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Study on the Effect of Seed Treatment and Foliar Application using Different Bio-Inoculants on the Seed Quality Characters of Groundnut Variety (VRI 2)

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ABSTRACT: Studies were initiated to evaluate the influence of seed priming technique (*Tricoderma viride* 10%, *Tricoderma viride* 10% + Rhizobium 10%, *Tricoderma viride* 10% + Rhizobium 10% + Phosphobacteria 10%, Carbendazim + Rhizobium 10% + Phosphobacteria 10%and control) in conjunction with crop management techniques *viz*., foliar spray (Panchakavya 1 %, Ground nut rich 1% and Panchakavya 1 % + Ground nut rich 1%) along with NPK application. The results revealed that seeds primed with *Tricoderma viride* 10% + Rhizobium 10% + Phosphobacteria 10%,and foliar sprayed with 1 % ground nut rich as crop management technique improved the productivity of ground nut and the seed recovery. On comparison of seed and crop management techniques the contribution of seed management technique was higher than crop management techniques.

Keywords: Ground nut – seed treatments – foliar spray – ground nut rich.

INTRODUCTION

Groundnut is called as the 'king' of oilseeds. It is one of the most important food and cash crop of our country. Groundnut is also called as wonder nut and poor man's cashew nut. The groundnut is particularly valued for its protein content (26%). Nodules formed by the native strains may not be able to fix sufficient nitrogen to meet the demand of the plant. But recent studies showed that Rhizobium inoculant has a favourable effect on legumes like groundnut (Singh *et al*., 1988). This inoculant helps to meet the additional nitrogen demand of the plant, by increasing nodulation, enabling realization of the yield potential of the plant. Cobalt increases nodule formation (Malla Ready *et al*., 2011). Groundnut (*Arachis hypogaea* L.) is one of Late leaf spot caused by *Cercosporidium personatum* is the destructive foliar disease in groundnut. The most obvious effect of this disease is the loss of photosynthetic tissue, which leads to premature defoliation. Late leaf spotis almost co-existent with the crop and contributes to loss in yield throughout the world (Choudary *et al.*, 2014). The control of leaf spot disease is becoming difficult as most of the cultivars are susceptible and no variety is absolutely resistant to the disease. Biological control of plant diseases using antagonistic bacteria is now considered as a promising alternative to the use of hazardous chemical fungicides. Late leaf spot is almost co- existent with the crop and contributes to significant loss in yield throughout the world (Choudary *et al*., 2014).

Organic farming in recent years is gaining impetus due to realization of inherent advantages as it confers in sustaining crop production and also in maintaining dynamic soil nutrient status and safe environment (Natarajan, 2002). Panchagavya, an organic product has potential to play the role in promoting growth and providing immunity in plant system. The use of organic liquid such as panchagavya results in higher growth, yield, and quality of crops. Different species of insect pests were reported to be associated with groundnut in different required of the country. Usually the management the pests is insecticide oriented, but the problems associated with synthetic chemicals *viz.* development of pest resistance objectionable pesticide residue and higher cost etc, has necessitated development of new control methods. Several plants and its product are known to be potential resources. The present study leaf extracts of different plants were associated with panchagavya.

The field experiment was laid out in a Randomized block design (RBD) with 8 treatment combinations comprised of five sources of seed treatment and three sources of foliar application having three replications. These sources of foliar application were applied either at branching or flowering and both at branching plus flowering stages. The initially prepared and filtered solution of panchagavya was diluted with water and applied on the crop foliage as per treatment.

The control of leaf spot disease is becoming difficult as most of the cultivars are susceptible and no variety is absolutely resistant to the disease. Biological control of plant diseases using antagonistic bacteria is now considered as a promising alternative to the use of hazardous chemical fungicides. abilities and their capacity to produce a wide range of antifungal metabolites. Bio-pesticides are cheaper, eco-friendly and do not pose risk of the pathogen developing resistance. Plant growth promotion and yield increase are the twin additional benefits from PGPR.

METHODS AND MATERIALS

Genetically pure seeds of groundnut var. VRI 2 was primed with liquid, biofertilizers under ambient conditions of coimbatore (11°1′6″N, 76°58′21″E) adopting the seed to solution ratio of 1:1and the soaking duration of 8 h.

Experiment 1: Effect of seed treatments and foliar applications on plant population, growth, yield attributes and yield.

Variety: VRI 2
No. of treatments: 8
No. of Replications: 3
Design: RBD
Area: 3 cents

Treatments:

T1: Control
T2: *Tricoderma viride* 10%
T3: *Tricoderma viride* 10%+ Rhizobium 10%
T4: *Tricoderma viride* 10% + Rhizobium 10% + Phosphobacteria 10%
T5: carbendazim + Rhizobium 10% + Phosphobacteria 10%
F1: Foliar application of Panchakavya 1%
F2: Foliar application of groundnut rich 1%
F3: Foliar application of Panchakavya1%+groundnut rich 1%

The experimental design adopted was factorial RBD with three replications. The crop raised with the above treatmental schedule were evaluated for the yield and yield attributing characters *viz*., Field emergence, Plant height, Number of branches per plant after sixty days of sowing, Fifty Percent Flowering, Pod yield/plant, Number of seeds/ Plant, Seed yield/Plant and Seed yield/ha, which was computed to seed yield per hectare.

Experiment 2: Effect of seed treatments on groundnut in laboratory conditions

Crop: Groundnut (VRI 2)
Treatments: 5 Treatments
Replications: 4
Design: CRD
Soaking duration: 6hours

Treatments:

T1: Control
T2: *Tricoderma viride* 10%
T3: *Tricoderma viride* 10% + Rhizobium 10%
T4: *Tricoderma viride* 10% + Rhizobium 10%+ Phosphobacteria 10%
T5: carbendazim + Rhizobium 10% + Phosphobacteria 10%

The experimental design adopted was factorial CRD with three replications. The germination (%) shoot length and root length was evaluated as per Anon, (2007). The normal seedlings of the germination test were measured for dry matter production with all seedlings. Based on the germination and vigour index values as per Abdulbaki and Anderson (1973) were computed. The data gathered were statistically scrutinized as per Panse and Sukhatme, (1985) at 5 percent probability level.

RESULTS AND DISCUSSION

Seed treatments decide the germination percentage of seeds under ambient conditions (Vijayakumar *et al.*, 1991). Application of bio fertilizer to the seeds is another simplest method of microbial inoculation towards productivity (Millet and Feldman 1986). Fages, (1994) opined that formulation of inoculant favours the dormant state of the organisms and the cells obtained on every seed survive. Vijayakumari and Janardhanan (2003) also reported about the enhanced germination and seedling growth parameters due to bio fertilizer pelleting in neem, kapok and amla. While in Maize, as reported by Kalaivani (2010); Karthika (2011); Kavitha (2011) seeds bioprimed with liquid bio fertilizer at 20 per cent concentration for 12h resulted in higher germination percentage and seedling vigour In groundnut VRI 2, the higher germination percentage (86 %) was recorded with seed treated with *Trichoderma viride* 10% + Rhizobium 10% + Phosphobacteria 10% of seed and the minimum (70%) was with control. The higher shoot length (5.19cm), root length (11.36 cm), and vigour index (1358) recorded with seed treated with *Trichoderma viride* 10% + Rhizobium 10% + Phosphobacteria 10% of seed and the minimum shoot length (4.13 cm), root length (6.98 cm), and vigour index (755) was with control. Phosphobacteria is a phosphorus mobilizing biofertilizer that enhanced the nutrient up take and productivity (Gomathy *et al.*, 2007). The adherence and survival of sporulated *Bacillus* culture on the seeds of black gram, green gram, soybean, maize and paddy was observed with maximum population due to seed treatment (Sumathy, 2001) and Seed inoculation with P solubilizers, found to increase plant biomass and yield (Kanimoli *et al.*, 2004).

Crop productivity is the output of complex edaphic, environmental and management factors (Zortia and Canigia 2009). The results of the present study revealed that the seed treatments (T), nutrient supplementation both as basal (S) foliar (F) and their interactions significantly varied with the evaluated parameters (Table 2). The seeds primed with T*richoderma viride* 10% + Rhizobium 10% + Phosphobacteria 10% (mixed in 1:1 ratio) recorded maximum values for Field emergence (78%), Plant height @ 60 DAS(13.91 cm), No. of branch per plant (7.8 cm), No. of pods per plant (27.773), Pod weight per plant (70.5 gm), No. of seeds per plant (56.166), Seed yield per plant (27.9gm), Seed yield per hectare (1409 Kg/ha), 100 seed weight (47.72 gm)and the minimum Field emergence (66 %), Plant height @ 60 DAS(10.22 cm), No. of branch per plant (6.44 cm), No. of pods per plant (24.916), Pod weight

per plant (65.083 gm), No. of seeds per plant (48.2), Seed yield per plant (23.466 gm), Seed yield per hectare (994 Kg/ha), 100 seed weight (40.31 gm)was with control Amutha *et al.* (2008) also observed similar results in *Cyamopsis tetragonoloba* L. Taub and expressed the synergistic influence of *P.flurorescens* and humic acid as cause for the improved yield due to invigourative growth promotive action.

Foliar spray is the application of needy nutrients at reproductive phase through foliage to have direct impact on seed set and its resultant nutrient quality. Irrespective of other factors, the results revealed that application of groundnut rich 1% excelled the application of panchakavya 1% and panchakavya 1% + groundnut rich 1% both with growth and yield characters. All growth parameters expressed hike in percentage from tasseling to maturation phase. Among the foliar spray foliar application of groundnut rich 1% recorded maximum values for Field emergence (71 %), Plant height @ 60 DAS(15.75 cm), No. of branch per plant (9.03 cm), No. of pods per plant (27.85), Pod weight per plant (73.883 gm), No. of seeds per plant (56.59), Seed yield per plant (27.593 gm), Seed yield per hectare (1330 Kg/ha), 100 seed weight (45.48 gm) and minimum with control.

Table 1: Influence of seed treatment on germination percentage, Root length (cm), Shoot length (cm) and vigour index of groundnut under laboratory conditions.

Treatments	Germination percentage	Root length (cm)	Shoot length (cm)	Vigour index
T1 – control	70(56.79)	4.13	6.98	755
T2 – *Trichoderma viride* 10%	72(58.05)	4.73	7.25	934
T3 – *T. viride* 10% + Rhizobium 10%	75(60.00)	4.41	7.18	847
T4 – *T. viride* 10% + Rhizobium 10% + phosphobacteria 10%	86 (68.03)	5.19	11.36	1358
T5 – Carbendazim + Rhizobium 10% + Phosphobacteria 10%	79(62.73)	3.59	9.60	1040
SEd	0.433	0.291	0.57	68.042
CD	0.899	0.582	1.14	136.085

* *significant at 1% level, *significant at 5% level

Table 2: Influence of seed treatment on field emergence, plant height @ 60 DAS, No. of branch per plant.

Treatment	Field emergence	Plant height @ 60 DAS	No. of branch per plant
T1 – control	70 (56.79)	10.22	6.44
T2 – *Trichoderma viride* 10%	75(60.00)	13.79	7.49
T3 – *T. viride* 10% + Rhizobium 10%	72 (58.05)	13.34	8.06
T4 – *T. viride* 10% + Rhizobium 10% + phosphobacteria 10%	78 (62.01)	13.91	7.80
T5 – Carbendazim + Rhizobium 10% + Phosphobacteria 10%	74 (59.35)	12.12	8.17
F1 – Foliar application of panchagavya 1%	70 (56.79)	13.25	8.16
F2 – Foliar application of groundnut rich 1%	71 (57.42)	15.75	9.03
F3 – Foliar application of panchagavya 1% + groundnut rich 1%	71 (57.42)	14.49	8.65
SEd	2.052	0.941	0.475
CD	4.134	1.882	0.951

* *significant at 1% level, *significant at 5% level

Table 3: Influence of seed treatment on number of pods per plant, pod weight per plant.

Treatment	No of pods per plant	Pod weight per plant (gm)	No. of seeds per plant
T1 – control	24.916	65.083	48.200
T2 – *Trichoderma viride* 10%	26.036	69.166	50.933
T3 – *T. viride* 10% + Rhizobium 10%	23.693	62.666	49.586
T4 – *T. viride* 10% + Rhizobium 10% + phosphobacteria 10%	27.773	70.500	56.166
T5 – Carbendazim + Rhizobium 10% + Phosphobacteria 10%	24.523	64.166	51.440
F1 – Foliar application of panchagavya 1%	26.120	59.850	50.200
F2 – Foliar application of groundnut rich 1%	27.850	73.883	56.590
F3 – Foliar application of panchagavya 1% + groundnut rich 1%	26.520	60.293	53.006
SEd	0.624	1.729	0.597
CD	1.132	3.459	1.195

* *significant at 1% level, *significant at 5% level

Table 4: Influence of seed treatment on number of seeds per plant, seed yield per plant, seed yield per hectare.

Treatment	Seed yield per plant (gm)	Seed yield per hectare (Kg/ha)	100 seed weight(gm)
T1 – control	23.466	994	40.31
T2 – *Trichoderma viride* 10%	23.766	1201	43.28
T3 – *T. viride* 10% + Rhizobium 10%	23.733	1100	43.73
T4 – *T. viride* 10% + Rhizobium 10% + phosphobacteria 10%	27.900	1409	47.72
T5 – Carbendazim + Rhizobium 10% + Phosphobacteria 10%	25.666	1164	39.13
F1 – Foliar application of panchagavya 1%	25.733	1178	41.65
F2 – Foliar application of groundnut rich 1%	27.953	1330	45.48
F3 – Foliar application of panchagavya 1% + groundnut rich 1%	26.573	1196	44.12
SEd	0.750	71.24	1.60
CD	1.500	142.48	3.21

* *significant at 1% level, *significant at 5% level

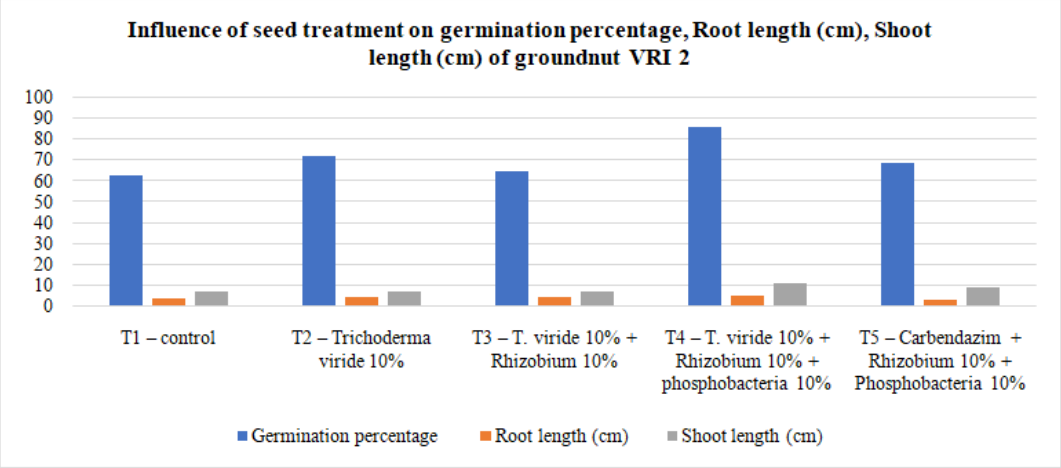

Fig. 1. Influence of seed treatment on germination percentage, Root length (cm), Shoot length (cm) of groundnut VRI 2.

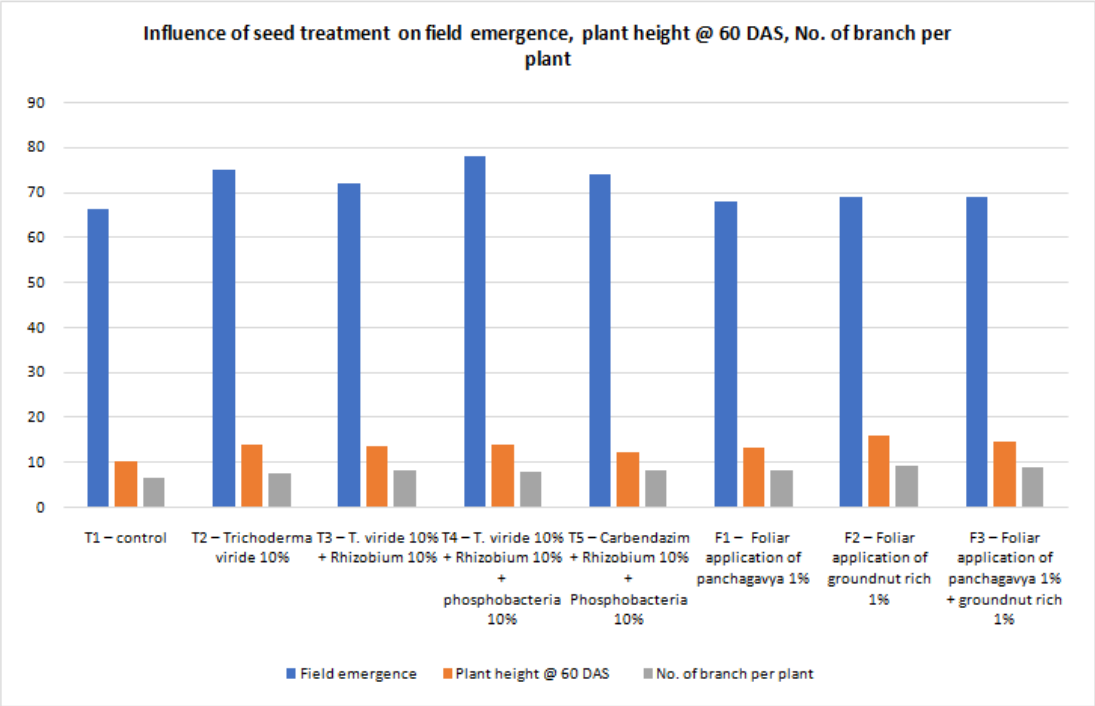

Fig. 2. Influence of seed treatment on field emergence, plant height @ 60 DAS, No. of branch per plant.

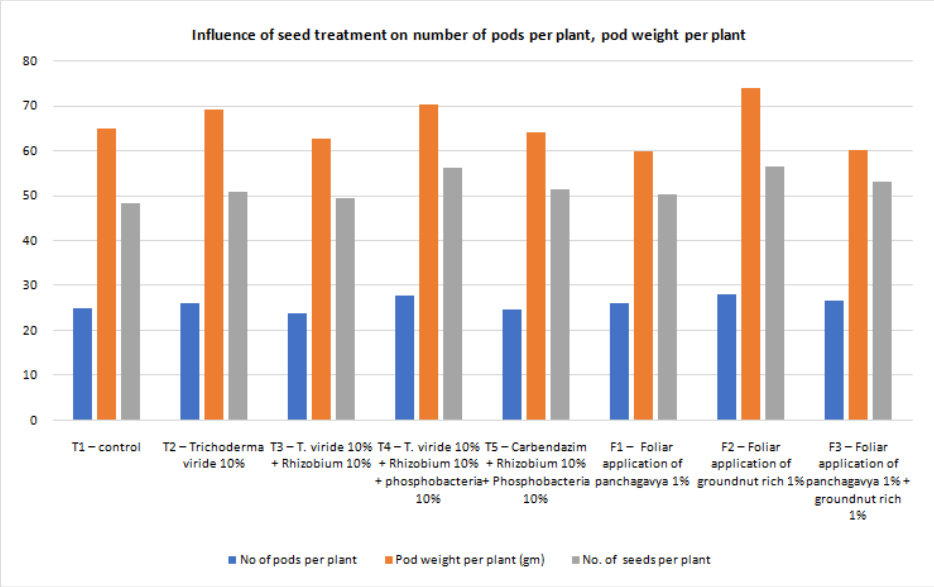

Fig. 3. Influence of seed treatment on number of pods per plant, pod weight per plant.

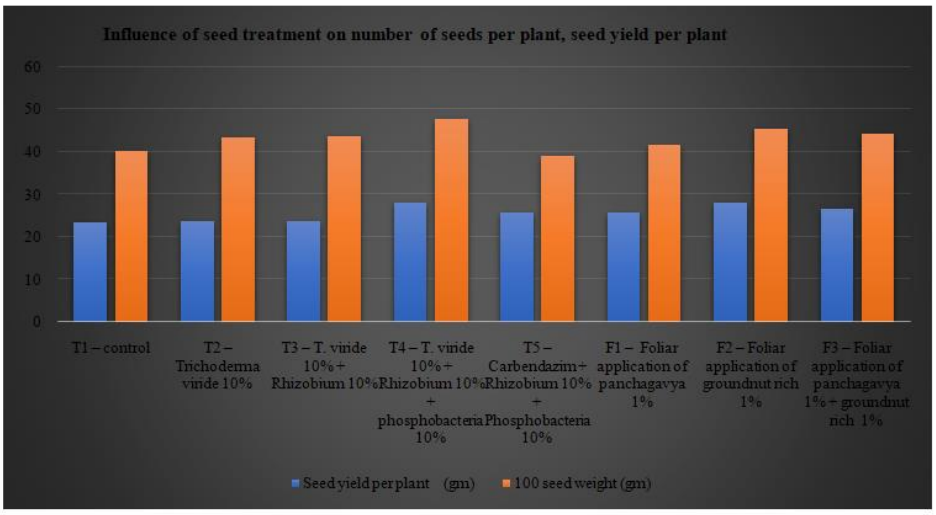

Fig. 4. Influence of seed treatment on number of seeds per plant, seed yield per plant.

Table 5: Comparison of groundnut rich 1 % foliar spray with panchavaya 1% foliar spray

Physiological, yield parameters	Effect 1 % groundnut rich over the 1 % panchakavya foliar spray (as percentage increase)
Field emergence	1.5
Plant height @ 60 DAS (cm)	18.87
No. of branch per plant	10.66
No of pods per plant	6.62
Pod weight per plant (gm)	23.44
No. of seeds per plant	12.73
Seed yield per plant (gm)	8.63
Seed yield per hectare (Kg/ha)	12.9
100 seed weight (gm)	9.68

Within the foliar sprays, groundnut rich 1% recorded 1.5, 18.87, 10.66, 6.62, 23.44, 12.73, 8.63, 12.9 and 9.68 per cent hike over the 1 % panchakavya foliar spray. Groundnut rich 1% foliar spray recorded maximum values for Field emergence, Plant height @ 60 DAS, No. of branch per plant, No of pods per plant, Pod weight per plant, No. of seeds per plant, Seed yield per plant, Seed yield per hectare, 100 seed weight compared to panchakavya 1% spray, the commonly recommended foliar nutrient (Anon, 2005) for enhance seed set (Table 5).

To trace the synergetic influence of combined application of bio products in seed treatments, the evolved specific concentrations of bio products, were combined with each of the other selected inoculants along with unprimed seeds and were evaluated for the

seed and seedling quality and yield characters. All treatments proved their invigourative effect also in combinations and were proved to be better than unprimed seeds in improving seed germination, seedling vigour and yield attributing characters. Among the evaluated combinations of the bio products *T. viride* 10% + Rhizobium 10% + phosphobacteria 10%scored as the best combination were further taken for evaluation on productivity. The study also proved that foliar application of groundnut rich (1 per cent) twice at 10days after sowing and flowering stage improved the productivity by improving growth, and yield attributing characters along with nutrient quality of grains.

CONCLUSIONS

The seeds primed with combinations of bio products evaluated for seed quality characters were (*Tricoderma viride* 10%, *Tricoderma viride* 10% + Rhizobium 10%, *Tricoderma viride* 10% + Rhizobium 10% + Phosphobacteria 10%, carbendazim + Rhizobium 10% + Phosphobacteria 10%) evaluated for productivity along with unprimmed seeds under ambient conditions of coimbatore, where the primed seeds were dried back to original moisture content. The results indicated that *Tricoderma viride* 10% + Rhizobium 10% + Phosphobacteria 10% performed best compared to unprimed seeds at productivity, measuring the higher order level of morphological, yield and yield attributing characters in terms of field emergence, plant height @ 60 DAS, No. of branch per plant, number of pods per plant, pod weight per plant, number of seeds per plant, seed yield per plant, seed yield per hectare. The seeds foliar spray of organic products evaluated for yield characters were (foliar application of Panchakavya 1%, foliar application of groundnut rich 1%, foliar application of Panchakavya1%+groundnut rich1%) evaluated for productivity. The results indicated that foliar application of groundnut rich 1% performed best compared to foliar application of Panchakavya 1% at yield and yield attributing characters.

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Conflict of Interest. None.

REFERENCES

Abdul-Baki, A. A. and J. D. Anderson. (1973). Vigour determination of soybean seeds by multiple criteria. *Crop Sci., 13*, 630-633.

Amutha, M., R. Sobithabai and R. A. S. Kumar. (2008). Effect of seagrass liquid fertilizer on germination and linear growth in *Cyamopsis tetragonoloba* L. Taub. *Seaweed Res. Utiln., 30*, 249-253.

Anon (2005). Crop production guide. Dept of agriculture, Govt. of Tamil Nadu, Chennai and Tamil Nadu Agricultural University, Coimbatore.

Anon (2007). International Rules for Seed Testing. *Seed Sci. & Technol., Supplement Rules, 5*, 1-50; 10, 1-2.

Choudary, K. M., Manish, M. P. and Pagar, R. D., (2014), Effect of foliar application of panchagavya and leaf extracts of endemic plants on groundnut *(Arachis hypogaea* L.*). Legume Res., 37*(2), 223-226.

Fages, J. (1994). *Azospirillum*inoculants and field experiments. (ed.) *Y. Okon. CRC Press, Florida, USA*. 87-110.

Gomathy, M., M. Thangaraju, N. O. Gopal and C. Sarathambal. (2007). Comparative performance of liquid formulation of phosphobacteria with carrier based inoculants on the growth and yield of maize (CO 1). *J. Soil Biol., 27*(1-2), 7-12.

Kalaivani, S. (2010). Seed biopriming studies with biocontrol agents and liquid biofertilizers in COH(M) 5 maize hybrid. *M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University*, Coimbatore.

Kanimoli, S., T. Umamaheswari and M. Thangaraju. (2004). Cyst induction in *Azospirillum* and regeneration of cyst cells. *Nat. Symp. Micro. Technol. prod. Agri., TNAU, Coimbatore*. 299.

Karthika, G. (2011). Seed biopriming using enriched humic acid with biocontrol agents in maize hybrid COH(M) 5. *M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University*, Coimbatore.

Kavitha, S. (2011). Biopriming with biocontrol agents and liquid biofertilizers for rice seed cv. ADT 43. *M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University*, Coimbatore.

Malla Ready, M., Padmaja, B., Uma Reddy, R. and Vishnu Vardhan Reddy, D., (2011), Response of sunflower to the foliar spray fertilization of micronutrients under no till condition in rice fallows. *Andra Agric. J., 58*(3), 271-275.

Millet, E., and M. Feldman (1986). Yield response of a common spring wheat cultivar to inoculation with *Azospirillum brasilense* at various levels of nitrogen fertilization. *Plant Soil, 80*, 255-259.

Natarajan, K. (2002). Panchakavya. A manual. Other India Press, Mapusa, Goa, India p.33.

Panse, U. G. and P. V. Sukhatme. (1985). Statistical methods for Agricultural Workers. *ICAR, Publication New Delhi*, pp. 327-340.

Singh, A. L., Joshi, Y. C. and Koradia, V. G. (1988), Effect of micronutrients and sulphur on groundnut (*Arachis hypogaea* L.) in calcareous soil. *Proc. Int. Congr. Plant Physiol., New Delhi, India*.

Sumathy, S. (2001). Enhancement of shelf life of phosphobacteria biofertilizers (*Bacillus* sp.) through induction of sporulation. *M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University*, Coimbatore.

Vijayakumar, A., V. Palanisamy, T. Jayaraj and R. Arumugam. (1991). Effect of seed treatments and containers on the storability of onion seeds. *South Indian Hort., 39*(5), 296-299.

Vijayakumari, B. and K. Janardhanan. (2003). Effect of biofertilizers on seed germination, seedling growth and biochemical changes in silk cotton. *Crop Res., 25*(2), 328-332.

Zortia, M. D. and M. V. F. Canigia (2009). Field performance of a liquid formulation of *Azospirillum brasilense* on dryland wheat productivity. *Europ. J. Soil Biol., 45*, 3-11.

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