

STRATEGIES FOR PROMOTION OF ORGANIC GROUNDNUT PRODUCTION IN INDIA

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Present Status of Organic Groundnut:

In India, commercial cultivation of organic groundnut is relatively new. A large volume of data is available on different components of organic farming, namely; organic manures, bio-fertilisers, bio-pesticides, and their effect on productivity in groundnut. However, systemic research on integrated approach for organic groundnut farming has started only recently.

A. Role of Organic Manures:

Organic manures (FYM, compost, Vermicompost, Oil cakes, etc.) have profound effect on improving soil physical, chemical and biological properties and enhancing productivity of field crops. In groundnut, FYM @ 10-15 ton/hectare increased pod and haulm yields and also improved quality parameters like selling, 100 kernel weight and sound mature kernel compared to the recommended dose of fertilizers. Vermicompost (1.5 t/ha) was as effective as FYM (5 t/ha) in increasing groundnut yield.

B. Role of Biofertilizers:

Bio-fertilizer plays an important role in sustaining crop production and maintaining soil health, particularly in arid and semi-arid conditions. In groundnut, mainly three types of biofertilizer namely, rhizobia for enhancing biological nitrogen fixation (BNF), phosphate solubilizing microbes (PSM) for augmenting phosphorus nutrition and plant growth promoting rhizobacteria (PGPR) for growth promotion and biocontrol capabilities are in the use by the farmers.

A number of experiments on biofertilizers were conducted under the All India Coordinated Research Project (AICRP) on Groundnut at multi-locations over the years. Two groundnut rhizobia namely, IGR 6 and IGR 40, enhanced groundnut pod yield by 11-18% and were recommended for use all over the country. A number of phosphate solubilizing bacteria (PSB) were tested and found to increase pod yield of groundnut. *Pseudomonas striata* produced 11% higher pod yield over control. Experiments conducted under AICRP, groundnut over the years clearly indicated a substantial increase in pod yield due to application of PSM, which was recommended for general application in rainfed groundnut.

Plant growth promoting rhizobacteria (PGPR) have emerged as an important group of microorganisms with growth promotion and bio control capabilities in crop production. Beneficial free-living soil bacteria isolated from the rhizosphere with the capabilities of improving plant health are usually referred to as PGPR. Three PGPR namely; PGPR 1, PGPR 2 and PGPR 4, belonging to fluorescent pseudomonads (specially *Pseudomonas fluorescens* and *Pseudomonas putida*), obtained from groundnut rhizosphere have been identified as effective biofertilizer for groundnut under rainfed condition.

application at the time of sowing (25-62.5 kg/ha) has been found very effective against collar and stem rot.

Besides, bacterial isolates were also found effective in reducing the population of *Aspergillus flavus*. Isolates of *Bacillus* spp. reduced the population of *Aspergillus* by 53% followed by *Pseudomonas fluorescens* by 48%. Spray of culture filtrates of *Verticillium laccanii* and *Penicillium islandicum* significantly reduced rust diseases under field condition. Among the bacterial antagonists, species of *Pseudomonas* are known to be highly potential. *Fluorescent pseudomonads* has been reported to be antagonistic against many soil-borne and foliar pathogens.

C. Role of Bio-Pesticides:

Bio-pesticides include biological agents (fungi and bacteria), and botanical pesticides. The biopesticides offer a viable, cost-effective and eco-friendly alternatives to synthetic pesticides for management of insect pests and diseases of groundnut. Biological control agents are microbes with proven antagonistic activities against other microbes. A critical analysis of the literature reveals that most of the biological agents have been tested against soil-borne diseases of groundnut. Among the biological agents, fungi were found most effective against stem and collar rot. *Trichoderma* spp either as seed treatment (4 g/kg of seed) or as soil

Among the plant products, Neem (*Azadirachta indica*) has been extensively used for the management of diseases in groundnut. Seed treatment with 5% Neem seed powder was found to be most effective against seed and seedling diseases. Soil application of Neem cake @150-250 kg/ha in furrows at the time of sowing was found useful in controlling soil-borne insect pest and diseases. Aqueous extracts of Neem seed @3-5% or leaf @2% may be used for the management of defoliators and major foliar fungal diseases. Foliar application of Neem oil 1-2% reduced incidents of leaf spot, rust and also defoliators.



D. Integrated Package for Organic Farming:

Though the farmers have practiced organic agriculture in India for quite sometime, systemic research on organic crop production in general and on groundnut production in particular has started very recently. So far, no recommendations on package of practice for organic farming have been made either at national level or at state level. The farmers have been practicing organic farming on the basis of their traditional wisdom and experiences. Experiments conducted in Gujarat, Rajasthan, Maharashtra, Karnataka and Tamil Nadu under the AICRP-Groundnut revealed that application of organic manure @ 10 t/ha + rhizobia + PSM and need based foliar spray of Neem oil @2% gave pod yield statistically at par with the conventional inorganic farming. However, cost of cultivation was slightly higher in organic treatment than in conventional. Application of rock phosphate along with FYM and PSM gave the yield at par with the recommended dose of fertilizers. Based on the pool results of 3 years, it was found that the field receiving organic manure + biofertilizer + biopesticides and permitted mineral fertilizer (rock phosphate and gypsum) gave almost equal pod yield with that of conventional farming.

PACKAGE OF PRACTICES (POP) IN ORGANIC FARMING:

In absence of specific recommendations with regard to POP to be followed while practicing organic groundnut farming, the available recommendations on organic manures, biofertilizers and biopesticides in groundnut and also the result available at NRCG and AICRP-Groundnut the following POP may be considered while cultivating groundnut organically.



A. Selection of Land and Land Preparation:

For growing groundnut, land should be selected where there is no application of chemical fertilizers or chemical pesticides in the crop at least for the last three years as per requirement of organic farming. Field should not be in the downstream where there is a possibility of accumulating run off water from the upper field, since there is a chance to leach down the water-soluble fertilizer and pesticide along with runoff water and also through soil particles due to soil erosion. During transition period of 3 years, every year inspection by the certifying agency is a must to declare the farm as organic farm.

B. Seed treatment, Seed Rate and Sowing:

After selling the pods, kernel should be treated with biofertilizer/biopesticides 4-5 gm/kg of seed or Neem seed powder 5% for controlling stem and collar rot diseases. Kernel should not be treated with chemicals for breaking dormancy, especially in Virginia cultivars. Proper seed rate and spacing should be adopted to maintain optimum plant density.

C. Manuring and Fertilization:

Well decomposed FYM or compost @15 t/ha should be applied at the time of field preparation. Poultry manure (5 t/ha) or vermi-compost (5 t/ha) can also be applied in place of FYM. Biofertilizers namely, rhizobia, phosphorus solubilizing microbes (PSM) and PGPR should be applied as seed treatment by adopting recommended method. Rock phosphate (25-40 kg/ha) and gypsum @500 kg/ha (only mined, not chemically prepared) should be applied as per recommended method as these 2 mineral fertilizers are permitted for organic farming. Half quantity of gypsum should be top dressed at the time of peak flowering.

D. Weed Management:

Weeds should be removed by hand weeding or through interculture operations. Deep ploughing, crop rotation and mulching with crop residues are other alternate methods to reduce the infestation of weeds in the crop.

E. Disease and pest control:

A number of biopesticides are available in the market to manage the insect pests and diseases of groundnut. The most economic and efficient biopesticides for managing diseases and pests of groundnut are mentioned here.

- Soil application of castor/ neem cake, 500 kg/ha along with *Trichoderma*, 25-62.5 kg/ha in the furrows at the time of sowing may reduce the incidents of collar and stem rot diseases.
- Foliar application of neem seed extract (5%) or neem leaf extract (5%) or neem oil (2%) help to manage the foliar fungal diseases and also the defoliators.
- Seed treatment with PGPR (4-5 g/kg of seed) or neem seed powder (5%) was found most effective against seed and seedling diseases.
- Pheromone trap for *Spodoptera* @10 kg/ha can help to reduce population of the pest and damage to the crop.
- Neem seed powder or Neem leaf powder @25 gm/kg of pods/seeds can reduce the damage of pods by *Caryedon serratus*. Neem oil at 5-20 ml/kg of groundnut seed has toxic and ovicidal effect on *C. serratus* over a period of 5 months and can be safely used to reduce the damage.

F. Harvesting and Storage:

Groundnut should be harvested at proper maturity to avoid the pod loss. Harvested pod should be dried in the shade and moisture content of pod should be brought down to 8-9%. Produce should be stored in polythene lined guny bags.

G. Certification and Packaging:

Proper certification by certifying agency should be carried out and labeling should be done according to the norms of organic products.

CONSTRAINTS IN PROMOTING ORGANIC GROUNDNUT FARMING:

Organic agriculture in many ways and eminently emerged as preferable model for the development of agriculture in India. Organic agriculture offers multiple benefits. These include economic aspects (premium price, high demand), natural resource conservation (improved soil fertility and water quality, preservation of natural and agro-biodiversity) and social benefits (generation of rural employment, improved household nutrition and reduced dependence on external inputs). Also, the export potential of organic groundnut in international market is very high. Since, Indian groundnut is very popular in the international market for the table purpose, due to its characteristics natural nutty flavour, delicious taste and crunchy texture and also has relatively longer shelf-life. Therefore, with the growing consumers taste and health consciousness, the world-over demand for organic food is on the rise. Though Indian groundnut has high export opportunity, it requires certain technological and policy related support. The limitations at present are:

• Non-availability of organic package of practices for different agro-ecological situations:

Some information might be available on individual component, but their integration as a package still needs to be worked out for different agro-ecological situations so that these recommendations can be passed on to the farmers for adaption in organic groundnut production.

• Inadequate availability of organic inputs (manures, bio-pesticides):

The success of organic farming solely depends on the availability of quality organic inputs. Organic

manures (FYM, compost, oil cakes) are usually not easily available close by. In that case, the other alternate source like crop residues, green manures, etc. have to be explored. Similarly, biofertilizers and biopesticides are the key component of organic farming, which should be of high quality and easily accessible.

• Limited market and lack of market information:

High premium price of organic produce is a major factor that encourages farmers to adopt organic cultivation. Premium price depends on market situations both at domestic and international markets.

• Lack of appropriate training:

Organic farming is a holistic approach that starts from selection of land to harvesting, storage and marketing of the produce. Therefore, proper training of the farmers, processors and traders is essential so that the stakeholders associated with organic farming derive the benefits.

• Absence of regulatory mechanism on quality:

The success of organic farming solely depends on the availability of quality organic inputs in sufficient quantity. A number of organic inputs namely, biopesticides, organic/bio-fertilizers, etc. are available in the markets but usually devoid of strict quality control by appropriate body. Thus, there is a strong need to evolve a proper mechanism for regulating and certifying quality of these bio-inputs in India.

• High-cost certification process:

Most certification agencies charging inspection and certification fees, exorbitantly.

Sometimes, different fees are applied for small farmers, large farmers and processors and traders. These costs are very high and the small farmers cannot afford to bear such a huge amount. Thus, the cost for certification has to come down considerably.

FUTURE THRUSTS:

A. Technology development:

- The knowledge on location specific organic package of practices is not adequately developed.

- Since organic farming relies mostly on organic manures, efficient methods of preparing organic manures/compost by utilizing crop-based residues and their impact on groundnut productivity and soil health need to be studied systemically.

- Impact of crop rotation, intercropping, deep tillage and other agronomic practices need to be re-emphasized and researched for their role in pest management.

- Indigenous technology knowledge (ITK) prevailing in different regions of the country for managing pests and diseases of groundnut to be properly documented and their scientific rational be established.

- The quality aspects of organically produced groundnut are very important. However, there is a strong need to study in detail the quality parameters affected by organic farming vis a vis conventional farming.

- The long-term study on organic vis-a-vis conventional farming in groundnut on soil health, crop productivity and quality aspects need to be undertaken to generate data based for developing sound and sustainable production system for organic farming.

B. Market Development:

The domestic market for promotion of organic farming in India has not yet been developed. We do not know appropriate market structure, behavior and performance of marketing system of organic produce. Even information regarding cost on storage, baggage, transport and handling losses are not known. Unless, these aspects are studied in detail, adoption of organic farming by the farmers in a large scale in the country would be difficult.

C. Quality Certification and Training:

It is essential to develop appropriate regulatory mechanism/certification system governing quality that fits both the domestic and export market. Training of the farmers on different aspects of production, storage, certifications and export at different levels are urgently required to become organic farming a farmers' movement in the country.

