

Liquid organic manures

A boon to organic farmers

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The demand for organic food is increasing day-by-day. The solid organic manures may not produce potential yield of crops due to low nutrient content and slow release of nutrients. Liquid organic manures can help to achieve the yield potential by helping in assimilation of nutrients and supplying growth promoting hormones like IAA, IBA, cytokinin, gibberellin, etc. They also protect crops from insects and diseases. It enhances soil organic matter content and microbial diversity and stimulates microfauna and enzymes for higher productivity of crops. It is a boon to the organic growers to achieve sustainability and doubling their income.

Keywords: Beejamrit, Jeevamrit, Panchagavya, Vermiwash

ORGANIC farming has been creating a buzz all around the world for the past few years. With rising consciousness among consumers about the health and environmental benefits, the market for organic food is now one of the fastest growing in the world, with a forecasted growth rate of 16.4%, during the period of 2020-25. The organic area in India accelerated from 0.0017 in 2000 to 2.66 million hectares in 2020-21 and it will continue to increase.

Organic farming depends on bulky organic manure like farmyard manure, compost, vermicompost and in some cases poultry manure. These manures contain very low amount of plant nutrients and their mineralization rate is also very slow. Therefore, farmers are not getting desired yield from organic farming. In recent days, liquid organic manures are getting relevance in organic farming. Foliar application of liquid organic manures leads to the absorption of nutrients twenty times faster than the soil application. Temporary nutrient deficiencies can be overcome by using liquid organic manures. They act as a tonic or stimulant for the crop growth and

improve nutrient assimilation. They play a key role in improving growth and yield of crops, besides improving soil quality. Hence, it has immense potential and role in organic production system.

Liquid organic manures

Liquid organic manure is the extract obtained during the process of decomposition/fermentation of organic matter or during the process of partial or complete composting or vermicomposting or excreta of animals such as urine, or extracts obtained during the decomposition/fermentation of concentrated organic manures.

Preparation and use of liquid organic manures

Some of the important and popular liquid organic manures have been described as under:

Panchagavya

Description of this holy combination could be traced out in Vedas. Ayurveda describes five important substances obtained from cows, viz. milk, ghee, curd, urine and dung. All these five products are individually called *gavya*. In Sanskrit,

panchagavya means the blend of five products obtained from a cow. *Panchagavya* is prepared by suitable combinations of these *gavyas*, which is given as under:

Cow dung	-	5 kg
Cow urine	-	4 litre
Cow milk	-	3 litre
Cow curd	-	2 litre
Cow ghee	-	1 kg
Water	-	10 litre

The above ingredients are mixed in a clean container thoroughly and kept for 15 days. The content is to be stirred twice a day both at morning and evening. It should be kept in the shade and covered with a clean gunny bag.

Enriched Panchagavya

Dr Natrajan, a medical practitioner and scientist from Tamil Nadu Agricultural University, Coimbatore has further refined the formulation suiting to the requirement of various horticultural and agricultural crops. It is called enriched *panchagavya* (*Dashgavya*). It is a cow extract based indigenous nutrient solution. Five to nine products, viz. cow dung, cow urine, cow milk, curd from cow milk, jaggery, *ghee* (butter), banana, tender

coconut and water are used for preparation of enriched *panchagavya*. When suitably mixed and used, these have miraculous effects. The flow chart for preparation of enriched *panchagavya* is given in Fig. 1.

Application

It is usually recommended as foliar application. 3% *panchagavya* solution is most effective and 500 L solution is sprayed for 1 ha. Spraying twice a month till maturity of crops is suggested. If sufficient *panchagavya* is not available, then spraying at pre-flowering and flowering provides good results also. *Panchagavya* may also be applied with irrigation water.

Uses of *panchagavya*

The cost of production of *panchagavya* is about ₹ 25-35 per litre. The B:C ratio up to 2.1 has been achieved in different crops with application of *panchagavya*.

Panchagavya contains many useful microorganisms such as fungi, bacteria, actinomycetes, etc (Table 1).

It contains macro-nutrients, essential micro-nutrients (Table 2), many vitamins and essential amino acids. Presence of growth regulatory substances such as indole acetic acid (IAA), gibberellic acid (GA3) and cytokinin in *panchagavya* cause a stimulatory effect on the growth rate of crops. The presence of plant

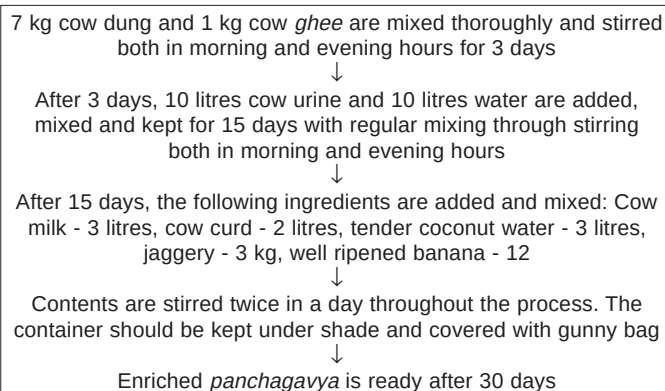


Fig. 1. Panchagavya preparation process.

growth enzymes, i.e. GA 3-oxidase, and GA 2-oxidase in *panchagavya* favours rapid cell division and multiplication and helps in enhancement of biological efficiency of crop plants. The formulation acts as tonic to enrich the soil, induce plant vigour with quality production. Nodule formation in pulses is enhanced.

Panchagavya contains enzymes, i.e. xanthin oxidase and lysozyme, which are involved in antibacterial-cum-antifungal mechanisms. The disease suppression effects of *panchagavya* may be partly attributed to the presence of high population of

fluorescent pseudomonads and saprophytic yeasts that induce pathogenesis-related protein, siderophores and antibiotics.

The acidic pH may be due to the presence of *Lactobacillus* in *panchagavya*, which produces various beneficial metabolites such as organic acids, hydrogen peroxide, and antibiotics, which are effective against other pathogenic microorganisms. *Panchagavya* improves soil quality due to the presence of effective microorganisms (*Lactobacillus*, *Saccharomyces*, *Streptomyces* and *Rhodopseudomonas*).

Beejamrit

Beejamrit is prepared by using local cow dung, cow urine, water and lime. The flow chart for preparation of *beejamrit* is given in Fig. 2.

Uses of *Beejamrit*

It is used as seed or seedling treatment to increase the germination capacity of seed and growth of seedlings. Several beneficial bacteria, hormones and alkaloids are present in *beejamrit*, which enhance seed germination and vigour, seedling length; and provides protection to seeds and seedlings from harmful seed-borne pathogens; other fungus, bacteria and soil borne diseases. 1 L solution of *beejamrit* is sufficient to treat 5 kg of seeds. Treat the seeds in *beejamrit*, dry in shade and use for sowing. It is a source of nutrients. The bacterial isolates from *beejamrit* were capable of the production of the growth promoters like IAA and GA, which promote the growth of plants. The beneficial micro-organisms in *beejamrit* enhance the microbial activity of the soil.

Jeevamrit

Indigenous cow dung is the main base of *jeevamrit*. The flow chart for preparation of *jeevamrit* is given in Fig. 3.

Table 1. Microbiological characteristics of *panchagavya*

Microbe	Population/ml of <i>panchagavya</i>
Total bacteria	22 × 10 ⁹
Total actinomycetes	60 × 10 ⁴
Total fungi	11 × 10 ³
Phosphate solubilizing bacteria	103 × 10 ⁶
Cellulolytic bacteria	8 × 10 ³
Fluorescent pseudomonads	151 × 10 ⁵
Nitrifying bacteria	5.4 × 10 ⁶
Denitrifying bacteria	2.7 × 10 ⁶

Table 2. Nutrient concentration in *panchagavya*

Nutrient	Concentration
Organic carbon (%)	2.24
Total N (%)	1.69
Total P (%)	1.15
Total K (%)	0.10
Fe (ppm)	345
Cu (ppm)	45
Mn (ppm)	413
Zn (ppm)	565

Take 5 kg of indigenous cow dung (preferably fresh or not more than 3 days old) in a cloth and bind it by tape and hang this in the 20 litres of water for 12 hours

↓

In another container, dissolve 50 g of lime in one litre water and keep for a night

↓

Next day morning, squeeze this bundle of the cow dung in water 3 times to extract material

↓

Add the soil from undisturbed bunds or forest or under tree cover in the solution and stir it well

↓

Add 5 litres of indigenous cow urine in the solution and add the lime water and stir it well

↓

Beejamrit is ready to treat the seeds



Fig. 2. Beejamrit preparation process.

In a plastic drum/barrel of 250 litres capacity, add 10 kg of fresh cow dung, 10 litres of cow urine, 2 kg of jaggery, 2 kg of *besan* (chickpea flour) and 150 g of soil from undisturbed bunds or forest or under tree cover in 200 litres of water and mix them thoroughly

↓

After adding all of the above-mentioned materials, stir well in clock wise direction

↓

Keep drum in shade covering with gunny bag or cotton cloth or plastic mosquito net

↓

Stir the prepared solution for 5-10 minutes for twice a day (morning and evening) with wooden stick

↓

Jeevamrit is ready for application at 9th day and it can be applied up to 12th day



Fig. 3. Jeevamrit preparation process.

Uses of Jeevamrit

It is a miracle microbial culture. The beneficial soil microorganisms, earthworms are activated when *jeevamrit* is applied with irrigation water. The enormous number of microbes present in it enhances microbial activity in soil. The soil application of *jeevamrit* at very low-rate acts as a tonic to soil, besides improving soil health. Generally, *jeevamrit* is applied at the rate of 500 L/ha as foliar spray. The availability and uptake of nutrients by crops is increased by the application of *jeevamrit*. The nutrient composition of *beejamrit* and *jeevamrit* is given in Table 3.

Vermiwash

For preparation of vermiwash, one kg adult earth worms devoid of casts is released into a trough containing 500 ml of luke warm water (37-40°C) and agitated for two minutes. The agitation in the lukewarm water makes the earthworms to release mucus and body fluids. Earthworms are then taken out and washed in

another 500 ml at room temperature (30°C and released back into the tank. Transferring into water is done to wash the mucus sticking to their body surface and this also helps the earthworms to revive from the heat shock. Both earthworm wash collected and mixed together for spray. This is the pure vermiwash.

Uses of vermiwash

The vermiwash is applied at 10% as foliar spray. Vermiwash provides growth promoters like gibberellin, cytokinin and auxins; and organic acids apart from some macro- and micro-nutrients resulting in improved growth of crops. Vermiwash contains enzymes and secretions of earthworms, which stimulate the

growth of crops. The presence of large number of beneficial microorganisms in vermiwash facilitates nutrient uptake and helps to increase the growth of the crops. It improves the germination percentage and seedling vigour of crops.

Vermiwash promotes humification, increases microbial activity, which in turn brings about the aggregate stability of soil particles, resulting in better aeration. It also binds mineral particles like calcium, magnesium and potassium in the form of colloids of humus and clay, facilitating stable aggregates of soil particles for desired porosity to sustain plant growth.

Vermiwash is enriched in certain metabolites and vitamins that belong to the B group and pro vitamin D

Table 3. Nutrient composition and pH of *beejamrit* and *jeevamrit*

Sample	pH	N (%)	P (%)	K (%)	Mn (ppm)	Cu (ppm)	Fe (ppm)
Beejamrit	8.02	2.38	0.127	0.485	16	36	168
Jeevamrit	4.92	1.05	0.122	0.081	46	51	318
Jaggery	6.37	0.84	0.209	0.290	9.1	28.80	-
Pulse flour	6.70	1.47	0.622	0.910	12.6	12.40	-
Cow dung	8.08	0.70	0.285	0.231	9.33	3.60	-
Cow Urine	8.16	1.67	0.112	2.544	6.3	20.00	-

which help to enhance crop growth. It has a positive effect in bringing colour to tomato fruits, due to the presence of nitrogen and other micronutrients, which enhanced the synthesis of lycopene. The application of vermiwash decreases nitrate content in chilli. The efficiency of vermiwash in imparting resistance to many pests and diseases is also reported. It is used as an effective biopesticide in many vegetable crops.

Rishi Krishi

Drawn from Vedas, the *Rishi Krishi* method of natural farming has been mastered by farmers of Maharashtra and Madhya Pradesh. In this method, all on-farm sources of nutrients including composts, cattle dung manure, green leaf manure and crop biomass are exploited to their best potential with continuous soil enrichment through the use of *Rishi Krishi* formulation known as '*Amritpani*' and virgin soil. About 15 kg of virgin rhizosperic soil collected from beneath of banyan tree (*Ficus bengalensis*) and 200 litres *amritpani* are applied separately in one acre. *Amritpani* is prepared by mixing 250 g *ghee* into 10 kg of cow dung followed by 500 g honey and diluted with 200 litres of water. This formulation is utilized for seed treatment (*beej sanskar*), enrichment of soil (*bhumi sanskar*) and foliar spray on plants (*padap sanskar*). For soil treatment, it needs to be applied through irrigation water as fertigation. The system has been demonstrated on a wide range of crops, i.e. fruits, vegetables, cereals, pulses, oilseeds, sugarcane and cotton.

Matka khad (Mod pot manure)

The *matka khad* is prepared in a mud pot (*matka*) and hence the name is so. One kilogram chickpea flour, one kilogram jaggery, one handful soil from below the tree of *peepal* (*Ficus religiosa*) or banyan or neem or forest or bund of the field, 15 kilogram fresh (not older than 24 hours) indigenous cow dung and 15 litres of indigenous cow urine are mixed together in 15 litre water and poured in the mud pot. The entire material stirred by a wooden stick daily for five minutes up to 15 days in clockwise direction.

After fifteen days, the organic manure is ready to use. Now sieve this mix solution with the cotton cloth. This filtered liquid material from one mud pot is diluted in 200 litres of water and is used for spraying one acre crop area. It can also be used as drenching in wider spaced crops. The *matka khad* filled in a can with a tape, is kept at one side of the irrigation channel and the *matka khad* come out drop by drop from the can in the irrigation channel and reaches entire field with the irrigation water. About 400 litres of *matka khad* is sufficient for direct use with irrigation water or by drip irrigation. The spraying of this liquid manure is done every 15 days interval up to the 50% flowering stage.

Compost tea

It is a mixture of nutrients and oxygen-loving (aerobic) bacteria, fungi, predatory nematodes and other microbes that live in finished compost. It takes time to separate these organisms from compost. Hence, compost tea is made by steeping compost in water for a day or more. Generally, the fresh finished compost is suspended in a barrel of water for 7 to 14 days, usually soaking in a burlap sack. It enhances the nutrient status in both plant and soil. It increases the population of mycorrhizal fungi and predatory nematodes, both of which help defend plants against a variety of microorganisms.

Amrithakaraikal (Amrit solution)

Place 10 kg of cow dung (as far as possible fresh) in a plastic vessel of 50 litres capacity. Add 10 litres of cow urine and 1 kg jaggery (palm jaggery for better results). Stir with hand all these constituents until the solution becomes uniformly dissolved. Keep for 24 hours to settle down and then it can be used for seed treatment, fertigation, etc.

Cow urine

Cow urine solution is prepared using fresh cow urine (100 ml) mixed with 1 litre cold water. About 6 litre solution is required to soak 6 kg seeds. During soaking, cow urine solution is kept 3-4 cm above from the seed level. After soaking for

about 16 hours, the seeds are shade dried for about 24 hours and used for sowing operation.

Other liquid organic manures

Several other indigenous liquid organic manures such as biodynamic liquid manure, liquid biodigester, biogas slurry dasagavya, fish nutrient solution, *amudham* solution, coconut-butter milk solution, Arappu-butter milk solution, egg extract, etc. are prepared and used for successful organic production systems.

Economics of liquid organic manures

All liquid organic manures are prepared from locally available resources, which are very cheap and most of them are free of cost. Farmers can easily prepare liquid organic manures. These liquid organic manures can play an important role in enhancing the nutrient use efficiency and reduce the level of solid organic manure, when applied in combination. Higher net returns and B:C ratio are reported in most of the crops due to the low cost for preparation. Considering this, utilization of liquid organic manures can be a viable option to fulfil the goal of Government of India to achieve the doubling of farmers' income by 2022.

SUMMARY

Liquid organic manures have beneficial effect on growth, yield and quality of crops and enhance the shelf life of fruits. It not only enhances the yield of crops, but improves soil quality and enhances the sustainability of organic production system in long run. Liquid and solid organic manure complement each other and hence, the former should not be used as substitute to the later. The use of liquid organic manure should be encouraged to promote low-cost organic farming. This low-cost technology will help in achieving the doubling of farmers' income due to higher net returns. Liquid organic manure is a great boon for organic growers.

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