



## Effect of liquid organic fertilizer on soil quality

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### Abstract

Liquid organic fertilizer is a completely organic product and is suitable for replacing chemical manures. It contains rejuvenating properties for soil. Not only does this concentrate have readily available nitrogen, phosphorus and potassium but also has other micro and macro nutrients. The present investigation was conducted to study the effects of the application of old and freshly prepaid liquid organic fertilizer (Jeevamrit) on the soil quality and yield of plants. The main objective of this work was to find out the most safe and economic fertilization treatment for coriander and garden plants. The aim of the current study is to preparation of organic liquid fertilizer, and to throw the light on the effects of organic materials (cow dung, cow urine, jaggery, pulses floor, etc.) and Jeevamrit on the soil nutrient content, plant growth and nutrient content of tested crops also, to study the direct and residual effect of tested old organic liquid fertilizer and in control condition on crops. Liquid Organic preparations contain higher number of bacteria, fungi, actinomycetes, N-fixers and P-solubilizers. From the studies it is evident that jeevamrit is to be used after some days after preparation. The application of these liquid formulations would supplement the application of biofertilizers and they can be prepared easily by locally available materials by the farmers, in rural areas.

**Keywords:** liquid organic fertilizer, soil quality, NPK

### Introduction

Ever increasing population of India would need to produce around 300 million tons of food grains by 2025 A.D. as against the current estimated production of about 209.2 million tonnes. The enhanced yield in future would have to be harvested from vertical rather than horizontal expansion of net cropped area. Enhanced agricultural production is depleting the finite nutrient resource from the soil and has been shown to potentially degrade the resource base. The present nutrient consumption rate is about 20-25 million tonnes of N, P and K, however, total nutrients consumption will be estimated as 30-35 million tonnes in 2025 A. D. The gap between nutrients removed by crops and addition through fertilizers would remain at about 10 million tonnes of nutrient per annum. Liquid organic fertilizers increased aggregate stability, hydrophobicity and total porosity, while decreased bulk density and soil penetration resistance. Increasing water stress levels reduced soil biological activity and made soil physical properties more unfavourable. In general, LOFs improved soil conditions by enhancing soil physical and biological properties and decreased the negative effects of water stress. The fertilizer production in the country lags behind actual consumption and the import bill for augmenting the locally manufactured fertilizers is staggeringly high. The continuous use of high levels of chemical fertilizers is adversely affecting the sustainability of agricultural production and causing soil pollution. Farming was related absolutely with nutrition manufacture and nutrition safety less than a period ago. Organic farming has been stirring the emotions of conventional farmers since its beginnings with the organic farming movement initiated by Sir Albert Howard (1873-1947) and the anthroposophical agricultural lectures of Rudolf Steiner in the early 1920's (Steiner, 1924) [15]. Ever increasing population of India

would need to produce around 300 million tons of food grains by 2025 A. D. as against the current estimated production of about 209.2 million tonnes. The productivity yield gap between conventional and organic farming has been investigated extensively, and the meta-analysis conducted by (Poniso *et al.* 2015) [8]. Organic farming is gaining importance in Indian agri- culture on account of sustainability and quality of the crops being produced. It is being practiced on 37.2 million ha area in 160 countries of the world, which constitutes about 0.9% of the world's agricultural land (Willer and Lernoud, 2014) [16]. The area under certified organic crops has increased from 42000 ha in 2003-04 to 1.08 m ha in 2010 (Yadav, 2010) [17]. The organic cultivation of crops has been recommended by substituting chemical fertilizers and pesticides with organic manures and biopesticides, respectively (Aulakh *et al.*, 2018) [1].

The commonly used organic manures like farmyard manure, green manures, composts, vermicompost and non-edible cakes are required in large quantities to meet the nutritional requirement of crops. The limited availability of these bulky organic manures demands their integration with other available options. The combined use of organic manures and specially prepared organics (Jeevamrit, Panchgavya) helped in sustaining soybean and wheat yields in organic nutrient management system (Sabale, 2005) [9]. The present investigation was conducted to study the effects of the application of old and freshly prepaid liquid organic fertilizer (Jeevamrit) on the soil quality and yield of plants. The main objective of this work was to find out the most safe and economic fertilization treatment for coriander and garden plants.

## Methodology

The experiment was carried out to study the formation of organic liquid fertilizer and its influence on plants. Two sets of jeevamrit, one each from the dung and urine of Indian cow were prepared by using 100 gm dung, 100 ml cow urine, 25 gm jaggery, 25-30 gm Flour of any pulses (Green gram, Bengal gram, black gram, Beans, Red gram) and 25-30 gm a handful of fertile soil from your farm. The final volumes of the mixtures were made to 1 litre with water in plastic containers. The mixtures were kept for incubation under shade for 5 days and stirred vigorously for 10–15 minutes three times a day with a wooden stick. The average minimum and maximum temperatures during the study period were 13 and 33°C, respectively. Beyond the 8th day of preparation the bacterial colonies in the liquid start reducing. In one acre of land 200 litres of solution is applied through irrigation water or direct soil application. The liquid organic fertilizer sample are analysed by following physico-chemical properties as pH, temperature, odour, colour, electric conductivity, nitrogen, phosphorus and potassium. Three Pots were filled with 500 gm of the prepared soil sample which was without mixed any organic materials and saving 20 coriander seeds in each pot. one pot for growth of coriander in control condition, second pot for the growth of coriander with application of two-month-old organic liquid fertilizer and third pot for the growth of coriander with application of freshly prepaid organic liquid fertilizer. The 5ml organic liquid fertilizer old and freshly prepaid is mixed with 10ml water and apply to the second and third pot respectively, and randomly after four days of seedling. Up to the flowering condition of plants.

## Soil sampling

A representative soil sample was collected from the experimental site at the depth 0.0 – 25 cm before cultivation. The soil samples were brought to the laboratory in a plastic bag as soon as possible, spread on a clean plastic sheet and aggregates were broken to get the actual partial size. The samples were air dried the room temperature. The soil was mixed thoroughly and a sample was taken and analysed for pH, EC, and total NPK. The prepared soil sample were divided into two parts; one of them used in a particular lab. Experiment and the second one was used in a pot experiment. Some physical and chemical properties of the experimental soil sample collected before planting of coriander seeds are present in Table

## Observation and result

One of the important problems of chemical fertilizers at overapplication is its negative effects on the environment, such as leaching, pollution of water resources, distraction of microorganisms and friendly insects. The aim of the current study is to preparation of organic liquid fertilizer, and to throw the light on the effects of organic materials (cow dung, cow urine, jaggery, pulses floor, etc.) and Jeevamrut on the soil nutrient content, plant growth and nutrient content of tested crops also, to study the direct and residual effect of tested old organic liquid fertilizer and in control condition on crops. The obtained result and then discussions will be handled in the following parts:

## Experiment

The experiment was carried out to study the preparation of organic liquid fertilizer and influence of organic liquid

fertilizer, old organic liquid fertilizer and control condition on growth and nutrient content of soil and coriander crop.

## Microbial parameters of Jeevamrut

Microbial population of Jeevamrutha between 1 and 30 days after preparation: The different fungi observed were *Aspergillus sp.*, *Fusarium sp.*, *Penicillium sp.*, *Trichoderma sp.*, isolated *P-solubilisers fungi like - Aspergillus sp.*, *Penicillium sp.*, *Bacteria like- Bacillus sp.*, *Pseudomonas sp.*, and *N-fixers like Bacteria - Azotobacter sp.*, *A. chroococcum*, *Bacillus sp.*, *Beijerinckia sp.*, *Actinomycetes - Streptomyces sp.* It clearly indicates that the jeevamrutha is enriched consortia of native soil microorganisms. The preparation would give best results if it is used between 9th to 12th days after preparation. (Devkumar N. *et al.* 2008). Influence of fresh organic liquid fertilizer, old organic liquid fertilizer and control condition on soil and vegetative growth of coriander plant. *Fresh organic liquid fertilizer*: It acts as an agent to increase the microbial count and friendly bacteria in the soil. As the preparation time is only 4-5 days it can be used effectively and frequently. Usage of Jeevamrit helps to increase the earthworm count in the soil; earthworm leads to a very porous quality soil which has a higher water holding capacity. It improves aeration, brings up minerals from deep in the subsurface that are often in short supply in surface layers. If used consistently it can eradicate the need for chemical fertilizers completely. It also improves the pH of the soil. *Old organic liquid fertilizer*: After 9-12 days of preparation the microbial count continuously goes on decreasing, so that old organic liquid fertilizer does not effectively influence on crop (coriander) and soil.

## Control condition

In control condition due to the no use of any type of fertilizer, we saw there is no proper germination and growth of coriander plants.

**Table 1:** Analytical results of Liquid organic fertilizer

| Sample              | pH   | N    | P     | K     | Mg (ppm) | Cu (ppm) |
|---------------------|------|------|-------|-------|----------|----------|
| Cow Dung            | 8.08 | 0.7  | 0.285 | 0.231 | 9.33     | 3.6      |
| Gomutra (Cow urine) | 8.16 | 1.67 | 0.112 | 2.544 | 6.3      | 20       |
| Gram Flour          | 6.7  | 1.47 | 0.622 | 0.91  | 12.6     | 12.4     |
| Jeevamrut           | 4.92 | 1.96 | 0.173 | 0.28  | 46       | 51       |

**Table 2:** Analytical results

| Parameters              | Unit    | Values |
|-------------------------|---------|--------|
| pH                      | --      | 7.00   |
| Temperature             | °C      | 28     |
| Electrical Conductivity | DSM     | 0.22   |
| Nitrogen                | %       | 0.75   |
| Phosphorus              | Kg/acer | 20.00  |
| Potassium               | Kg/acer | 150.00 |

## Conclusion

Heavy use of chemicals in agriculture has weakened the ecological base in addition to degradation of soil, water resources and quality of the food. At this juncture a keen awareness has sprung on the adoption of organic farming as a remedy to cure the ills of modern chemical agriculture. It is very much essential to develop a strong workable and compatible package of nutrient management through organic resources for various crops based on scientific facts,

local conditions and economic viability. The aim of these products is not to supply nutrition but rather to favour and stimulate the metabolism of plant. The bio stimulant products offer a sustainable, environmental-friendly means of enhancing crop productivity in broad acre and specialty crops worldwide. Many scientific studies have demonstrated the potential of various categories of bio stimulants to improve crop production and to ameliorate abiotic stresses such as drought and soil salinity.

Liquid Organic preparations contain higher number of bacteria, fungi, actinomycetes, N-fixers and P-solubilizers. From the studies it is evident that jeevamrut is to be used between 9 to 12 days after preparation. The application of liquid organic fertilizer preparations would complement the application of biofertilizers and it can be organized simply by locally accessible things by the farmers, in rural areas.

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