22 No. 2 PP 215-220 ISSN 0971 - 6920

FUNGICIDE TOLERANCE AGAINST STRAINS OF *BRADYRHIZOBIUM JAPONICUM*

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Received **:** 25.8.16; ***Accepted*** : 22.10.16

ABSTRACT

Ten strains of *Bradyrhizobium japonicum* were isolated from ten localities from Pravara area and labeled as B_1, B_2, B_3, B_4, B_5 ……. B_{10}. These isolates were tested for different fungicides combination From the finding it was interesting to note that the *B. japonicum* strains showed variation in resistance to different fungicides combination.

Figure : 00 References : 11 Tables : 04

KEY WORDS : *B. japonicum*, Fungicides combination, *Glycine max* strains

Introduction

Soybean (*Glycine max)* is an important crop plant belonging to family Papiliniocaceae now called as golden bean contain 40% protein, 20% carbohydrates, 3.80% crude fibers, vit.A, vit. B and vit. C. in India. It is cultivated during kharif season in Maharashtra it is cultivated in different district. Nitrogen fixation in soybean takes place with nodule formation. Nodule development on soybean is a sort of communication between host root and bacteria i.e. release of isoflavonoids by host and recognisation by expressing nod factor and invade root hair and multiply and form nodule.

Nitrogen fixation process depends upon successive symbiosis between bacteria and host plant i.e. size, number of root nodules as well as biomass. Significant increase in number and size of nodule increases crop productivity of soybean, earlier flowering, and number of seed[1,5,9].

Besides nitrogen fixation, *B.japonicum* produce extracellular substances like vitamins, growth promoting substances which enhance the seed germination, quick initial growth of tap root and early plant development[1,3].

Using fungicides crop diseases control in legume fields has contributed to increase yield and improved quality[4]. Fungicides not only affect plant growth but also have a detrimental effect on soil microorganisms growth and metabolism[2,6]. Some studies have been evaluated on the effect of different fungicides on Rhizobium bacteria growth and nitrogen fixation capacity[10,11]. Rhizobium isolates have different wide resistance to fungicides[7,8], therefore efforts were taken to investigate the effects of fungicides on growth of *B.japonicum* isolates

Materials and Methods

Uprooted soybean plants from ten localities at Pravaranagar (Dist. Ahmednagar) were brought to the laboratory, roots were washed, and pink nodules were collected in beaker and washed with distilled water. The nodules were surface sterilized in 0.1% $HgCl_2$ for 5 min, rinsed four times with sterilized distilled water, treated with 70% ethyl alcohol for 3 min. and repeatedly washed with sterilized distilled water. Nodules were crushed with 1 ml. water and suspensions of *B. japonicum* were made. Serial dilutions of nodule extract were prepared and 1ml of 10^{-6} dilution was spread on sterile Congo red Yeast Extract Mannitol Agar (CREYEMA) plates. The plates were incubated at $26^0C \pm 2^0C$ for 4 days. Large gummy colonies of *Rhizobia* appeared on CREYEMA plates within 3 days. Ten strains of *Rhizobia* were isolated as B_1, B_2,B_3,B_4,B_5 ……. B_{10} , strains were maintained on CREYEMA slants. The efficiency of isolates was studied against different fungicides like Bavistin, Mancozeb, SAAF+Mancozeb at different ppm

TABLE - 1 : Resistance of *B. japonicum* strains against SAAF fungicide

Strain	Concentrations in ppm								
	20	40	50	100	1000	2000	3000	4000	Control
B_1	+++	++	-	-	-	-	-	-	+++
B_2	+++	++	-	-	-	-	-	-	+++
B_3	+	-	-	-	-	-	-	-	+++
B_4	+++	++	-	-	-	-	-	-	+++
B_5	+++	+++	+++	++	++	++	+	-	+++
B_6	+++	++	++	-	-	-	-	-	+++
B_7	+++	++	-	-	-	-	-	-	+++
B_8	+++	++	++		-	-	-	-	+++
B_9	+++	++	-	-	-	-	-	-	+++
B_{10}	+++	++	-	++	++	++	-	-	+++

TABLE- 2 : Resistance of *B. japonicum* strains against Bavistin fungicide

Strain	Concentration in ppm								
	100	250	500	1000	2000	2500	3000	3500	Control
B_1	+++	+++	++	++	+	-	-	-	+++
B_2	+++	+++	++	++	+	-	-	-	+++
B_3	+++	+++	++	++	+	-	-	-	+++
B_4	+++	+++	++	++	+	-	-	-	+++
B_5	+++	+++	++	++	++	-	-	-	+++
B_6	+++	+++	++	++	++	+	+	-	+++
B_7	+++	+++	++	++	+	-	-	-	+++
B_8	+++	+++	++	++	++	-	-	-	+++
B_9	+++	+++	++	++	+	-	-	-	+++
B_{10}	+++	+++	++	++	+	-	-	-	+++

TABLE - 3 : Resistance of *B. japonicum* strains against Mancozeb fungicide

Strain	Concentration in ppm							
	500	1000	2000	2500	3000	3500	4000	Control
B_1	+	-	-	-	-	-	-	+++
B_2	+++	+++	+++	+++	++	++	-	+++
B_3	+++	++	-	-	-	-	-	+++
B_4	+	-	-	-	-	-	-	+++
B_5	+	-	-	-	-	-	-	+++
B_6	+	-	-	-	-	-	-	+++
B_7	+++	+	-	-	-	-	-	+++
B_8	+++	+	-	-	-	-	-	+++
B_9	+++	-	-	-	-	-	-	+++
B_{10}	+	-	-	-	-	-	-	+++

TABLE - 4 : Resistance of *B. japonicum* strains against SAAF+ Mancozeb Fungicide

Strain	Concentrations in ppm							
	25	50	100	200	400	800	1000	Control
B_1	+++	+	-	-	-	-	-	+++
B_2	+++	++	++	-	-	-	-	+++
B_3	+++	+	-	-	-	-	-	+++
B_4	+++	++	++	++	+	+	-	+++
B_5	+++	++	++	++	+	+	-	+++
B_6	+	-	-	-	-	-	-	+++
B_7	+++	++	++	++	+	-	-	+++
B_8	+++	++	++	++	+	-	-	+++
B_9	+++	+++	++	++	-	-	-	+++
B_{10}	+++	-	-	-	-	-	-	+++

concentrations by food poisoning techniques. Equal volume of sterile double strength nutrient and double strength concentration of fungicides were mixed in petridishes. After solidification of plates a loopful isolate were inoculated on plates aseptically and incubated at room temp. The observations were recorded in the form of growth of colonies.

Results and Discussions

Resistance against different fungicides (Tables 1 - 4) indicates that all the strains except B_3 were resistant to 20 ppm conc. of SAAF. However, B_5 strain was proved to be highly resistant to 50 ppm SAAF conc. For Bavistin (Table - 1) B_5, B_6, and B_8 proved their resistance up to 2000 ppm conc., to Mancozeb fungicide (Table - 2) only B_2 strains proved their resistance upto 3500 ppm conc. However, the remaining strains have proved their resistance up to 5000 ppm., to SAAF + Mancozeb combination (Table - 4) B_4 and B_5 showed their resistance up to 800 ppm conc. However B_7 and B_8 up to 400 ppm conc. and others were to the range 25 to 100 ppm conc. The variation in resistance in *R. japonicum* strains have pointed out that murcury based fungicides inhibits growth of *Rhizobium.* Worker[11] supported that carbendazim pyroxychlore and quintozene were least toxic and thiram the most toxic followed closely by captan, zineb, chlorothalonil, dodine, folpet and benomyl.

References

1. ASANUMA, K.I. (1980) Effect of nodulation on the growth and chemical composition of soybean plants. *Technical Bulletin of Faculty of Agriculture, Kagwa University.* **32** : (1):1-7.
2. CASTRO, S., VINOCUR, M., PERMIGIANI, M., HALLE, C., TAURIANT, FARBA, A. (1997) Interaction of the fungicide mancozeb and Rhizobiumsp. in pure culture and under field conditions. *Biol Fertil. Soils.* **25** : 147-151.
3. DIATLOFF, A. (1986) Compatibility of systemic and non systemic fungicides with *Rhizobium japonicum* applied to soybean seeds. *Soil Biol. Biochem.* **18** (1) : 121-122.
4. FOX, J.E., GULLEDGE, J., ENGELHAUPT, E., BUROW, M.E., MCLACHLAN, J.A. (2007) Pesticides reduce symbiotic efficiency of nitrogen-fixing rhizobia and host plants. *Proc. Nat. Acad. Sci. USA,* **104** : 10282-10287.
5. IBRAHIM, S.A. AND MAHMOUD, S.A. (1989) Effect of inoculation on growth, yield and nutrients uptake of some soybean varieties. *Egyptian J. Soil Sci.* **29** (2) : 133-142.
6. LENNOX, L.B. AND ALEXANDER, M. (1981) Fungicide enhacement of nitrogen fixation and colonization of *Phaseolus vulgaris* by *Rhizobium phaseoli*. *Appl. Environ. Microbiol.* **41** : 404-411.
7. MARTYNIUK, S., ORON, J. AND MARTYNIUK, M. (1999a) Interaction between chemical seed dressings and *Bradyrhizobium* inoculant on lupine seeds. *Bot. Lithuan.* **3** : 95-98.
8. MARTYNIUK, S., WOZNIAKOWSKA, A., MARTYNIUK, M. AND ORON, J. (1999b) Interaction between chemical dressings and *Rhizobium* inoculant on pea seeds. *Prog. Plant Prot.* **39** (1) : 120-125.
9. RAHMAN, M.M. AND SONARIA, C.L. (1990) Effect of *Bradyrhizobium japonicum* strains on growth and N_2-fixation rate of soybean. *Annals of Agric Res.* **11** (2) : 205-207.
10. RENNIE, R.J. AND DUBETZ, S. (1984) Effect of fungicides and herbicides on nodulation and N2 fixation in soybean fields lacking indigenous *Rhizobium japonicum. Argon. J.* **76** (3) : 451-454.
11. TU, C.M. (1981) Effect of fungicides on growth of *Rhizobium japonicum* and symbiotically grown soybean in soil under laboratory conditions. *Prot. Ecol.* **3** : 41-46.