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# Evaluation of cow-based bio-enhancers and organic manure on growth, yield attributes and yield of *kharif* groundnut under organic farming

**MH Chavda, PP Chaudhari, SN Makwana and YB Vala**

**Abstract**
A field experiment entitled, "Evaluation of cow-based bio-enhancers and organic manure on growth, yield attributes and yield of *kharif* groundnut under organic farming" was carried out during two consecutive *kharif* seasons of 2021 and 2022 on loamy sand soil of Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. The nine nutrient management treatments under organic farming applied to groundnut during *kharif* season were laid out in randomized block design and twenty-seven treatment combinations comprising nine nutrient management treatments of groundnut through organic manure along with cow-based bioenhancer with three replications. Significantly higher growth parameters, yield attributes, pod yield (1488 kg/ha) and haulm yield (2263 kg/ha) of groundnut were found with the application of 100% RDN through vermicompost + *panchgavya* @ 4% spray at 30 and 60 DAS, which also gave the highest net return (₹53102/ha) and BCR (2.12).

**Keywords:** Groundnut, *panchgavya*, *Bijamrut* and *Jivamrut*

## Introduction
The overuse of inorganic fertilizers and other chemicals that causes environmental contamination and pest epidemics has been a major concern in recent years. The guiding principle of organic farming is to let Mother Nature give us the food that intended. Instead of forcing the plant to grow quickly against its natural course, organic farming feeds the plant as well as the miniature of life that exists in the soil. Organic farming is all about producing healthy food and fiber without the use of synthetic agrochemicals while ensuring animal welfare and environment sustainability. Organic system relay on a modern and synthetic understanding of ecology and soil science, while also integrating traditional agricultural knowledge.

Now-a-days, organic farming is becoming more and more popular, which promotes the switch from a high volume to a high value production system. Management techniques that preserve soil health, effective nutrients supply systems that rely on organic materials rather than chemicals, and integrated pest management are important to attaining these goals. Therefore, the use of botanicals and bio-enhancers derived from cows in combination with organic manures was discovered to be beneficial components in organic farming for a reliable and economical supply of nutrients. These combinations were eco-friendly, safe and improve soil fertility by improving physical, chemical and biological condition of soil.

Groundnut (*Arachis hypogaea* L.) is an annual legume which is also known as peanut, earthnut, monkeynut and goobers. Groundnut is known as poor man's almond. It is the 13$^{th}$ most important food crop and 4$^{th}$ most important oilseeds crop of the world. Groundnut seed contains about 50% edible oil. The remaining 50% of the seed has high quality protein (21.4% to 36.4%), carbohydrates (6.0% to 24.9%), vitamin "E," niacin, falacin, calcium, phosphorus, magnesium, zinc, iron, riboflavin, thiamine and potassium (Das, 1997) [3]. The groundnut oil is generally used in the preparation of vanaspati ghee, soap, cosmetics and cold creams besides as cooking medium. Groundnut oil is light yellow in colour and sweet in taste and flavour. This contains about 20% saturated and 80% unsaturated fatty acids. Polyunsaturated fatty acid has 2 types *i.e.*, oleic acid (40% to 50%) and linoleic acid (24% to 35%) (Mathur and Khan, 1997) [14]. These multiple uses of groundnut make, it an excellent cash crop for domestic markets as well as for foreign trade in several developing and developed countries. Moreover, processed goods like sweets and dry powder made from kernels are used.

Oil cake and groundnut haulms are utilized as organic manure or as animal fodder. Additionally, groundnut shells are used as boiler fuel and as a filler in a variety of organic and biological products, including hard boards, activated charcoal and cork alternatives. Being a legume, the groundnut plant fixes atmospheric nitrogen symbiotically and enhances the fertility of the soil.

Globally, groundnut covers 295 lakh hectares with the production of 487 lakh tonnes with the productivity of 1647 kg per hectare (FAOSTAT, 2021). Groundnut is cultivated in one or more (*kharif* and summer) seasons, but nearly 80% of acreage and production comes from *kharif* crop (June to October). In India, total groundnut area was 4.81 million hectare and production of 6.69 million tonnes with productivity of 1393 kg/ha during while, in Gujarat, total groundnut area, production and productivity were 2.55 million hectare, 3.72 M.T. and 1456 kg/ha, respectively, during the year of 2018-19 (DES, 2021). In Gujarat groundnut is largely cultivated in Junagadh, Rajkot, Dwarka, Banaskantha, Amreli, Jamnagar, Bhavnagar, Gir Somnath and Kachchh districts. Groundnut cultivation is increasing day by day, since it provides ideal crop sequence (groundnut-potato-groundnut) and gives better returns due to cash crop and fodder for dairy cattle especially in North Gujarat condition.

Since excessive chemical use has a negative influence on the environment, human health, and soil health, the Indian government has promoted organic farming through a number of projects and programmes. The National Agriculture Policy, which was approved by the Government of India in 2000, includes organic farming as a specific type of farming. In order to foster scientifically advanced organic farming techniques for sustainable agricultural systems as well as reliable marketing and supply chains for the output, the Gujarati government recently announced "Gujarat Organic Farming Policy-2015." It aims to promote the use of natural resources in favour of organic agriculture in a way that is technically sound, financially successful, environmentally benign, and socially acceptable. The strategy aims to maximize the land and crop potential for organic farming, preserve bio-resources, strengthen rural economies, encourage value addition, speed up the expansion of agro-business, and ensure a fair standard of living for farmers, agricultural workers, and their families. A comprehensive set of practices for the region's primary crops must be developed immediately for the programme to be implemented effectively.

One of the most valuable organic fertilizers for preserving soil fertility in alternative agricultural systems is farmyard manure (Jarvan *et al.,* 2017) [12]. Prior to the invention of chemical fertilizers in the middle of the nineteenth century, the only known sources of plant nutrients added to the soil were farmyard manure and compost (Hack, 1982) [10]. Regular addition of organic materials, especially composted ones, boosted aggregate stability and decreased soil bulk density, which in turn enhanced soil physical qualities (Diacono and Montemurro, 2010) [6]. Also addition of cattle manure resulted in significant increases in soil organic carbon, macro-aggregate stability and aggregate protected carbon. Addition of animal manure may increase biodiversity in the soil, thereby causing alteration in composition, size and activity of soil microorganisms and enzyme activities (Watts *et al.,* 2010) [18]. An earlier analysis revealed that, in terms of production, each tonne of farmyard manure was equivalent to 3 kg of fertilizer nutrients for single crops and 5 kg for double cropping. According to Gaur (1986) [8], 1,000 tonnes of fresh cow dung might theoretically include 15 tonnes of nitrogen and 4 tonnes each of P and K with the studies conducted by Sujathamma *et al*. (2003) [17].

Cow-based bio-enhancers, organic manure and bio-fertilizer play important role in crop production. Organic matter encourages the creation of soil crumb, which makes the soil friable and permits proper air and water flow as well as rainwater absorption, acting on the physical qualities of the soil. Using cow products like dung, urine, milk, curd, and ghee, the *Panchagavya*, *Jeevamrut* and *Bijamrut* are more affordable, environmentally friendly organic formulations.

## Materials and Methods

A field experiment was conducted at Organic Unit, Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar during the *kharif* seasons of 2021 and 2022, entitled with "Evaluation of cow-based bio-enhancers and organic manure on growth, yield attributes and yield of *kharif* groundnut under organic farming". The treatments consisted of nutrient management under organic farming *viz.*, $G_1$: 100% RDN through FYM, $G_2$: 100% RDN through castor cake, $G_3$: 100% RDN through vermicompost, $G_4$: 100% RDN through FYM + *Panchagavya* @ 4% spray at 30 and 60 DAS, $G_5$: 100% RDN through castor cake + *Panchagavya* @ 4% spray at 30 and 60 DAS, $G_6$: 100% RDN through vermicompost + *Panchagavya* @ 4% spray at 30 and 60 DAS, $G_7$: 100% RDN through FYM + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS, $G_8$: 100% RDN through castor cake + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS and $G_9$: 100% RDN through vermicompost + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS to groundnut in *kharif* season and replicated three times in Randomized Block Design. Organic manure *viz.*, farm yard manure, vermicompost and castor cake were applied to groundnut crop 15 days before sowing as per the treatments and uniformly mixed with soil at the time of bed preparation as per the treatment. The required quantity of *Jivamrut* applied as soil application (drenching) after the 30 and 60 DAS of groundnut and foliar application of *panchagavya* @ 4% applied after the 30 and 60 DAS of groundnut. Before sowing, seeds were treated with *Rhizobium* and PSB biofertilizers @10 ml/kg seed during both the years. The seeds were sown manually at 45 cm row apart by maintaining the seed rate of 120 kg/ha and the seeds were sown in previously opened furrow at the depth of 5 to 6 cm and seeds were properly covered with soil and light irrigation was applied in each plot immediately after sowing. The observation on plant growth, yield attributes and yield were recorded as per standard procedure. Economics was worked out on the basis of prevailing market prices of inputs and output obtained from each treatment. The data were statistically analyzed for various characters as described by (Panse and Sukhatme, 1967) [15].

## Results and Discussion

### Plant population

An examination of data (Table 1) indicated that different treatments tried in the experiment did not exert any significant effect on the plant count at 20 DAS and at harvest during both the years of experimentation and in pooled study. This

indicated that the plant stand was uniform throughout its life cycle. Thus, it was cleared that the variation in different growth, yield attributes and yields of groundnut were not influenced significantly due to plant population, but affected entirely due to the application of different nutrient management treatments.

**Effect on growth parameters**

An inquisition of the data in Table 1 revealed that application of 100% RDN through vermicompost + *panchgavya* @ 4% spray at 30 and 60 DAS ($G_6$) showed significantly higher plant height at 60 DAS (32.16 cm), harvest (44.93 cm) and number of branches per plant (7.41) during pooled study. In two year pooled data, treatment $G_6$ remained statistically at par with $G_5$, $G_9$ at 60 DAS and harvest. A perusal of data (Table 2) revealed that significantly higher number of root nodules per plant, fresh and dry weight of root nodules per plant at 45 DAS (45.86) registered with application of 100% RDN through vermicompost + *bijamrut* @ seed treatment 200 ml/kg seed + *jivamrut* @ 500 lit/ha at 30 and 60 DAS ($G_9$) during pooled study, which remained statistically at par with $G_8$, $G_7$ in pooled study. Dry matter accumulation was significantly influenced at all the crop growth stages during both the years as well as in pooled study except at 30 DAS during both years which was found non-significant due to effect of different treatments. A reference to data (Table 2 and Table 3) revealed that application of 100% RDN through vermicompost + *panchgavya* @ 4% spray at 30 DAS, 60 DAS, 90 DAS and at harvest ($G_6$) were produced significantly higher dry matter accumulation per plant and which was remained at par with $G_5$ and $G_9$ during pooled study. An assessment of data (Table 3) indicated that crop growth rate between 0-30 DAS was found non-significant due to different treatments during individual year, but it turned out significant effect in pooled over years. Significantly higher CGR value at 0-30 DAS (0.99 g/m$^2$/day), 30-60 DAS (8.37 g/m$^2$/day) noted with treatment $G_6$ (100% RDN through vermicompost + *panchgavya* @ 4% spray at 30 and 60 DAS), but it remained statically at par with $G_5$ in pooled results. In case of 60-90 DAS, application of 100% RDN through castor cake + *panchgavya* @ 4% spray at 30 and 60 DAS ($G_5$) recorded significantly higher CGR value at 60-90 DAS (9.12 g/m$^2$/day) and which was remained at par with treatment $G_6$, $G_9$, $G_4$ and $G_8$. At later growth stage *i.e.* 90 DAS- at harvest, the CGR value remained unchanged statistically during both the year as well as in pooled study. Relative growth rate between 0-30 DAS, 30-60 DAS, 60-90 DAS and 90 DAS- at harvest was not influenced significantly by different treatments tried in the experiment except 0-30 DAS in pooled study only. A glance of data (Table 4) showed that application of 100% RDN through vermicompost + *panchgavya* @ 4% spray at 30 and 60 DAS ($G_6$) recorded significantly higher relative growth rate at 0-30 DAS (0.2398 g/g/day) in pooled study and remained at par with $G_5$, $G_9$ and $G_4$. An examination of data (Table 2) indicated that the different treatments tried in the experiment did not exert any significant effect on the day to maturity during both the years of experimentation and in pooled study. It might be attributed over to multifarious role of vermicompost in terms of nutrients supply as well as improvement in physical, chemical and biological properties of soil which finally reflected on growth of plant. This might be due to adequate amount of nutrient supply which enhanced the cell division and cell enlargement and helped to convert more solar energy to chemical energy. Vermicompost releases its nutrient quickly because it take shorter time for mineralization. The results were in line with the findings of Konthoujam *et al*. (2013) [13]. Application of bio enhancer *i.e. panchagavya* through foliar spray enhanced the growth rate of plant since, it contains the favorable macro and micro nutrients and growth hormones in liquid formulation. It resulted in stimuli in the plant system and in turn increased the production of growth regulator in the cell system favoring cell division and elongation. Higher response was also due to the fact that nutrient composition of *panchagavya* was high as compared to other liquid bioenhancers. These results are in conformity with the findings of Gowthamchand *et al*. (2019) [9].

**Effect on yield attributes and yield**

A glimpse of data (Table 5 & Table 6) revealed that application of 100% RDN through vermicompost + *panchgavya* @ 4% spray at 30 and 60 DAS ($G_6$) to groundnut registered significantly higher number of pods per plant at harvest (12.68), pod yield per plant (9.43 g), haulm yield (1488 kg/ha) and stover yield (2263 kg/ha) during pooled study, which was remained at par with treatment $G_5$, $G_9$ and $G_4$ during pooled. An examination of data indicated that the different treatments tried in the experiment did not exert any significant effect on the number of kernel per pod, the 100-kernel weight (g) and shelling percentage during both the years of experimentation and in pooled study. Crop yield is the complex function of physiological processes and biochemical activities, which modify plant anatomy and morphology of the growing plants. Remarkable differences in pod yield of groundnut were noted due to nutrient management through different sources of organic manures. Prolonged availability of moisture due to addition of organic manure might have resulted into increased uptake of nutrients, release of phytohormones and organic acids which provided food for the beneficial bacteria. In addition of vermicompost seems balance supply of nutrients over a longer time to the and also due to its pivoted role in enhancing physic-chemical and biological properties of soil which would have resulted into favourable soil atmosphere and ultimately higher yield attributes and yield. The higher availability of N and P in addition to micronutrients might have contributed to higher yield by the application of vermicompost. Besides this, slow release of nutrients from decomposed organic matter, loose and friable soil condition due to organic matter application and significant nitrogen fixation, as a result, significant improvement in all yield attributing characters such as number of pods per plant and pods yield per plant might have contributed to higher pod yield of groundnut. These results are in confirmation with the findings of Choudhary *et al.* (2017) [2] in groundnut and Desai *et al*. (2019) [5]. The easy transfer of nutrients and growth stimulants to plants through foliar spray of optimum dose of *panchagavya* might be the reason for enhancement in plant growth and yield attributes. Smaller quantities of growth hormones like IAA and GA present in *panchagavya* when foliar fed could have created stimuli in the plant system which in turn increased the production of growth regulator in cell system and the action in plant system stimulated the necessary growth and development of plant leading to higher yield. The cow dung in *panchagavya* act as a medium for the growth of beneficial microbes and cow urine provides nitrogen which is essential

for crop growth upon fermentation with other ingredients in *panchagavya* has beneficial effect on growth and yield (Patil *et al*., 2012) [16].

**Economics**

Among the different nutrient management treatments in Table 7, application of 100% RDN through vermicompost + *panchgavya* @ 4% spray at 30 and 60 DAS ($G_6$) recorded the maximum net (₹53102/ha) realizations and BCR (2.12), which was closely followed by the treatment $G_5$ (₹50517/ha and 2.07). The minimum net realization (₹34707/ha) was fetched with the treatment $G_1$ (100% RDN through FYM) and the lower BCR (1.74) recorded under treatment $G_8$ (100% RDN through castor cake + *bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS). This indicated that use of organic manure (vermicompost or castor cake) along with @ 4% *panchagavya* at 30 and 60 DAS was found more remunerative with respect to net return and BCR as compared to rest of the treatments. This could be attributed due to higher pod and haulm yield of groundnut received in these treatments. These findings are in accordance with those reported by Hadiyal *et al.* (2017) [11] and Bhutadiya (2019) [1].

**Table 1:** Plant population and growth parameters of groundnut as influenced by nutrient management under organic farming (Pooled of 2 year)

| Treatments | Plant population per metre row length | | Plant height (cm) | | | Number of branches/plant at harvest |
|---|---|---|---|---|---|---|
| | At 20 DAS | At harvest | At 30 DAS | At 60 DAS | At harvest | |
| $G_1$: 100% RDN through FYM | 10.10 | 9.33 | 9.24 | 25.69 | 36.30 | 5.91 |
| $G_2$: 100% RDN through castor cake | 10.02 | 9.44 | 9.36 | 27.39 | 37.64 | 5.99 |
| $G_3$: 100% RDN through vermicompost | 10.09 | 9.48 | 9.48 | 27.96 | 39.42 | 6.17 |
| $G_4$: 100% RDN through FYM + *Panchgavya* 4% spray at 30 and 60 DAS | 10.03 | 9.49 | 9.81 | 30.31 | 42.26 | 6.77 |
| $G_5$: 100% RDN through castor cake + *Panchgavya* 4% spray at 30 and 60 DAS | 10.05 | 9.53 | 10.16 | 31.21 | 43.82 | 7.03 |
| $G_6$: 100% RDN through vermicompost + *Panchgavya* 4% spray at 30 and 60 DAS | 10.06 | 9.54 | 10.23 | 32.16 | 44.93 | 7.41 |
| $G_7$: 100% RDN through FYM +*Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @500 lit/ha at 30 and 60 DAS | 10.06 | 9.52 | 9.58 | 29.41 | 39.92 | 6.37 |
| $G_8$: 100% RDN through castor cake + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS | 10.11 | 9.50 | 9.70 | 29.51 | 41.25 | 6.47 |
| $G_9$: 100% RDN through vermicompost + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS | 10.05 | 9.72 | 10.12 | 30.82 | 43.54 | 6.90 |
| S.Em.± | 0.27 | 0.29 | 0.31 | 0.81 | 1.30 | 0.26 |
| C. D. (P = 0.05) | NS | NS | NS | 2.33 | 3.75 | 0.76 |
| Interaction (Y × G) | NS | NS | NS | NS | NS | NS |
| C. V.% | 4.68 | 7.42 | 5.68 | 6.74 | 7.78 | 9.84 |

**Table 2:** Growth parameters of groundnut as influenced by nutrient management under organic farming (Pooled of 2 year)

| Treatments | Number of root nodules/ plant at 45 DAS | Weight of root nodules at 45 DAS (mg/plant) | | Days to maturity | Dry matter accumulation (g/plant) | |
|---|---|---|---|---|---|---|
| | | Fresh | Dry | | At 30 DAS | At 60 DAS |
| $G_1$: 100% RDN through FYM | 39.05 | 78.32 | 58.29 | 120.83 | 1.11 | 9.42 |
| $G_2$: 100% RDN through castor cake | 39.19 | 80.90 | 59.73 | 120.67 | 1.15 | 10.88 |
| $G_3$: 100% RDN through vermicompost | 39.48 | 81.11 | 59.89 | 120.50 | 1.17 | 11.00 |
| $G_4$: 100% RDN through FYM + *Panchgavya* 4% spray at 30 and 60 DAS | 39.94 | 81.39 | 60.46 | 117.33 | 1.22 | 11.48 |
| $G_5$: 100% RDN through castor cake + *Panchgavya* 4% spray at 30 and 60 DAS | 42.88 | 83.40 | 62.11 | 117.17 | 1.24 | 11.88 |
| $G_6$: 100% RDN through vermicompost + *Panchgavya* 4% spray at 30 and 60 DAS | 43.33 | 84.60 | 62.75 | 115.17 | 1.33 | 12.64 |
| $G_7$: 100% RDN through FYM +*Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @500 lit/ha at 30 and 60 DAS | 43.70 | 88.39 | 65.91 | 119.17 | 1.20 | 11.11 |
| $G_8$: 100% RDN through castor cake + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS | 45.45 | 94.94 | 70.36 | 118.33 | 1.21 | 11.31 |
| $G_9$: 100% RDN through vermicompost + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS | 45.86 | 95.75 | 70.99 | 116.50 | 1.23 | 11.59 |
| S.Em.± | 1.57 | 2.70 | 2.08 | 3.08 | 0.03 | 0.37 |
| C. D. (P = 0.05) | 4.52 | 7.79 | 5.98 | NS | 0.09 | 1.07 |
| Interaction (Y × G) | NS | NS | NS | NS | NS | NS |
| C. V.% | 9.13 | 7.75 | 8.03 | 6.37 | 6.61 | 8.10 |

**Table 3:** Growth parameters of groundnut as influenced by nutrient management under organic farming (Pooled of 2 year)

| Treatments | Dry matter accumulation (g/plant) | | Crop growth rate (g/m$^2$/day) | | | |
|---|---|---|---|---|---|---|
| | 90 DAS | At harvest | 0-30 DAS | 30-60 DAS | 60-90 DAS | 90 DAS-harvest |
| $G_1$: 100% RDN through FYM | 19.09 | 27.78 | 0.82 | 6.15 | 7.16 | 6.44 |
| $G_2$: 100% RDN through castor cake | 20.98 | 28.84 | 0.85 | 7.20 | 7.49 | 5.82 |
| $G_3$: 100% RDN through vermicompost | 21.03 | 28.91 | 0.86 | 7.28 | 7.43 | 5.84 |
| $G_4$: 100% RDN through FYM + *Panchgavya* 4% spray at 30 and 60 DAS | 22.82 | 31.07 | 0.91 | 7.59 | 8.40 | 6.11 |
| $G_5$: 100% RDN through castor cake + *Panchgavya* 4% spray at 30 and 60 DAS | 24.20 | 33.45 | 0.92 | 7.88 | 9.12 | 6.86 |
| $G_6$: 100% RDN through vermicompost + *Panchgavya* 4% spray at 30 and 60 DAS | 24.85 | 34.01 | 0.99 | 8.37 | 9.05 | 6.79 |
| $G_7$: 100% RDN through FYM +*Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @500 lit/ha at 30 and 60 DAS | 21.89 | 29.62 | 0.89 | 7.34 | 7.99 | 5.73 |
| $G_8$: 100% RDN through castor cake + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS | 22.16 | 30.76 | 0.90 | 7.48 | 8.04 | 6.37 |
| $G_9$: 100% RDN through vermicompost + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS | 23.51 | 32.28 | 0.91 | 7.67 | 8.83 | 6.50 |
| S.Em.± | 0.49 | 0.85 | 0.02 | 0.28 | 0.38 | 0.41 |
| C. D. (P = 0.05) | 1.41 | 2.44 | 0.07 | 0.79 | 1.09 | NS |
| Interaction (Y × G) | NS | NS | NS | NS | NS | NS |
| C. V.% | 5.37 | 6.75 | 6.61 | 9.08 | 11.33 | 16.08 |

**Table 4:** Growth parameters of groundnut as influenced by nutrient management under organic farming (Pooled of 2 year)

| Treatments | Relative growth rate (g/g/day) | | | |
|---|---|---|---|---|
| | 0-30 DAS | 30-60 DAS | 60-90 DAS | 90 DAS-harvest |
| $G_1$: 100% RDN through FYM | 0.2336 | 0.0714 | 0.0236 | 0.0125 |
| $G_2$: 100% RDN through castor cake | 0.2348 | 0.0749 | 0.0219 | 0.0106 |
| $G_3$: 100% RDN through vermicompost | 0.2353 | 0.0748 | 0.0216 | 0.0106 |
| $G_4$: 100% RDN through FYM + *Panchgavya* 4% spray at 30 and 60 DAS | 0.2369 | 0.0745 | 0.0231 | 0.0103 |
| $G_5$: 100% RDN through castor cake + *Panchgavya* 4% spray at 30 and 60 DAS | 0.2375 | 0.0752 | 0.0238 | 0.0108 |
| $G_6$: 100% RDN through vermicompost + *Panchgavya* 4% spray at 30 and 60 DAS | 0.2398 | 0.0750 | 0.0225 | 0.0104 |
| $G_7$: 100% RDN through FYM +*Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @500 lit/ha at 30 and 60 DAS | 0.2362 | 0.0742 | 0.0226 | 0.0100 |
| $G_8$: 100% RDN through castor cake + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS | 0.2366 | 0.0744 | 0.0225 | 0.0109 |
| $G_9$: 100% RDN through vermicompost + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS | 0.2371 | 0.0747 | 0.0236 | 0.0105 |
| S.Em.± | 0.0012 | 0.0010 | 0.0010 | 0.0010 |
| C. D. (P = 0.05) | 0.003 | NS | NS | NS |
| Interaction (Y × G) | NS | NS | NS | NS |
| C. V.% | 0.94 | 4.63 | 11.80 | 12.41 |

**Table 5:** Yield attributes of groundnut as influenced by nutrient management under organic farming (Pooled of 2 year)

| Treatments | Number of pods/plant | Number of kernel/pod | Pod yield (g/plant) | 100 kernel weight (g) |
|---|---|---|---|---|
| $G_1$: 100% RDN through FYM | 9.93 | 2.050 | 7.44 | 41.74 |
| $G_2$: 100% RDN through castor cake | 9.88 | 2.055 | 7.51 | 41.89 |
| $G_3$: 100% RDN through vermicompost | 10.30 | 2.062 | 8.25 | 41.99 |
| $G_4$: 100% RDN through FYM + *Panchgavya* 4% spray at 30 and 60 DAS | 11.77 | 2.083 | 8.72 | 43.14 |
| $G_5$: 100% RDN through castor cake + *Panchgavya* 4% spray at 30 and 60 DAS | 12.28 | 2.093 | 8.97 | 44.54 |
| $G_6$: 100% RDN through vermicompost + *Panchgavya* 4% spray at 30 and 60 DAS | 12.68 | 2.103 | 9.43 | 45.84 |
| $G_7$: 100% RDN through FYM +*Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @500 lit/ha at 30 and 60 DAS | 10.62 | 2.072 | 8.25 | 42.31 |
| $G_8$: 100% RDN through castor cake + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS | 10.96 | 2.078 | 8.65 | 42.89 |
| $G_9$: 100% RDN through vermicompost + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS | 11.89 | 2.088 | 8.74 | 44.48 |
| S.Em.± | 0.46 | 0.07 | 0.28 | 1.31 |
| C. D. (P = 0.05) | 1.33 | NS | 0.81 | NS |
| Interaction (Y × G) | NS | NS | NS | NS |
| C. V.% | 10.11 | 7.78 | 8.19 | 7.43 |

**Table 6:** Pod and haulm yield as well as shelling percentage of groundnut as influenced by nutrient management under organic farming (Pooled of 2 year)

| Treatments | Pod yield (kg/ha) | Haulm yield (kg/ha) | Shelling percentage |
|---|---|---|---|
| $G_1$: 100% RDN through FYM | 1145 | 1652 | 65.15 |
| $G_2$: 100% RDN through castor cake | 1163 | 1730 | 65.77 |
| $G_3$: 100% RDN through vermicompost | 1183 | 1797 | 65.89 |
| $G_4$: 100% RDN through FYM + *Panchgavya* 4% spray at 30 and 60 DAS | 1342 | 2021 | 66.98 |
| $G_5$: 100% RDN through castor cake + *Panchgavya* 4% spray at 30 and 60 DAS | 1448 | 2158 | 67.24 |
| $G_6$: 100% RDN through vermicompost + *Panchgavya* 4% spray at 30 and 60 DAS | 1488 | 2263 | 67.65 |
| $G_7$: 100% RDN through FYM +*Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @500 lit/ha at 30 and 60 DAS | 1231 | 1913 | 66.03 |
| $G_8$: 100% RDN through castor cake + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS | 1269 | 1937 | 66.90 |
| $G_9$: 100% RDN through vermicompost + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut* @ 500 lit/ha at 30 and 60 DAS | 1437 | 2075 | 67.07 |
| S.Em.± | 57.80 | 78.40 | 1.14 |
| C. D. (P = 0.05) | 166 | 226 | NS |
| Interaction (Y × G) | NS | NS | NS |
| C. V.% | 10.89 | 9.85 | 4.19 |

**Table 7:** Economics of groundnut as influenced by nutrient management under organic farming (Pooled of 2 year)

| Treatments | Cost of cultivation (₹/ha) | Gross returns (₹/ha) | Net returns (₹/ha) | BCR |
|---|---|---|---|---|
| $G_1$: 100% RDN through FYM | 42253 | 76960 | 34707 | 1.82 |
| $G_2$: 100% RDN through castor cake | 43093 | 78430 | 35337 | 1.82 |
| $G_3$: 100% RDN through vermicompost | 44834 | 79965 | 35131 | 1.78 |
| $G_4$: 100% RDN through FYM + *Panchgavya* 4% spray at 30 and 60 DAS | 46653 | 90625 | 43972 | 1.94 |
| $G_5$: 100% RDN through castor cake +*Panchgavya* 4% spray at 30 and 60 DAS | 47153 | 97670 | 50517 | 2.07 |
| $G_6$: 100% RDN through vermicompost + *Panchgavya* 4% spray at 30 and 60 DAS | 47493 | 100595 | 53102 | 2.12 |
| $G_7$: 100% RDN through FYM +*Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut*@ 500 lit/ha at 30 and 60 DAS | 46497 | 83425 | 36928 | 1.79 |
| $G_8$: 100% RDN through castor cake + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut*@ 500 lit/ha at 30 and 60 DAS | 49234 | 85825 | 36591 | 1.74 |
| $G_9$: 100% RDN through vermicompost + *Bijamrut* (seed treatment 200 ml/kg seed) + *Jivamrut*@ 500 lit/ha at 30 and 60 DAS | 48122 | 96595 | 48473 | 2.01 |

Selling price: Pod 60₹/kg
Haulm 5₹/kg

## Conclusion

Based on the findings of two years of experimentation, it is concluded that for securing higher pod yield and net profit from groundnut crop under organic farming, apply 100% RDN either through vermicompost or castor cake along with either *panchgavya* @ 4% spray at 30 and 60 DAS or seed treatment with *bijamrut* @ 200 ml/kg seed + two spray of *jivamrut* @ 500 lit/ha at 30 and 60 DAS to groundnut.

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