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Effect of Organic, Inorganic and Biological Fertilizers on Biochemical Content of Groundnut Seed

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A B S T R A C T

Present study was conducted at University of Rajasthan, Jaipur. Five treatments named as control (no fertilizer and manure), chemical fertilizer (DAP), cowdung, vermicompost and biofertilizer were taken for study. Biochemical analysis for different seed parameters viz. protein content, total soluble sugar, starch content, total lipid content and total phenol content were done by standard methods. Results revealed that protein content (238.33 mg/gm), total lipid content (476.77 mg/gm), total phenol content (6.93 mg/gm), total soluble sugar (92.33 mg/gm) and starch content (191 mg/gm) was reported significantly higher in vermicompost treatment (T4) compare than Rhizobium (T_5), DAP (T_2), cowdung (T_3) and control (T_1) treatment. It was concluded that chemical fertilizers could replace by vermicompost and biofertilizer for better nutrient quality in groundnut.

***Key words*:** Chemical fertilizers, Cowdung, Vermicompost, Rhizobium biofertilizer, Biochemical attributes

Present study was conducted to evaluate the effect of different source of fertilizers on biochemical attributes of groundnut seed. The virtue of chemical fertilizer to increase production of agricultural products for global population, increased use of pesticides has resulted many environmental and health problems. Indians take average 356 mg/day/person toxic residue of agriculture chemicals through diet that is 40 times more than average American's intake [1]. Vermicomposting is eco-biotechnological process in which biodegradable waste converted to organic fertilizer by earthworm with cooperation of microorganism. Vermicompost is rich in humas, NPK, micronutrient; microflora nitrogen fixing and phosphorous solubilizing bacteria and actinomycetes, growth hormones viz. auxines, gibberellins and cytokinins [2]. In geocarpic fruit development (Groundnut), after flowering and fertilization above ground intercalary meristem present at the base of ovary produce gynophore. Gynophore with ovary penetrates in the soil and further development of embryo and fruit expansion occurs [3]. Atmospheric nitrogen fixing ability of *Rhizobium* biofertilizer increases growth of groundnut (*Arachis hypogaea* L.). Application of *Rhizobium* strains significantly influenced nodule number per plant, growth parameters per plant, shelling percentage and kernel weight [4]. *Rhizobium* inoculation with 100% recommended doses of nitrogen and polythene mulch significantly influenced *Arachis hypogaea* L. growth, yield and yield attributes. The morphological parameters like root length, plant height, number of leaves, root nodules, fresh weight, dry weight and yield attributes and nutrient content (Nitrogen, phosphorus and potassium) were higher in 4 t h^{-1} vermicompost compare than lower doses of vermicompost. The best vegetative plant growth parameters viz. plant height, root length, germination percentage, number of leaves and flowering parameters of marigold plant were observed with cowdung based vermicompost compare than cowdung and control [5].

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MATERIALS AND METHODS

This experiment was done at University of Rajasthan, Jaipur. To evaluated the effect of DAP (Diamonium phosphate), cowdung, vermicompost and *Rhizobium* biofertilizer on seed biochemical attributes, five treatments with four replicates were taken to pot plants. Experiment is based on CRD (complete randomized design) method. There were T_1- control (no fertilizer), T_2- DAP (.59 gm DAP in 10 kg soil), T_3- cowdung (45.50 gm cowdung in 10 kg soil) and T_4- vermicompost (45.50 gm vermicompost in 10 kg soil) and T_5- biofertilizer (5 ml Rhizobium biofertilizer in 10 kg soil and seed treatment). For biochemical analysis seed was collected after harvesting of groundnut plant from different treatments.

Evaluation of total lipid in seed was done by Barnes and Blackstock [6] method. Seed TSS (Total soluble sugar)

was quantified by phenol-sulphuric acid method [7]. Seed Starch content estimated by Mc Cready *et al.* [8] method. Seed protein content was evaluated by Lowry *et al.* [9] method. Seed TPC (Total phenol content) was measured by Bray and Thorpe [10] method.

Statistical analysis was done by OPSTAT, Analystat and MS excel software. One way ANOVA, t test and Post Hoc Tukey test were used to check significance difference between different treatments at p<.05 significance level. Standard error mean (SEn) and critical difference (CD) were done at p<.05 probability level.

RESULTS AND DISCUSSION

Total lipid in seed was measured 339.37±6.07, 380.43±14.6, 378.43±8.06, 476.77±7.40 and 422.97±17.52 mg/gm in T_1, T_2, T_3, T_4 and T_5 respectively. Seed protein content was analyzed 166.13±7.58, 191.67±9.61, 188.93±6.96, 238.33±2.89 and 212.67±11.40 mg/gm in T_1, T_2, T_3, T_4 and T_5 respectively. Total lipid and protein content in seed was significantly influenced with vermicompost treatment (T_4) and biofertilizer treatment (T_5) compare than control (T_1) [11].

Table 1 Effect of DAP, cowdung, vermicompoat and biofertilizer on total lipid content, protein content, total soluble sugar, starch content and total phenol content of *Arachis hypogaea* L. seed

Treatment	Total lipid (Seed) mg/gm	Protein content (Seed) mg/gm	Total soluble sugar (Seed) mg/gm	Starch content (Seed) mg/gm	Total phenol (Seed) mg/gm
T_1	339.37±6.07	166.13±7.58	43.27±0.64	104.67±0.58	4.05±.02
T_2	380.43±14.6*	191.67±9.61*	74.40±0.53***	118±3.61**	5.53±.03***
T_3	378.43±8.06*	188.93±6.96*	48.67±0.99***	115.17±0.15**	5.43±0.15***
T_4	476.77±7.40***	238.33±2.89***	92.33±2.08***	191±3.61***	6.93±0.35***
T_5	422.97±17.52***	212.67±11.40***	75.07±.31***	128.33±3.51***	5.67±.04***
SE(m)	6.724	4.737	0.637	1.606	0.100
CD (0.05)	21.462	15.120	2.034	5.126	0.320

***=p 0.001, **=p 0.01, *=p 0.05, NS=Non significant

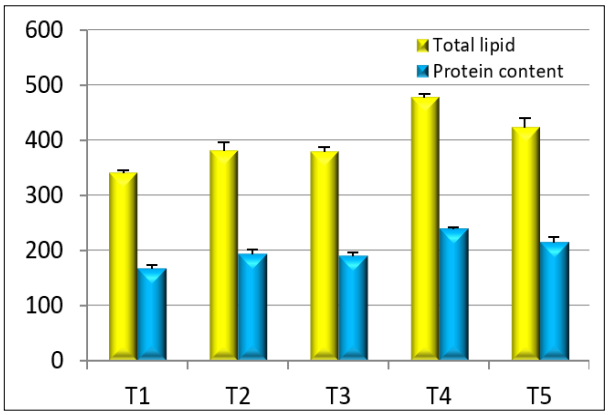

Fig 1 Effect of DAP, cowdung, vermicompoat and biofertilizer on total lipid and protein content of groundnut seed

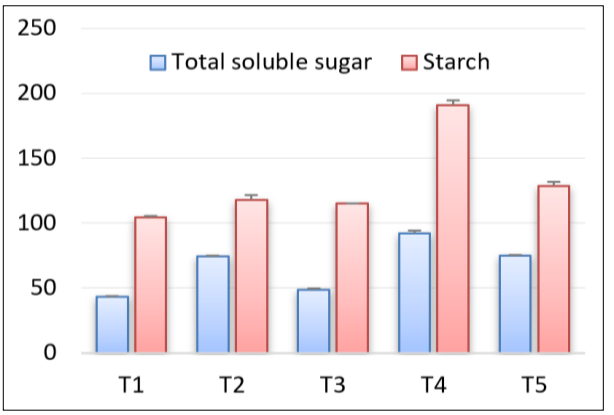

Fig 2 Effect of DAP, cowdung, vermicompoat and biofertilizer on Total soluble sugar and starch content of groundnut seed

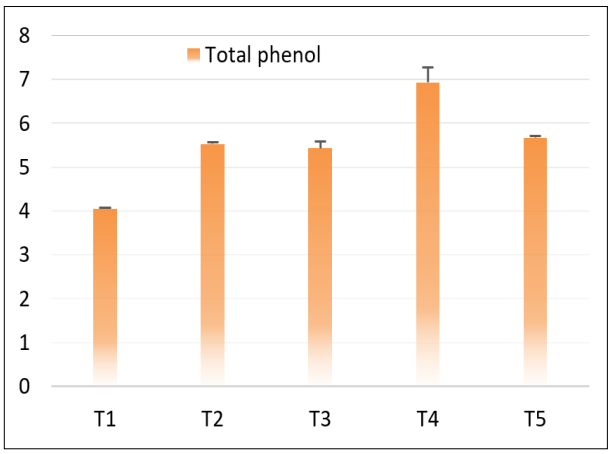

Fig 3 Effect of DAP, cowdung, vermicompoat and biofertilizer on total phenol content of groundnut seed

They reported significantly increase in protein and oil content with vermicompost and inorganic fertilizers in Indian mustard. Application of *Rhizobium* biofertilizer + cow manure + lime significantly influenced oil and protein content of seed of groundnut compares than other combination of treatments and control [12].

Total soluble sugar content reported 43.27±0.64, 74.40±0.53, 48.67±0.99, 92.33±2.08 and 75.07±0.31 mg/gm in T_1, T_2, T_3, T_4 and T_5 respectively. Seed starch content measured 104.67±0.58, 118±3.61, 115.17±0.15, 191±3.61 and 128.33±3.51 mg/gm in T_1, T_2, T_3, T_4 and T_5 respectively. Total soluble sugar and protein content were significantly increased by vermicompost treatment (T_4) and biofertilizer treatment (T_5) compare than control (T_1). Significantly higher starch and protein content was reported with vermicompost and Azosprillum in Chilli (Ns-1701) by [13]. Significantly influence in total soluble sugar and protein content was also recorded with vermicompost, chemical fertilizer and biofertilizer in *Amaranthus Tristis* by [14].

Total phenol content in seed was recorded 4.05±.02, 5.53±.03, 5.43±0.15, 6.93±0.35 and 5.67±.04 mg/gm in T_1, T_2, T_3, T_4 and T_5 respectively. Total phenol content was significantly influenced with vermicompost treatment (T_4) and biofertilizer treatment (T_5) compare than other treatments. Total phenol content and oil content in seed were reported significantly higher total phenol content was

recorded with vermicompost + Mycorrhiza compare than chemical fertilizer + Mycorrhiza, Azotobacter + Mycorrhiza and control in Syrian Cephalaria (*Cephalaria syriaca* L.) by [15].

CONCLUSION

It was concluded that individual treatment with recommended doses of vermicompost and *Rhizobium* biofertilizer significantly influenced nutrient content of groundnut seed viz. total lipid, protein, total soluble sugar, starch and total phenol content. Results of our study also revealed that chemical fertilizer could replace by vermicompost and biofertilizer.

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