

A STUDY ON ROLE OF JEEVAMRUTH IN NATURAL FARMING: A REPLACEMENT FOR SYNTHETIC FERTILIZERS

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Abstract: The intensive use of synthetic fertilizers these days has called up for an urgency to practice natural farming and it is necessary to regain the capacity to produce the natural food. Jeevamruth is one such natural amendment which can replace the use of chemical fertilizers and reclaim the sustainability of the environment. It is prepared from desi cow dung, desi cow urine, pulse flour, jaggery and one handful of bund/forest soil. The constituents like cow dung and cow urine act as an inoculum of beneficial microbes and these microbes multiply in number by using pulse flour and jaggery. The beneficial micro organisms in jeevamruth help in mineralization of soil nutrients and make the nutrients available to plants when applied to the soil. Foliar application of jeevamruth also bring in some changes in the phyllosphere microclimate. This review mainly contributes on the method of preparation, nutrient composition, microbial populations of jeevamruth.

IndexTerms - Jeevamruth, microbial, natural farming.

Introduction

In India natural farming has been followed from the ancient times. At that time it was more of a "do nothing" farming, where farmer just sow the seeds and the rest is handled by the nature. There were abundant earthworms, beneficial soil microbes, beneficial insects which act as natural predators of agriculturally harmful pests, natural pollinators, minimum soil disturbance, well aerated soil with balanced nutrient availability and these were the favorable factors where nature can do its work, which is mainly a balance in the mother nature. But things had been gradually changing since then farmers under modern agriculture started practicing intensive agriculture. Due to this organic life in the soil decreased, soil appeared to be dead due to the loss of native agriculturally useful microbes. The use of harmful pesticides led to the decline in beneficial insects, as well as increased resistance in the pests towards these pesticides which is very difficult to control them. There is a need to bring back everything and need to put back everything in a harmony with the nature. Natural farming is a necessary action to be followed in order to get back in a harmony with the mother nature.

Natural farming is a way to keep the native organic life alive and maintain the health of the soil by the use of natural manures and other cow based liquid organic biofertilizers which increase the microbial count that are beneficial in releasing the nutrients to the crops. It is one way to reduce the risk of environmental pollution. Some of the potential sources of nutrients in the natural farming are from animal wastes like dung and urine, green manure, crop residues. There are many indigenous techniques followed by the local farmers in a particular locality. These preparations are mainly from the local cow dung, urine and other products. These formulations aim at improving the soil health, increase in production in a more sustainable way. Some of the cow based natural formulations prepared by the indigenous farmers are Jeevamruth, beejamruth, Panchagavya.

Now a days the cost of chemical fertilizers is increasing where small and marginal farmers are not able to afford. Soil is also facing adverse effects due to the use of synthetic chemical fertilizers. In this situation liquid formulations such as Jeevamruth, Beejamruth and Panchagavya can be used as a replacement for the chemical fertilizers. Jeevamruth, Beejamruth and Panchagavya are the quality natural sources which supply the nutrients to the plants and economical in preparation as all the ingredients are naturally available. Jeevamruth accelerates the biological activity inside the soil and makes the nutrients available to the plants. Jeevamruth is considered to be a miracle of natural farming which supply the nutritional requirements of the plants and used in pest management. Jeevamruth is prepared from Indian desi cow products like dung and urine and a cow is enough to cultivate a whole of 12 hectares of land (Palekar, 2009). Many farmers are dependent on jeevamruth for natural farming as a replacement for the chemical fertilizers.

The present study is initiated to evaluate the role of Jeevamruth in natural farming as a replacement to chemical fertilizers under the following heads

1. Preparation of jeevamruth
2. Influence of jeevamruth on soil fertility
3. Effect on growth and yield

1.Preparation of jeevamruth

Preparation: Jeevamruth is a miracle fermented microbial culture which supply nutrients. The solution is catalytic in nature and improves the microbial activity and macro fauna populations in the soil. The aerobic and anaerobic bacteria which are present in the desi cow dung and urine multiply in number by using the ingredients like jaggery and pulse flour in the 48 hour fermentation process (FAO 2016). Preparation of jeevamruth is given in detail below.

Ingredients for the preparation of jeevamruth:

1. Water 200 liters
2. Desi cow dung 10kgs
3. Desi cow urine 10lts
4. Jaggery 2kgs
5. Pulse flour 2kgs
6. Handful soil from the bund/forest

Take a container of 200 liters capacity. Add 200 liters water into it. Then add 10kgs desi cow dung and mix it thoroughly in water. Mix it well with a stick. Add 10 liters of desi cow urine into it. Mix powdered organic jaggery 2kgs along with pulse flour 2kgs mix it well without forming any clumps. Finally add 1 hand full of bund/forest soil into the container and mix it well with a stick in clockwise direction. Cover the container with a gunny bag. The mixture should be stirred thoroughly daily in the morning and evening in clockwise direction. Incubate the prepared solution for 9 to 12 days (Palekar 2005 & Devakumar et al, 2010). After the completion of the fermentation process Jeevamruth is ready for use. A golden brown colored layer can be observed on the top of the jeevamruth solution. Jeevamruth can be applied through irrigation water or as foliar application. The microbes in the local cow dung and urine multiply their populations with the help of jaggery and pulse flour. They act as food for these microbes. The bund/forest soil contain different species of microbes, so adding handful of bund/forest soil allows a diversity of microbes into the culture (Palekar, S., 2006).

Cow dung based organic manures contain different species of beneficial microbes predominantly bacteria, fungi, yeast, actinomycetes (Swain, MR., Ray RC.,2009). Cow urine is rich in amino acids, result in increased nitrogen percentage in organic preparations and also provide resistance to plants against plant pathogens (Herran J, Toress, RRS, Rojo, Ge. 2008). Jaggery contain potassium a quality nutrient for plants and increase drought resistance(<http://www.indiastudychannel.com>). Pulse flour is rich in amino acids which inturn improve the beneficial micro organisms and chickpea is a good source of dietary protein with less fat (Boye et al 2010). Forest soil is a bioinoculant rich in NPK, nitrogen fixers, phosphate solubilizing bacteria and other beneficial microorganisms and moreover these are natural occurring microbes and serves long in the organic preparations(Papen, H.A. et al 2002., Sreenivasa et al 2010).

2.Influence of jeevamruth on soil fertility

Jeevamruth enriches the soil with nutrients and increases the soil fertility. Soil application of Jeevamruth create favourable conditions for the availability of nutrients by increasing pH in acidic soils and decreasing the pH in alkaline soils and maximizing nutrient availability at pH 6.5 to 7.8 (Kulkarni S.S 2019).

a) Influence on beneficial micro organisms

Jeevamruth consists of naturally occurring microbes which are beneficial for plant nutrient availability viz., Bacteria, fungi, Yeast, Actinomycetes, and some photosynthetic bacteria. Different microbial populations present in Jeevamruth are listed in table:

1

Table 1: Different microbial populations present in Jeevamruth

Organisms	Colony count (cfu/ml)
Bacteria	20.4x10 ⁵
Fungi	13.8x10 ³
Actinomycetes	3.6x10 ³
Phosphate solubilizing organisms	4.5x10 ²
Free living n2-fixers	5.0x10 ²

Source: (https://agritech.tnau.ac.in/org_farm/orgfarm_ofk_soil.html)

These microbes bring in mineralization process and make nutrients available to the plants. The microbial count in jeevamruth varies significantly from dates of preparations. According the DEVAKUMAR N, et al. 2014, higher colony forming units (CFU) were found in between 9 to 12 days of the preparation of jeevamruth. The results showed highest bacterial CFUs such as viz., *Azotobacter* sp., *Bacillus* sp., *Beijerinckia* sp., *Chromatium* sp., *Chromobacterium* sp., *Pseudomonas* sp., *Rhodomicrobium* sp., *Serretia* sp., *Xanthomons* sp., which are beneficial microbes for the plants.

Table 2: count of bacterial CFUs from 1 to 30 days from the date of preparation of jeevamruth.

Microbes	Microbial Population									
Days after Preparation	01	02	03	04	05	06	07	08	09	10
Bacteria (10 ⁵)	213	351	269	271	361	495	692	780	813	855
Fungi (10 ⁴)	11	2	6	2	1	6	7	31	32	29
Actinomycetes (10 ³)	1	1	1	1	1	2	1	9	12	8
N-Fixers (10 ⁴)	34	29	16	46	23	09	20	27	63	69
P-Solubilizers (10 ⁴)	61	60	12	48	37	53	61	48	50	80

Microbes	Microbial Population									
Days after Preparation	11	12	13	14	15	16	17	18	19	20
Bacteria (10 ⁵)	843	727	447	526	562	551	402	367	339	292
Fungi (10 ⁴)	36	17	08	21	18	14	17	06	05	04
Actinomycetes (10 ³)	11	03	03	03	06	01	02	03	02	02
N-Fixers (10 ⁴)	67	58	49	34	40	118	90	64	43	30
P-Solubilizers (10 ⁴)	52	79	67	32	34	131	40	47	48	35

Maximum beneficial microbial population is found on 10th day in jeevamruth from the date of preparation (DEVAKUMAR N, et al. 2014).

b) Nutrient status in jeevamruth

Table 3: Nutrient status in jeevamruth constituents(DEVAKUMAR N, et al. 2014)

Sample	pH	N	P	K	Mg(ppm)	Cu(ppm)
Local cowurine	8.16	1.67	0.112	2.544	6.3	20.00
Local cowdung	8.08	0.70	0.285	0.231	9.33	3.60
Pulse flour	6.70	1.47	0.622	0.910	12.6	12.40

Table 4: Nutrient status in jeevamruth

Parameter	Jeevamrutha
pH	7.07
Soluble salt (EC) dSm-1	3.40
Total Nitrogen per cent	770
Total Phosphorus (ppm)	166
Total Potassium (ppm)	126
Total Zinc (ppm)	4.29
Total Copper (ppm)	1.58
Total Iron (ppm)	282
Total Manganese (ppm)	10.7

Source: (https://agritech.tnau.ac.in/org_farm/orgfarm_ofk_soil.html)

3.Effect on growth and yield

Jeevamruth showed increased growth and yield when applied as seed treatment, foliar spray and soil application also. 5-11% of yield is increased when Jeevamruth is applied as seed treatment (Devakumar et al, 2008). Spray of Jeevamruth @200-500 liters/acre in fieldbean resulted in 15 to 40% of its yield(Anon, 2010). Jeevamruth with the combination of other liquid formulations such as Panchagavya has yielded good results in capsicum (Boraiah, 2013).

Experiments conducted by Reshma Sutar et al., (2015), showed significant increase in growth parameters such as number of pods per plant, length of pods, pod weight, number of seeds per pod, seed weight per plant and 100 seed weight with the application of 1000 liters of jeevamruth and 7.5% panchagavya per hectare. The total and effective number of nodules as well as its fresh weights and dry weights also were effected by the application of jeevamruth along the Panchagavya. These experiments concluded that liquid organic formulations like jeevamruth and panchagavya are effective in increasing the grain yield in cowpea.

Conclusion:

The above review is based on jeevamruth, a liquid organic amendment. From the collected literature this review provides information on jeevamruth preparation, nutrient composition, microbial populations and effect on growth and yield of plants. Jeevamruth is considered as a miracle of natural farming as it is easy to prepare, composed of macro and micro nutrients, presence of beneficial micro organisms like bacteria, actinomycetes and some fungi. This natural preparation stimulates the activity of N-fixers, P solubilizers and other beneficial micro organisms which are useful to plants. Jeevamruth from the date of its preparation the maximum beneficial micro organisms count is on day 10 from the date of preparation.

References:

- [1] Anon, (2010), Organic Farming and activities of Organic Farming Research Centre, A Bulletin by University of Agricultural Sciences, Bangalore.

- [2] Boraiah, B., (2013), Effect of organic liquid formulations and manures on growth and yield of capsicum. Ph.D.Thesis, University of Agricultural Sciences, Bangalore.
- [3] Boye, et al (2010) Food research international 43,537.
- [4] HerranJ, Toress, RRS, Rojo, Ge. 2008. Importancia de los abonos orgánicos Ra Ximhai 4;57-67.
- [5] Kulkarni S.S. "Production and microbial analysis of Jeevamrutham for Nitrogen fixers and Phosphosphate solubilizers in the rural area from Maharashtra.. "IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) 12.8 (2019): PP- 85-92.
- [6] La Via Campesina (2016). *52 Profiles on Agroecology: Zero Budget Natural Farming in India*, FAO case study.
- [7] N Devakumar *et al* Role of Indigenous Liquid Organic Manures in Organic Crop Production, ISBN: 978-93-83566-03-7, *Organic Farming and Sustainability*, National Institute of Advanced Studies 2014. Bangalore - 560 012.
- [8] N. DEVAKUMAR *et al*. Microbial analytical studies of traditional organic preparations beejamrutha and jeevamrutha. RAHMANN G & AKSOY U (Eds.) (2014) Proceedings of the 4th ISOFAR Scientific Conference. 'Building Organic Bridges', at the Organic World Congress 2014, 13-15 Oct., Istanbul, Turkey (eprint ID 23621).
- [9] Palekar, S. 2009. *How to Practice Natural Farming?* All India Pingalwara Charitable Society. pp 22-27.
- [10] Palekar, S., (2006), Text book on Shoonya Bandovalada naisargika Krushi, published by Swamy Anand, *Agri Prakashana*, Bangalore.
- [11] Papen H. A, Gabler E. Z & Rennenberg H (2002): Chemolitho autotrophic nitrifiers in the phyllosphere of a spruce ecosystem receiving high nitrogen input. *Curr. Microbiol.*, 44:56-60.
- [12] Reshma Sutar, G.M. Sujith* and N. Devakumar (2015), Growth and yield of Cowpea [*Vigna unguiculata* (L.) Walp] as influenced by jeevamrutha and panchagavya application, AGRICULTURAL RESEARCH COMMUNICATION CENTRE, DOI: 10.18805/LR-3932.
- [13] Swain MR, Ray RC. 2009 Biocontrol and other beneficial activities of *Bacillus subtilis* isolated from cow dung microflora *Microbiol Rec* 164;121-130.