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Jevamrutha: Organic Liquid Formulations For Sustainable Agriculture Practices: A Review

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Abstract: *In the context of today's modern agriculture, jeevamrutha, popularized by Shri Subhash Palekar, is a panacea for the prosperity of small farmers. It is important to provide a congenial environment to microorganisms that help in making available the essential nutrients for plant growth viz., nitrogen, phosphorus, and potassium, to the plants. Jeevamrutha provides such an environment to beneficial microbes. Application of Jeevamrutha to soil improves the soil considerably. It also encourages microbial activity in the soil.*

Keywords*:Farming; jeevamrutha; growth; yield; India*

I. Introduction

Zero budget natural farming is a holistic alternative to the present paradigm of high-cost chemical inputs-based agriculture. Zero budget natural farming is a farming practice that believes in natural growth of crops without adding any fertilizers and pesticides or any other foreign elements. The word zero budget refers to the zero-net cost of production of all crops (inter crops, border crops, multi crops). The inputs used for seed treatments and other inoculations are locally available in the form of cow dung and cow urine.A call to nature where no external inputs need to be purchased is referred to as zero budget natural farming or naisargik sheti or jaivik kheti[1]. This concept was pulled into light by Subhash Palekar and it has attained wide success in southern India, especially Karnataka where it was firstly evolved. This type of farming is stands on four pillars: jeevamrutha, beejamrutha, acchadana (mulching) andwhapasa (moisture)[2].

Among four pillars, jeevamrutha, given by Palekar, has been proved to be benefaction for combating various plant diseases[3]. Jeevamrutha is claimed to be a panacea for organic farming to fulfill the nutritional requirement of crops as well as for pest management. Organic liquid formulation like jeevamrutha and panchagavya helps to buildup soil fertility through enhanced activity of soil micro flora[4]. These have the properties of both biofertilizer and biopesticide and play a key role in promoting growth and immunity to the plant system. Jeevamrutha is the best alternative that we can use in place of chemical fertilizer and serves as a source of beneficial microorganisms[5]. It offers source of the microorganism that fix nitrogen, solubilize phosphorus, also it is the rich source of carbon, nitrogen, phosphorus, potassium, and many micronutrients[6].

II. Methods of Preparation of Jeevamrutha

Jeevamrutha was prepared with horse gram, jaggery, native cow urine, dung, a hand full of virgin or garden soil (devoid of any chemicals) and water. The ingredients in proper proportions were mixed in a cement tank and covered with a gunny bag. The contents are stirred well twice or thrice a day with a wooden stick and the jeevamrutha is ready for use after second day[7].

Another method of preparation is done by mixing 10 kg local cow dung with 10 litres cow urine, add 2 kg local jaggery, 2 kg pulse flour and handful of garden soil and the volume made up to 200 litres. Keep the drum in shade covering with wet gunny bag and stir the mixture clockwise thrice a day and incubate[8]. Some of the ingredients used in the preparation as well as the method of preparation of jeevamrutha may vary. The quantity to be prepared depends upon the area of land to which the jeevamruthamust be applied.

Another method is by mixing 500g cow dung, 500 ml cow urine, 100 g green gram (soaked overnight and ground), 25 g undisturbed soil, 100 ml coconut water and ten litres of water thoroughly and kept for 3 days by covering with muslin cloth. Stirring was done twice a day in clockwise direction. Jeevamrutha was stored in plastic vessels covered with muslin cloth in open condition for different periods [9].

III. Method of Application

The method of application varies according to convenience. In a field study conducted by Research Institute on Organic Farming (RIOF), University of Agricultural Sciences, Karnataka, the recommended farmyard manure was applied to all plots three weeks before transplanting and incorporated into the soil. Jeevamrutha was directly applied to the soil at 20, 40 and 60 days after transplanting[10].

Jeevamrutha popularized by Shri Subhash Palekar suggests applying the mixture when the ground is wet for the plants. This seems to work wonders for the plants due to increased microbial activity by 3rd and 4th day. This is an excellent culture for enabling the exponential increase of beneficial microbes[11].

According to a study conducted in Maharashtra on the effect of organic inputs on soybean crop, jeevamrutha was applied to soybean at 30 and 45 days after sowing along with the irrigation[12].

It can be used through irrigation water and along with farmyard manure during land preparation or at the time of sowing. Jeevamrutha can also be used as spray after filtering at 5% concentration[13].

On a study based on evaluation of microbial culture by using jeevamrutha in Punjab, the field evaluation of jeevamrutha was done on rice, maize and wheat in rice–wheat and maize–wheat cropping systems during 2009–10 and 2010–11 in a split plot design. The subplots consisted of soil application of jeevamrutha, and soil - foliar application of jeevamrutha[14].

Table 1: Use of Jeevamrutha on various crops

Sl. No	Name of the author/s	Type of crop	Method of application	Findings of the research
1	Boraiah*et al.*,(2017)[15]	Capsicum	Applied to the base of the seedlings manually at 25, 50, 75 and 100 DAT.	Higher yield per hectare.
2	Amareswariand Sujathamma, (2014)[7]	Rice (Masura&Hamsa	Jeevamrutha was applied as foliar spray in the nursery and given with irrigation every fortnight in the main fields.	In Masura the grain yield and gross return using chemicals cultivation were 8% higher than that of cultivation with Jeevamrutha. But both grain yield and gross return through chemical farming were found to be 5% less than that of jeevamrutha in case of Hamsa variety.
3	Ramesh *et al.*,(2018)[16]	Maize	Foliar spray	Higher plant height and LAI (Leaf Area Index). Significantly higher cob length and cob girth was registered.
4	Singh*et al.*,(2018)[17]	Sweet basil	Applicationthrough irrigation.	Able to enhance the germination percentage of seeds in presence of NaCl salinity stress.
5	Sornalatha*et al.*,(2018)[18]	Ridge gourd	The seeds were soaked for overnight in beejamrutha+jeevamrutha. After germination it was used as foliar spray.	Maximum height was observed. The shoot length, root length was found to be better and the number of leaves was higher.
6	Reshma *et al.*,(2018)[19]	Cowpea	Jeevamrutha was applied when the soil was wet near the root zone of the crop.	Higher growth parameters. Higher plant height, number of branches, number of leaves, leaf area, and leaf area index.

Table 2: Advantages of jeevamrutha

Sl. No.	Advantages	Author/s
1	Acts as an agent in increasing microbial count and essential bacteria.	Devakumar*et al.*,(2014)[5]
2	Higher number of nitrogen fixers	Boraiah et *al.*,(2017)[15]
3	Contains enormous amount of microbial load which multiply in the soil and acts as tonic to enhance microbial activity in soil.	Palekar, (2006)[8]
4	It also contains micro & macronutrients essential for plant growth & development.	Ramesh*et al.*,(2018)[16]
5	Results in higher growth, yield and quality of crops.	Sornalatha S and Esakkiammal (2018)[20]
6	Requires less money if prepared by farmers and can be prepared easily by locally available materials in rural areas.	Devakumar*et al.*,(2014)[5]
7	Jeevamrutha enhances the earthworm biomass, density, and also higher recovery of vermicompost	Veeresh and Narayana, (2013)[21]
8	The presence of methanol, propanol, butanol and ethanol as the fermentation by-products.	Natarajan, (2008)[22]
9	Increase pH of Jeevamrutha during storage.	Yogananda, (2015)[23]

IV. Limitations of Jeevamrutha

The main disadvantage of zero budget farming is while the method is natural, but it does incur a minimum input cost. The cost is in the indirect form of labor for field work and cattle rearing, the input requirement for cattle feed and its health requirements like vaccinations. Zero budgetsimply that no direct cost is incurred but there are indirect costs in terms of feed to the cattle, labor and so on which are kept at very minimal. Zero budget natural farming might be profitable in the long run, but as of now, completely depending on it for profit is not feasible (particularly for those owning more than 5 acres)[24].

A study was conducted with the specific objectives of assessing over all farmers' perception. Among the sixty farmers who were interviewed, it was found that majority of the farmers had medium perception. They also stated that use of this farming facilitates natural enemy's population and it is complex to adopt. Majority of the farmers who were interviewed believed that it is difficult to practice. Some other problems stated include difficulties in adopting it on a large scale[25].

V. Scenario In India

Zero budget natural farming is becoming common in states like Karnataka, Andhra Pradesh, Tamil Nadu, Himachal Pradesh, Gujarat and Punjab. Andhra Pradesh has recently announced plans to support 3000 farmers to adopt zero farming via state support[26]. The Government of Andhra Pradesh has launched a scale-out plan to transition 6 million farms/farmers cultivating 8 million hectares of land from conventional synthetic chemical agriculture to natural farming by 2024, making Andhra Pradesh India's first 100 per cent natural farming state (UN Environment)[27]. As reported by the Economic Times Bureau, the state of Maharashtra has announced the promotion of natural farming to reduce cost of production of farmers and thereby double their income. However, in Maharashtra, a considerable number of followers have returned to practicing chemical farming as they failed to improve their incomes with natural farming.

In 2018, the Himachal Pradesh governor urged the community farmers to adopt the sustainable farming as it would help in changing the system of chemical farming. The Himachal Pradesh government allocated 250 million rupees for natural farming [28].According to the agricultural department, a few individual farmers in the districts of Palakkad, Thrissur and Wayanad follow natural farming.In Kerala, the movement was first introduced in Palakad district, which remains its largest base of followers. In Kerala, native cows have been almost completely eradicated with the introduction of high yielding hybrid cows. Yet according to its practitioners, all these problems are meaningless when viewed in relation to the abundant yield this system of soil management promises [29]

VI. Scenario In Karnataka

It has attained wide success in southern India, especially the southern Indian state of Karnataka where it was first evolved. A rough estimation presents around 100,000 farmer families follow the natural farming practices in Karnataka (52 Profiles on Agro ecology). A study conducted by (Khadse*et al.*,2017)[30] points the positive impact on various agro ecological indicators from among the farmer households. The following results were observed health improvement among all households, soil conservation, seed autonomy, quality of produce and rise of income yield,

and seed diversity. At the same time pest attack has decreased. According to Palekar, being a state that has a large quantum of drought-prone land, next to only Rajasthan, Karnataka is bound to benefit from this farming as this system reduces water consumption (Satishkumar and Umesh 2018)[31].In a case study in Pannur village of Mysuru district, a paddy farmer as his hereditary occupation grew paddy using chemical fertilizers and pesticides. After a meeting with Palekar in 2005, he ditched chemicals and pesticides and shifted to natural farming. Today in 2020 he successfully grows more than 170 varieties of trees using natural methods, on five acres. His crops did not take well to the home-made fertilizer, and nearly 50 per cent of them got damaged in the initial period of gestation. The massive profits further validated the success within the first three months of production. After earning an annual income of 25 lakh, he strongly believes that adopting the sustainable model can reduce agriculture-related issues like heavy credit, chemicals, monetary loss and most importantly, prevent farmer suicides The impact has been positive and affirms the claims that the method can reduce risk. There are criticisms against because to follow that one must adhere to strict guidelines of do's and don'ts[30].

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