Original Research Article

Effect of bio-fertilizers and VAM on growth, yield and economics of Rabi Groundnut in Balasore district of Odisha

ABSTRACT

Anon farm trial was conducted during the Rabi season of 2019-20& 2020-21 at Narayanpur village of baliapal block of balasore district to evaluate the effect of Biofertilisers and VAM on growth, yield & economics of Groundnut production. The experiment was laid out in Randomized block design with three treatment combination replicated seven times. The results of the experiment revealed that integrated application of N-P_2O_5-K_2O @ 20:40:40kg/ha + Seed treatment with Rhizobium@ 50g /kg of seed) + Soil application of PSB@ 5kg/ha + soil application of VAM@ 10kg/ha recorded significantly maximum growth & yield attributes resulting 25.4% higher pod yield than sole application of N-P_2O_5-K_2O @ 20:40:40kg/ha.

Key words: RabiGroundnut, Bio fertilizers, Rhizobium,, VAM, Growth, Nodulation, Yield

INTRODUCTION

Groundnut (*Arachishypogaea* L) a member of family leguminaceae, is the 13th most important food crop, 4th important source of vegetable oil and 3rd main source of vegetable protein in the world. India is the second largest producer of groundnut after Brazil, accounting for 22.98 per cent of the total area and 14.52 per cent of the production of the world. As regards the nutritional value of groundnut, its seed contains about 40-50% oil, 20-30% protein and 10-20% carbohydrate (Okello et al., 2010). The productivity of groundnut in Odisha is very low (1044 kg/ha) primarily due to its cultivation in acidic soils with low N, P, Ca, S, B besides inadequate organic matter (Mohapatra and Dixit, 2010).They further stressed that proper fertilizer management of groundnut crop with right kind of nutrients at right time adopting the right method of application has significant effect on yield and quality. The low yield of groundnut in India was suggested to be due to low nodulation and to competition from indigenous ineffective strains (Basu and Bhadoria, 2008). Bio-fertilizers can play an important role in meeting the nutrient requirement of crops through biological nitrogen fixation (BNF), solubilization of insoluble phosphorus sources (PSB), extend the nutrient absorption to zones not accessible to plant roots (VAM) (Patil et. al. (2014). Thus it is necessary to look into the mineral nutrition aspects of groundnut for achieving high yield and advocate the suitable package of practices for optimization

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of yield (Singh *et al.*, 2012).. The present review is devoted to recent works relating to integrated nutrient management in groundnut seed crops and other crops.

MATERIALS AND METHODS

Anon-farm trail on groundnut was conducted at Narayanpur village under Baliapal block of Balasoredistrict byKVK, Balasoreduring the Rabi season, 2019-20. The experiment was laid out in randomized block design with three treatment & seven replications. The soil pH was 6.8, high in available nitrogen and medium in available phosphorous & potash. The treatment consisted of **T1**=N-P_2O_5-K_2O@ 20:40:40kg/ha, **T2** =N-P_2O_5-K_2O@ 20:40:40kg/ha + Seed treatment with Rhizobium@ 50g /kg of seed) + Soil application of PSB@ 5kg/ha and **T3**: N-P_2O_5-K_2O @ 20:40:40kg/ha + Seed treatment with Rhizobium@ 50g /kg of seed) + Soil application of PSB@ 5kg/ha + soil application of VAM@ 10kg/ha.

Groundnut var. Dharani was sown at 60cm x 20cm spacing with 125kg seed/ha in second week of February. The irrigation was given at whenever Full dose of Phosphorus and Potash were applied at the time of sowing of both the crops as di-ammonium phosphate. The recommended cultural operations and plant protection measures were carried out timely.Seed was inoculated with *Rhizobium leguminosarum.* PSB & VAM incubated with the 200kg prelimed FYM (Lime 10kg) incubated for 7 days at 30% moisture & applied in rhizosphere at the time of planting. Yield attributes characters like pods per plant was counted at physiological maturity stage.

Table 1: Effect of bio-fertilizer on Yield attributingcharacters &pod yield in Rabi Groundnut

Treatments	Plant Height (cm)	Pods/Plant (no.)	Pod Yield (q/ha)	Haulm Yield (q/ha)	Shelling (%)
T1	42.9	21.60	20.4	32.17	68.20
T2	43.4	24.20	22.8	35.81	70.40
T3	44.7	26.00	**25.6**	41.61	73.50
CD	0.929	0.942	0.828	1.641	1.058
S.E. (m)	0.298	0.303	0.266	0.527	0.339
CV	1.805	3.344	3.065	3.814	1.270

Table 2: Effect of bio fertilizer on economic parameters in Rabi Groundnut

Treatment	Cost of cultivation (Rs./ha)	Gross return (Rs/ha)	Net return (Rs./ha)	BC ratio
T1	58000	103836	45836	1.79
T2	58600	116052	57452	1.98

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T3	60050	**130304**	70254	2.17

RESULTS & DISCUSSION

Effect on growth attributes &yield:

Seed inoculation with bio fertilizer *Rhizobium* & soil application of PSB significantly enhanced the plant height as well as pods per plant, haulm yield, shelling percentage and eventually pod yield in Rabi Groundnut crop as compared to the control plot (Table-1).Biofertilisers inoculation resulted in greater nodulation. The additional supply of nitrogen and phosphorus helped in formation of new cell and thus, proliferation of growth. Phosphorus is an important constituent of co-enzymes involved in photosynthesis which might have been increased accumulation of photosynthesis. Rhizobium bacteria have the capacity to fix atmospheric nitrogen to soil and make it available to plant. Phosphorus solubilizing microorganisms reserved in available form of readily hydrolyses organic phosphate and degrade them in the soil through production of organic acids. Biofertilisers inoculation resulted in 11.76% & 11.31% higher pod & haulm yield in Rabi Groundnut. These recordings corroborates the findings of Ola *et al.* **(**2013), Patil et. al. (2014)&Zalane et. al. (2009). The combined application of Rhizobium, PSB & VAM along with recommended dose of NPK significantly increases the plant height, pods per plant, haulm yield & shelling percentage. Pod yield, haulm yield & shelling percentage were significantly improved by 25.4, 29.5 & 7.7% under T3, respectively as compared the sole application of 20:40:40kg/ha NPK. Integrated applicationof RDF + Rhizobium + VAM + PSB might haveprovided sufficient and balanced nutrients in readilyavailable form throughout the growth period of thecrop and the increased availability of plant nutrients,their uptake leading to the greater photosynthesisproduction of metabolites and enzymatic activitiesmight have influenced into increased nodulation andextensive root system and the greater production ofmetabolites and their translocation to various sinksespecially the productive strictures (pods and seeds)could have helped to increase into the number ofpods per plant besides increasing the overall growth. The results are in accordance with the findings of Arumugamet. al. (2010)&Choudhury et. al. (2011).

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Effect on Economics:

The selling price of Groundnut is RS 5090/- per quintal. (Local market rate) was considered while calculating the economics. The results revealed that maximum net return (Rs. 70254/- per ha) & BC ratio (2.17) were recorded from the treatment T3. Favorable BC ratio was

self-explanatory of economic viability which further convinced the farmer about the use of bio fertilizer & VAM in Groundnut production.

CONCLUSION

Seed inoculation with Rhizobium along with soil application of PSB & VAM incubated with FYM in combination with chemical fertilizer NPK can improve the crop productivity in Rabi Groundnut. Farmers of different villages of Baliapal, Jaleswar&Bhograi block showed positive response for the execution of this technology. However more awareness about judicious use of fertilizers after soil testing is required. Potential yield of the crop specifically the variety can be achieved through scientific knowledge, good quality need based input & proper application these inputs by the practicing farmers. Horizontal spread of this technology can be achieved through various extension activities Frontline demonstration like training, method demonstration, Field day, exposure visit & kisan gosthi etc.

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