Research Paper :

Effect of bio-agent seed treatments on seed and seedling diseases of groundnut

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SUMMARY

Experiment was conducted on the effect of bio-agent seed treatments on seed and seedling disease of groundnut variety Amber with three treatments and three doses of each treatment. Observations were recorded on seed germination, seedling length and seed vigour index and appearance of disease in response to application of different treatments and their doses. It was observed that *T. viride* @ 8 g/ kg seed was found most effective in improving the seed germination and reducing disease incidence of groundnut as compared to *Rhizobium* and PSB at their different doses.

Key words : Groundnut, Bio-agent and seed vigour index

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Groundnut (*Arachis hypogaea* L.) being a legume oilseed crop plays a double role in building of the economy of the country. The most valuable product from this oilseed is the oil and that from legume, the protein. It builds up the soil fertility by fixing atmospheric nitrogen through the root nodules and also is an efficient cover crop for land exposed to soil erosion. Being an oilseed crop, it contains 40 to 60 per cent oil. In addition to protein, groundnut is a good source of calcium, phosphorus, iron, zinc and boron. It also contains vitamin E and small amount of vitamin B complex. Like other crops, groundnut also suffers from several fungal, viral, bacterial and nematode diseases. Considering the importance of groundnut and the losses caused by diseases to this crop particularly at seed and seedling stages, several methods have been used to reduce the disease losses but still there is need to find out an effective and eco - friendly method to reduce the disease losses through bio-agent / bio pesticide. Therefore, this experiment was planned for investigation.

MATERIALS AND METHODS

The experiment was conducted on groundnut variety "Amber'' collected from seed processing plant of C.S.A. University of Agriculture and Technology, Kanpur. The bio-agents included in the test were *Trichoderma viride*, *Rhizobium* and PSB (Phosphorus solubilizing bacteria) @ 4, 6 and 8 g/ kg seed. The laboratory work was done under controlled conditions in the Seed Testing Laboratory of Seed Science and Technology Department, C.S.A.University of Agriculture and Technology, Kanpur during 2008-09.

Laboratory analysis :

The collected seeds were tested for the following quality parameters:

Germination test :

Four hundred seeds were tested for germination in four replications of 100 each in completely randomized block design. The medium used for germination was between papers (B.P.). The seeds were tested and placed for germination in germination chamber at 25^0 C along with control.

Observations recorded on standard germination test as normal seedlings (%), abnormal seedlings (%), dead seeds (%) and dormant seeds (%). First and final counts on 5^{th} and 10^{th} day of putting of the samples as normal, abnormal seedlings, dead and dormant seeds were noted.

Measurement of seedling length:

Ten seedlings were randomly taken from each replication on final count day. Total seedling lengths (root + shoot length) were immediately measured in cm and averaged.

Seedling vigour index:

Seedling vigour index = Germination (%) x Total seedling length (cm) was calculated.

The following methods were used for the screening of seed samples for the presence of the pathogens**.**

Inspection of seeds:

First of all, four hundred seeds from each samples, were examined by naked eye and then under stereoscopic binocular microscope for the presence of discoloration, malformation and fungal bodies and fungal mycelium on seeds.

Four hundred seeds per samples in four replications each of one hundred seeds were tested by Standard Blotter Method. Ten randomly selected seeds from each sample were planted on three moist blotters at equal distance with the help of sterilized forceps in each 9.5 cm Petri dish. These seeds were then incubated at 25^0 C for seven days under twelve hour altering cycle of light and darkness (ISTA, 1985). These seeds were examined for the presence of *A. flavus*, *A. niger* and *Fusarium oxysporium* under stereoscopic binocular and then under compound microscope.

RESULTS AND DISCUSSION

It is clear from Table 1 that the doses (bio-agent) applied and interaction of treatments did not show significant effect on germination. All the treatments were found to differ significantly from one other**.** The minimum germination was recorded in *Rhizobium* (70.83 %) and maximum was found in *Trichoderma viride* (77.81 %). Raju and Murthy (2000) tested the efficacy of *T. harzianum* and *T. viride* by soaking the seeds in the spore's suspension of *Aspergillus niger* @ 15 ml/ 30 seeds for five minute. The inoculation of seed reduced the germination percentage to 36 per cent as compared to 68 per cent in control. However, the seed germination by inoculating seed with T. *harzianum* and *T. viride* reported the germination up to 80 and 70 per cent, respectively.

While accounting the effect of bio-agent seed treatments and their doses on seedling length of groundnut (Table 2) revealed that highest seedling length was recorded in *T. viride* (6.49 cm) while minimum was recorded in PSB (3.25 cm). *T. viride* and *Rhizobium* also showed significantly difference to each other. Minimum seedling length was obtained in dose @ 4 g/ kg seed (4.22 cm) while maximum was recorded in dose @ 8 g/ kg seed (5.32 cm). The interaction of treatments and doses had also been observed by Zaidi (2003) when he incited soybean with *Bradyrhizobium* and *Pseudomonas fluorescens* he recorded improved seedling stand, seedling length and dry matter in comparison to control.

Table 1: Effect of bio-agent seed treatments and their doses on germination of groundnut

Treatments	Dose			
	@ 4 g/kg seed	@ 6 g/kg seed	@ 8 g/kg seed	Mean
Trichoderma viride	60.93 (76.39)	61.80 (77.67)	62.96 (78.82)	61.90 (77.81)
Rhizobium	52.22 (62.47)	57.21 (70.77)	57.44 (71.03)	57.31 (70.83)
PSB	58.28 (73.36)	59.05 (73.55)	59.64 (74.45)	59.00 (73.47)
Mean	58.81 (78.18)	59.37 (74.04)	60.02 (75.03)	59.40 (74.09)
	Treatment	Dose		TxD
S.E. $\pm$	1.26	1.26		2.18
C.D. (P=0.05)	2.50	NS		NS

Figures in parentheses indicate percentage NS-Non significant

Table 2 : Effect of bio-agent seed treatments and their doses on seedling length of groundnut

Treatments	Dose			
	@ 4 g/kg seed	@ 6 g/kg seed	@ 8 g/kg seed	Mean
Trichoderma viride	6.36	5.57	7.55	6.49
Rhizobium	3.57	4.26	4.23	4.02
PSB	2.73	2.86	4.16	3.25
Mean	4.22	4.23	5.32	4.59
	Treatment	Dose		TxD
S.E. $\pm$	0.29	0.29		0.50
C.D. (P=0.05)	0.57	0.57		NS

NS-Non significant

As regard effect of bio-agents seed treatment and their doses on seed vigour index (Table 3) it revealed that the highest seed vigour index was observed in *T. viride* (507.78) while minimum was recorded in PSB (238.80). *T. viride* and *Rhizobium* showed significantly differences to each other. The dose, 8 g/kg seed differed significantly from doses of 4 and 6 g/kg seed. The minimum seed vigour index was obtained in 4 g/kg seed (313.72). The maximum seed vigour index was recorded in *T. viride* @ 8 g/ kg seed (598.94) while minimum was found in PSB @ 4 g/ kg. Ravi and Thipees (2007) also reported the seedling growth, increased vigour index and biomass of sesame, groundnut and castor crops.

Effect of bio-agent seed treatments and their doses on *Aspergillus niger* (collar rot) of groundnut has been illustrated in Table 4 which reveals that lowest disease incidence was recorded in *T. viride* (12.39%) followed by PSB (14.39 %) while *Rhizobium* has shown highest disease incidence (18.74%). *T. viride* was found most effective in reducing collar rot disease incidence. Different doses of different treatments have not shown significant differences over each other. Combinations of *T. viride* @ 8 g/ kg seed have shown lowest disease incidence (11.64 %) as compared to *T. viride* @ 6 g/ kg seed (12.64) and *T. viride* @ 4 g/ kg seed (12.92) followed by PSB @ 8 g/ kg seed (14.29 %) , PSB @ 6 g/ kg seed (13.88%) and PSB @ 4 g/ kg seed (14.99 %). The highest disease incidence was found in *Rhizobium* @ 4 g/kg seed (20.98 %), @ 6 g/ kg seed (17.87 %) and 8 g/ kg seed (17.32 %) combinations. Biswas and Gupta (2005) reported that *T. viride* was most effective in inhibiting the growth of *Macrophomina phaseolina in vitro* as well as in reducing the incidence and sclerotial emergence *in vivo*, causing charcoal rot in soybean.

As regard the effect of bio-agent seed treatments on *Fusarium oxysporium* (wilt) of groundnut, Table 5 reveals that lowest disease incidence was recorded in *T. viride* (8.06%) followed by *Rhizobium* (10.70 %) . While PSB has shown highest disease incidence (12.70 %). The doses @ 8 g, 6 g and 4 g/ kg seed have shown their efficacy in reducing disease incidence in reducing manner. Interactions of treatment and disease have shown significant difference to each other. Combination of *T. viride* @ 8 g/ kg seed has shown highest efficacy in reducing disease incidence up to (7.32 %) followed by *T. viride* @ 6 g/kg seed (7.63 %) while the maximum incidence was recorded in PSB @ 4 g/ kg seed. Similar results have been shown by Sangli and Bambawale (2004) who reported *in vitro* evaluation of the antagonists against *F. oxysporum* f. sp. *sesami* in which *T. viride* reduced the growth of pathogen 83.18 % and *T. harzianum* reduced the growth upto 79.54 per cent.

Table 3 : Effect of bio-agent seed treatments and their doses on seed vigour index

Treatments	Dose			
	@ 4 g/kg seed	@ 6 g/kg seed	@ 8 g/kg seed	Mean
Trichoderma viride	485.45	429.95	598.94	507.78
Rhizobium	252.25	301.01	300.35	284.53
PSB	197.46	209.72	309.21	238.80
Mean	313.72	313.56	402.83	342.70
	Treatment		Dose	TxD
SE (diff.)	7.70		7.70	13.33
CD (P=0.05)	15.24		15.24	26.39

Table 4: Effect of bio-agent seed treatments and their doses on *Aspergillus niger* (collar rot of groundnut)

Treatments	Dose			
	@ 4 g/kg seed	@ 6 g/kg seed	@ 8 g/kg seed	Mean
Trichoderma viride	21.07 (12.92)	20.83 (12.64)	19.95 (11.64)	20.61 (12.39)
Rhizobium	27.76 (20.98)	25.01 (17.87)	24.59 (17.32)	25.65 (18.74)
PSB	22.78 (14.99)	21.87 (13.88)	20.21 (14.29)	22.29 (14.39)
Mean	23.70 (16.15)	22.57 (14.73)	21.58 (13.53)	22.85 (15.08)
	Treatment		Dose	TxD
SE (diff.)	0.82		0.82	1.41
CD (P=0.05)	1.62		N.S.	N.S.

Figures in parentheses indicate percentage
NS- Non significant

Table 5 : Effect of bio-agent seed treatments and their doses on *Fusarium oxysporium* (wilt of groundnut)

Treatments	Dose			
	@ 4 g/kg seed	@ 6 g/kg seed	@ 8 g/kg seed	Mean
Trichoderma viride	17.72 (9.26)	14.04 (7.63)	15.70 (7.32)	16.49 (8.06)
Rhizobium	22.24 (14.33)	18.05 (9.60)	16.98 (8.53)	19.09 (10.70)
PSB	26.50 (19.91)	17.44 (8.98)	18.69 (10.26)	20.88 (12.70)
Mean	22.15 (14.29)	17.18 (8.72)	17.13 (8.67)	18.82 (10.41)
	Treatment		Dose	TxD
SE (diff.)	0.79		0.79	1.36
CD (P=0.05)	1.56		1.56	2.70

Figures in parentheses indicate percentage

Table 6 : Effect of bio-agent seed treatments and their doses on *Aspergillus flavus* (yellow mould of groundnut)

Treatments	Dose			
	@ 4 g/kg seed	@ 6 g/kg seed	@ 8 g/kg seed	Mean
Trichoderma	15.70	11.76	11.15	12.87
viride	(7.32)	(4.15)	(3.74)	(4.96)
Rhizobium	18.09	15.70	14.92	16.24
	(9.64)	(7.32)	(6.63)	(7.82)
PSB	14.50	14.04	13.55	14.03
	(6.27)	(5.89)	(5.49)	(5.88)
Mean	16.10	13.83	13.21	14.38
	(7.69)	(5.72)	(5.22)	(6.17)
	Treatment		Dose	TxD
SE (diff.)	0.74		0.74	1.28
CD (P=0.05)	1346		1.46	NS

Figures in parentheses indicate percentage
NS-Non significant

In case of assessing the effect of bio-agent seed treatments on *Aspergillus flavus* (yellow mould) incidence (Table 6) reveals that lowest incidence was recorded in *T. viride* (4.96%) followed by PSB (5.88%) and *Rhizobium* (7.82%). The interactions of treatments have shown significant differences to each other. *T. viride* @ 8 g/ kg seed has shown highest efficacy in reducing disease incidence. Shivani *et al*. (2005) reported that PS_I and Ps_{11} reduced incidence of collar rot by 69.80 and 56.90 %, respectively, in *Sclerotium rolfsii* infested soil making the organism a potential bio control agent against collar rot of sunflower.

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