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Microbial analytical studies of traditional organic preparations beejamrutha and jeevamrutha

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Key words: Beejamrutha, Jeevamrutha, Bacteria, Fungi, N-fixers, P-solubilizers

Abstract

An experiment was conducted on liquid formulations to study microbial diversity and know the best period of its use in crop production. Higher colony forming units (CFU) were observed on the day of preparation of beejamrutha and in jeevamrutha it was between 9th to 12th days after preparation (DAP). Higher number of bacteria, different fungi and N-fixers clearly indicate that the jeevamrutha is enriched consortia of native soil microorganisms. It was found that, beejamrutha would give best result if it is used on the day of preparation and Jeevamruth between 9th to 12th days after preparation. The microbial studies revealed that higher bacterial population was recorded followed by N-fixers, P-solubilizers, fungi and actinomycetes. Due to the higher beneficial microbial load would mobilise more of plant nutrients and provide plant growth promoting substances and also other micro nutrients required by the plants.

Introduction

Organic agriculture is now finding place in the mainstream of development and shows great promise commercially, socially and environmentally. While there is continuum of thought from earlier days to the present, the modern organic movement is radically different from its original form. Liquid formulations that are used in organic agriculture like panchagvya, beejamrutha and jeevamrutha are the fermented products which are used as plant growth enhancing substances prepared with material available with farmers. They are the rich sources of beneficial micro flora which support, stimulate the plant growth and help in getting better vegetative growth and also good quality yield. Formulations prepared on agricultural by- products, *viz.,* bran of grains, oil cakes, farmyard manure *etc*., which are found to support excellent growth carrier and storage media (Devakumar *et al*. 2011). During the last few years, there has been an increasing interest in the use of panchagavya, beejamrutha, jeevamrutha and other liquid organic formations in organic agriculture. Devakumar *et al*., (2008) and Srinivas et al., (2010) have reported the presence of many beneficial microorganisms viz., nitrogen fixers, phosphorus solubilizers, actinomycetes and fungi in jeevamrutha and beejamrutha. With this in view, an experiment was conducted to study the microbial load and diversity in the fermented liquid formulations viz., beejamrutha and Jeevamrutha.

Material and Methods

A laboratory study was conducted at Organic Farming Research Centre (OFRC), ZARS, Navile, Shivamogga, University of Agricultural Sciences, Bangalore, India. The liquid organic formulations beejamrutha and jeevamrutha were prepared by following procedures given by Palekar (2006). Beejavamrutha was prepared by soaking 5 Kg of local cow dung in 20 litres of water and 50 g of lime in one litre water overnight. Next day morning squeeze cow dung into the lime soaked water and to this add 10 liters of local cow urine, stir thoroughly and add lime solution and mix well. Jeevamrutha is prepared 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 upto 200 litres. Keep the drum in shade covering with wet gunny bag and stir the mixture clockwise thrice a day and incubate. Laboratory studies on microbial analysis of beejamrutha and jeevamrutha were made following serial dilution and plate count technique. Samples were drawn on daily basis up to 7 days after preparation (DAP) for beejamrutha and up to 20 days for Jeevamrutha. Samples were studied for five groups of micro organisms' *viz*., bacteria & fungi, actinomycets, N-fixers and P-solubilizers.

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Results

Maximum CFUs of bacteria, fungi, actinomycets, N-fixers and P-solubilizers were present in beejamrutha on the day of preparation and later on there was sharp decline in their number as the days elapsed (Table 1) and maximum CFUs of bacteria (623), fungi (22) actinomycets (2), N-fixers (71) and P-solublisers (52) were recorded on the day of preparation of beejamrutha and thereafter, it decreased progressively and it was minimum on 7th day after preparation.

From the table 2 it was noticed that the higher colony forming units (CFU) in Jeevamrutha were recorded between 9th to 12th days after preparation. In the preparations, higher number of bacterial CFUs *viz*., *Azatobacter* sp., *Bacillus* sp., *Beijerinckia* sp., *Chromatium* sp., *Chromobacterium* sp., *Pseudomonas* sp., *Rhodomicrobium* sp., *Serretia* sp., *Xanthomons* sp., were recorded.

Table: 1. Microbial population of Beejamrutha between 1 to 7 days after preparation

Days After Preparation	Microbial populations (CFU's*)				
	Bacteria (10^5)	Fungi (10^4)	Actinomycetes (10^3)	N-fixers (10^4)	P-solubilisers (10^4)
1	623	22	2	71	52
2	435	11	2	40	42
3	371	11	1	39	34
4	259	9	2	39	34
5	208	2	1	28	25
6	190	2	1	19	20
7	171	1	1	15	10

*Colony farming units

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 - *Azatobacter* sp., *A.chroococcum*, *Bacillus* sp., *Beijerinckia* sp., Actinomycetes - *Streptomyces* sp. It clearly indicates that the jeevamrutha is enriched consortia of native soil micro organisms. The preparation would give best results if it is used between 9th to 12th days after preparation.

Table: 2. Microbial population of Jeevamrutha between 1 and 30 days after preparation

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

The nutrient composition of beejamrutha, jeevamrutha and their constituents (Table 3) reveals that beejamrutha is alkaline and jeevamrutha is acidic in nature. They are good source of macro and micro nutrients.

Table: 3. Nutrient composition of beejamrutha, jeevamrutha and their constituents.

Sample	pH	N	P	K	Mg(ppm)	Cu(ppm)
Beejamrutha	8.02	2.38	0.127	0.485	16	36
Jeevamrutha	4.92	1.96	0.173	0.280	46	51
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

Discussion

Beejamrutha and jeevamrutha were found to have higher number of beneficial microorganisms. Maximum microbial population was observed on the day of preparation in beejamrutha and on 10th day after preparation in jeevamrutha. The presence of beneficial microorganisms in these liquid formulation might be mainly due to their constituents such as: cow dung, cow urine, legume flour and jaggery containing both macro and essential micro nutrients, many vitamins, essential amino acids, growth promoting substances like indole acetic acid (IAA), gibberlic acid (GA) and beneficial microorganisms (Palekar, 2006; Sreenivasa *et al*., 2010; Neelima and Sreenivasa, 2011). For jeevamrutha a handful of soil is collected from the field for which these formulation is to be used is also added at the time of preparation. This would serve as a initial inoculums of bacteria, fungi, actinomycetes, N-fixers and P-solublizers. Hence, the higher beneficial microorganisms found in these organic formulations are in confirmity with Papen *et al.,* (2002), Sreenivasa et al., (2010) who have also reported the presence of naturally occurring beneficial microorganisms predominantly bacteria, yeast, actinomycetes and certain fungi in organic liquid manures. Hence, these formulations would serve a long way in supplementing many of the biofertilizers and biocontrol agents used in crop production in the rural areas. This is also in conformity with Devakumar *et al*., (2011) who have reported that both jeevamrutha and panchagavya have enhanced the growth of nitrogen fixers in locally available substrates such as FYM, pressmud, compost and digested biogas slurry.

Somasundaram *et al.,* (2003) have found that under higher acidity, more number of beneficial microorganisms were recorded in panchagavya. They not only enhance the microbes in the environment but also act as catalysts with a synergistic effect to promote all the useful microbes of the environment. These microorganisms secrete proteins, organic acids and antioxidants in the presence of organic matter and convert them into energy thereby the soil micro flora and fauna change a disease inducing soil to a disease suppressive soil.

Conclusion

Liquid Organic preparations contain higher number of bacteria, fungi, actenomycets, N-fixers and P-solubilizers. From the studies it is evident that beejamrutha is to be used on the day of preparation while jeevamrutha to be used between 9 to 12 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.

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