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EFFECT OF ORGANIC MANURE AND BIOFERTILIZERS ON SEED QUALITY OF GROUNDNUT (*ARACHIS HYPOGAEA* L.)

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ABSTRACT

A field experiment was undertaken in the experimental field of Seed Technology Research Unit, Dr.PDKV, Akola (MS) during *kharif* season of 2010-2011 with a view to study the effect of four soil treatments viz. FYM (20t ha^{-1}) + *Rhizobium* inoculation (5kg ha^{-1}), vermicompost (3t ha^{-1}) + *Rhizobium* inoculation (5kg ha^{-1}), green manuring (10t ha^{-1}) + *Rhizobium* inoculation (5kg ha^{-1}) and Control (RDF) combination with seed treatments viz. No seed treatments, *Trichoderma viride* (2g kg^{-1} of seed) and PSB treatment (25g kg^{-1} of seed) on seed quality of groundnut variety TAG-24. Application of vermicompost + *Rhizobium* in combination with *Trichoderma* seed treatment increase germination percentage (94.5%), seedling length (18.40cm), seedling dry weight (0.39g) and vigour index (1738.43), shelling percentage (76.40%), protein content (29%) and oil content (43.20%) in comparision to other treatments. Vermicompost (3 t/ha) + *Rhizobium* (5 kg/ha) in combination with *Trichoderma viride* (2 g/kg of seed) seed treatment was most beneficial for inhancing seed quality of groundnut because of increase in availability of nutrient, enhance nutrient uptake and activity of microbial agent.

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) belongs to genus *Arachis* of family Leguminosae is the "King of oilseed" in our country is an important crop both for oil and food. About 2/3 of the crop produce in the world is crushed to extract oil and 1/3 is used to make other edible products. Groundnut naturally enriches the soil through symbiosis. Organic sources which are good for improvement of soil properties, besides supplying nutrients for longer period of time without leaving ill effects on soil has been realized. Biofertilizers are the most useful technology necessary to support developing organic, sustainable, green and non-polluted agriculture. Addition of biofertilizers not only helps to proliferate beneficial microbes in soil but also provide residual effect for subsequent crops and help in recycling and decomposition of organic matter. Organic farming can provide quality food without adversely affecting the soil health and environment (Yadav et al., 2013). Lenin *et al.* (2013) stated that vermicompost + AMF application increase the all nutrient content of groundnut. Combined application of farm compost, FYM with *Rhizobium* + PSB + *Trichoderma* increase nutrient content in soil and nutrient uptake by plant (Ipsita Das and Singh, 2014). With the introduction of new high yielding varieties for getting maximum production, farmers are extensively using chemical fertilizers and indiscriminate use of these chemical fertilizers are prone to several problems like deterioration of soil health, contamination of natural resources and reduction in seed quality. Use of either FYM, vermicompost alone and along with other organic amendments like neem seed cake, biofertilizers and biopesticides etc. become imperative to go for rational use of organic matter for sustainable crop production with better quality. With the increasing degradation of soil through chemical fertilizer, the need to replace them with organic sources. Therefore, present study was planned to find out the response of groundnut at varying levels of organic sources of nutrients and biofertilizers in relation to seed quality with the objective to study the effect of organic treatment on crop establishment and seed quality in groundnut and to develop organic farming protocol for maximizing seed quality of groundnut.

MATERIALS AND METHODS

The experiment was conducted at the farm of Seed Technology Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during *kharif* season of 2010-2011 on Groundnut variety TAG-24. The treatment consisting of soil treatments viz. $\mathbf{F_1}$-FYM (20t ha^{-1}) + *Rhizobium* inoculation (5kg ha^{-1}), $\mathbf{F_2}$-Vermicompost (3t ha^{-1}) + *Rhizobium* inoculation (5kg ha^{-1}), $\mathbf{F_3}$-Green manuring (10t ha^{-1}) + *Rhizobium* inoculation (5kg ha^{-1}) and $\mathbf{F_4}$-Control (RDF-25:50:00 NPK ha^{-1}) in combination with seed treatments viz. $\mathbf{S_1}$-No seed treatments, $\mathbf{S_2}$-*Trichoderma viride* (2g kg^{-1} of seed) and $\mathbf{S_3}$-PSB treatment (25g kg^{-1} of seed). The experiment was laid out in Factorial Randomized Block Design (Gomez and Gomez. 1989) with 12 treatments in combinations in three replication having plot size 2.1m x 4m.

The observations were recorded replication wise in each treatment from randomly selected five plants namely germination percentage (%) (As per ISTA Rule, 1999), seedling length (cm), seedling dry weight (g), vigour index [germination (%) x seedling length (cm)] (Abdul Baki and Anderson, 1973),

Table 1: Effect of Organic Manure and Biofertilizers on Germination (%), Seedling length (cm), Seedling dry wt. (g), Vigour index, Shelling %, Seed Protein (%) and Seed Oil (%)

Treatments	Germination (%)	Seedling length (cm)	Seedling dry wt. (g)	Vigour index	Shelling %	Seed Protein (%)	Seed Oil (%)
Soil treatments							
F_1	90.33(71.91)*	17.51	0.34	1581.18	72.70(58.51)*	26.50(30.98)*	41.50(40.10)*
F_2	93.20(74.84)*	17.96	0.38	1672.17	73.47(59.02)*	28.50(32.30)*	43.10(41.03)*
F_3	92.90(74.52)*	17.69	0.37	1641.71	71.23(57.57)*	25.90(30.61)*	42.80(40.86)*
F_4	90.23(71.77)*	17.40	0.32	1570.22	70.55(57.14)*	24.53(29.69)*	39.90(36.17)*
SE (m) ±	0.31	0.13	0.007	12.72	0.18	0.18	0.02
CD at 5%	0.92	0.37	0.020	37.31	0.52	0.52	0.06
Seed treatments							
S_1	90.60(72.16)*	17.12	0.33	1550.80	70.31(56.98)*	25.80(30.56)*	41.70(40.26)*
S_2	92.22(73.93)*	18.18	0.38	1676.10	73.27(58.88)*	26.80(31.18)*	41.80(40.29)*
S_3	92.00(73.69)*	17.63	0.36	1622.05	72.38(58.31)*	26.70(31.13)*	41.90(40.32)*
SE (m) ±	0.27	0.11	0.006	11.02	0.15	0.15	0.02
CD at 5%	0.79	0.32	0.018	32.31	0.45	0.45	NS
Interaction Effect							
F_1S_1	90.10(71.69)*	17.10	0.30	1540.09	70.67(57.20)*	25.60(30.37)*	41.50(40.10)*
F_1S_2	90.70(72.27)*	18.13	0.38	1643.46	73.27(58.87)*	26.00(30.67)*	41.20(39.93)*
F_1S_3	90.20(71.77)*	17.30	0.35	1559.97	74.17(59.45)*	27.90(31.88)*	41.80(40.28)*
F_2S_1	91.80(73.37)*	17.17	0.36	1575.51	71.37(57.65)*	27.60(31.66)*	42.00(40.97)*
F_2S_2	94.50(76.46)*	18.40	0.39	1738.43	76.40(60.94)*	29.00(32.58)*	43.20(41.09)*
F_2S_3	93.00(74.68)*	18.30	0.38	1702.57	72.63(58.46)*	28.80(32.46)*	43.10(41.03)*
F_3S_1	90.40(71.96)*	17.21	0.35	1556.39	69.87(56.71)*	25.50(30.33)*	42.90(40.91)*
F_3S_2	93.50(75.25)*	18.17	0.39	1698.37	72.59(58.43)*	26.80(31.18)*	43.00(40.97)*
F_3S_3	94.40(76.36)*	17.70	0.37	1670.35	71.22(57.56)*	26.00(30.65)*	42.40(40.68)*
F_4S_1	90.00(71.60)*	17.00	0.30	1531.21	69.31(56.36)*	24.30(29.56)*	39.70(39.05)*
F_4S_2	90.20(71.76)*	18.01	0.34	1624.13	70.82(57.30)*	25.00(29.99)*	39.90(39.17)*
F_4S_3	90.40(71.96)*	17.20	0.32	1555.31	71.53(57.76)*	24.30(29.56)*	40.00(39.28)*
SE (m) ±	0.54	0.22	0.012	22.03	0.31	0.31	0.03
CD at 5%	1.59	NS	NS	NS	0.90	0.91	0.10

*Figures in parenthesis are arcsine values.

shelling (%), protein content (%) calculated by multiplying the nitrogen (%) with 6.25 (Jackson, 1978) and oil content (%) by Soxhlet apparatus (Sankaran, 1965).

RESULTS AND DISCUSSION

From study it is found that Vermicompost + *Rhizobium* soil treatment in with *Trichoderma* seed treatment recorded numerically maximum germination percentage (94.5%) in combination as well as in alone. Indrakumar singh and Chauhan (2009) found similar results while working on french bean had indicated high germination percentage with application of vermicompost.

Seedling length (cm), seedling dry weight (g) and vigour index were significantly influenced due to different soil as well as seed treatments and recorded highest in vermicompost + *Rhizobium* soil treatment and *Trichoderma* seed treatment. However interaction effect found to be non significant. Above results as an accordance with Mane *et al*. (1993) stated that *Rhizobium* inoculation increases root length and root weight in groundnut. (Lenin *et al.,* 2012) also found that vermicompost + AMF inoculation enhanced shoot and root length.

Significantly maximum shelling percentage (73.47%) was obtained in vermicompost + *Rhizobium* soil treatment and *Trichoderma* seed treatment (73.27%). Interaction effect also had significantly influenced shelling percent and highest value recorded in vermicompost + *Rhizobium* with *Trichoderma* seed treatment (76.40%). The present results in an accordance with the findings of Mallingawad (2010) found that application of organics like FYM, vermicompost with PSB, *Rhizobium* and *Trichoderma* increases shelling percent in groundnut. Also the findings Zalate and Padmani (2009) an accordance with the same.

From the results it is observed that vermicompost + *Rhizobium* soil treatment and *Trichoderma* and PSB seed treatment recorded significantly highest protein content (%) as well as oil content (%). Interaction of various soil and seed treatments also significantly influenced the above parameters and maximum value recorded due to application of vermicompost + *Rhizobium* in combination with *Trichoderma* seed treatment. Organic treatments showed superiority over control, which might be due to the high level of N and P in the plant which increases the proportion of protein and oil in the seed (Elsheikh and Mohamedzein, 1998). Bajrang Lal Ola *et al*. (2013) shows that application of vermicompost (3 t/ha) along with *Rhizobium* and PSB increases protein and oil content in groundnut. Senthil Kumar *et al*. (2014) revealed that oil content of groundnut increase significantly due to application of biofertilizer enriched vermicompost. Arun Kumar *et al*. (2014) stated that vermicompost + RDF increases protein content in seed. Hence, vermicompost (3 t/ha) + *Rhizobium* (5 kg/ha) in combination with *Trichoderma viride* (2 g/kg of seed) seed treatment was most beneficial for enhancing the seed quality of groundnut.

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