

## Promising organic farming approaches for groundnut cultivation

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Though groundnut can be grown under diverse agroclimatic conditions, in India, it is mainly grown under semi-arid region where there is a great pressure of drought, mineral deficiencies, insect pests and diseases. More over due to its underground pod bearing habit groundnut farmers prefer light-textured soils which are generally deficient in most of the macro- and micro-nutrients (Kanwar et al., 1983; Singh, 1999). These mineral deficiencies, occurring mainly in young and developing leaves as chlorosis, cause severe yield losses and their intensity has been increased with the introduction of high yielding groundnut varieties. Application of fertilizers and micronutrients either in soil, seed or through foliar applications are the main corrective measures, but these are not long lasting and have to be applied with every crop (Singh,1999). As farmers has to grow the crop for years together with reasonable yields under sustainable farming system, there is a need to relook and exploit the organic farming approaches using the local manurial sources for growing groundnut without using much of chemical fertilizers and pesticides. As the bold seeded groundnut are mostly exported and used for purpose and should be pesticide free these approaches are more needed for bold seeded groundnut. Therefore, field experiment was conducted to study the various organic farming approaches for groundnut cultivation with an objective to meet the nutrient requirement and to produce pesticide free groundnut.

### Materials and Methods

Field experiments were conducted during two consecutive wet and dry seasons at the Research Farm of the National Research Centre for Groundnut, Junagadh, India in a medium black, calcareous, clayey soil containing, 0.71 % organic carbon, 640 mg/kg total N, 5.4 mg/kg available P (Olsen P), 10 mg/kg heat soluble S (available S), 6.2, 6.5, 0.6 and 0.90 mg/kg DTPA extractable Fe, Mn, Zn, and Cu respectively and 0.45 mg/kg water extractable B and pH 8.2. The experiment was laid out in a randomized block design with 9 treatments and four replications. The details of the treatments are summarized in Table 1. The field was prepared and divided into plots of 100 m<sup>2</sup> (12.5 m x 8 m) by raising bunds. The groundnut variety Somnath was grown under recommended package of practices with various organics, but no pesticides were used. The weed biomass of each plot was also recorded during the entire cropping season. The crop was harvested at maturity, dried in sun for a week and pod and fodder yields recorded. The soil samples of each plot after harvest of the crop was collected and analysed.

### Results and Discussions

The two seasons of experimentation on various organic farming approaches revealed that though the responses of FYM and cakes were higher than others, all these were useful in groundnut cultivation and increased groundnut yield and soil fertility (Table 2). There was slow effect of these organics and during first season, only FYM, cakes and bio-fertilizers (PSM + *Bradyrhizobium*) could produce significantly higher pod and haulm yields over control which were also at par with Chemical (NPK) fertilizer. However during next season of testing biogas slurry and mulching could also produced significantly higher pod yield than control (Table 2).

The various organic treatments FYM, cakes, biogas slurry, peanut-cotton briquete, biofertilizers and mulching increased 21, 12, 9, 5, 15 and 7% pod yield over control, respectively during first season and 49, 57, 42, 20 23 and 34 % respectively during second season as against 17.3 and 33.7% increase due to NPK fertilizers, respectively during those seasons. The micronutrient availability of the soil after harvest of crop were also increased due to various organic fertilizers in this study (Table 2). Addition of organic matter increase the organic content, changes the soil physical conditions for crop and also increase the soil microbial activity which help in releasing the mineral nutrients from the soil as well as fertilizers and increase the nutrient availability to plant. Interestingly the soil where chemical fertilizer was applied showed lesser micronutrient availability than other treatment in this study. Due to lesser organic matter and <sup>1</sup>microbial activity in this treatment there was probably lesser replenishment of nutrient from the soil-labile pool than the organic fertilizer treatment, however due to high yield the crop in this treatment harvested high amount of nutrient from the soil and hence there was probably a negative balance.

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During kharif season weeds are problem in groundnut and FYM and cakes, showed more weed biomass than the other treatments (Table 2). Addition of these high fertility organic matter probably gave congenial environment for weed to grow in competition with crop.

Thus it is concluded that use of FYM, castor/ neem cakes, biogas slurry, waste of peanut/cotton and mulching with local plant materials are the promising organic farming approaches for groundnut cultivation and based upon the availability, any one of these could be used. However for immediate response FYM and cakes are best.

#### References:

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Table 1. Details of the various organic farming approaches used in the experiment

| S.No. | Treatments                                    | Rate of application   | Mode of application   |
|-------|---|---|---|
| 1     | Control                                       | -   | -   |
| 2     | Chemical fertilizer                           | NPK (40:40:40) each at 40 kg/ha   | 50% basal + 50% 45 DAS  |
| 3     | FYM   | 10 t/ha fully decomposed FYM  | Basal   |
| 4     | Cakes of castor and neem (3: 1 ratio)         | 1 t/ha (750 kg/ha castor cake + 250 kg/ha neem cake)  | Basal   |
| 5     | Slurry of Biogas plant (Cow dung slurry)      | 40,000 litre/ha biogas slurry (4 t/ha on dry wt basis)  | 50% at 30 DAS + 50% 50 DAS  |
| 6     | Briquet of Peanut shell and cotton waste      | 10 t/ha   | Basal   |
| 7     | Biofertilizers (PSM + <i>Bradyrhizobium</i> ) | 500 ml/ha culture solution of <i>Pseudomonas striata</i> (PSM) and NC 92 containing $10^9$ cells/ml | Culture solution applied in the furrows in moist soil at the time of sowing |
| 8     | Mulching with wild sorghum and/or local weeds | 20 t/ha fr. wt applied 20 DAS   | Spread in between the plant rows at 20 DAS                                  |
| 9     | Green manuring                                | Green manuring with Mungbean  | Basal   |

Table 2. Effect of various organic farming approaches on the groundnut yields, weed biomass and soil micronutrient

| Treatments                         | Weed biomass (Kg/ha dry wt) | Pod Yield (kg/ha) |        | Haulm Yield (kg/ha) |        | Micronutrient content (ppm) of soil after harvest of Kharif, 1998 crop |      |      |      |      |
|------------------------------------|-----------------------------|-------------------|--------|---------------------|--------|--|------|------|------|------|
|                                    |                             | Kh, 1998          | R 1999 | Kh, 1998            | R 1999 | Fe   | Mn   | Zn   | Cu   | Mo   |
| Control                            | 317                         | 830               | 868    | 3189                | 3310   | 6.01   | 6.5  | 0.60 | 0.93 | 0.42 |
| NPK 40:40:40                       | 256                         | 975               | 1162   | 3950                | 4353   | 5.92   | 6.92 | 0.60 | 0.92 | 0.40 |
| FYM                                | 469                         | 1002              | 1300   | 4325                | 4117   | 8.22   | 8.24 | 1.02 | 1.19 | 0.70 |
| Cakes                              | 486                         | 927               | 1367   | 3987                | 4061   | 8.53   | 9.15 | 0.68 | 1.10 | 0.70 |
| Bio-gas Slurry                     | 390                         | 907               | 1232   | 3466                | 3760   | 8.71   | 8.86 | 0.81 | 1.20 | 0.64 |
| Briquet of waste of Peanut/ cotton | 395                         | 872               | 1039   | 3261                | 4048   | 7.63   | 8.49 | 0.75 | 1.12 | 0.65 |
| Biofertilizers                     | 388                         | 954               | 1071   | 3510                | 3682   | 7.86   | 7.71 | 0.76 | 0.95 | 0.56 |
| Mulching                           | 377                         | 890               | 1168   | 3463                | 3485   | 8.41   | 9.8  | 0.78 | 1.01 | 0.67 |
| Green manuring                     |                             |                   | 1091   |                     | 3641   |  |      |      |      |      |
| LDS (0.05)                         | 70                          | 82                | 168    | 378                 | 585    | 1.38   | 1.58 | 0.11 | 0.16 | 0.12 |