Role of Organic Liquid Formulations in Agriculture: A Review

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Abstract

The demand for organic food is increasing day by day. To achieve the organic goals and sustainability, the use of organic liquid formulations is seen as one of the alternatives as it avoids the use of synthetic and inorganic chemicals in agriculture. These organic formulations are prepared from the raw materials obtained from the plants, animals and their waste materials such as cow dung, cow urine, cow milk, cow curd, honey, jaggery etc. Amritpani, Beejamruth, Jeevamruth and Panchagavya are some of the organic liquid formulations that are in practice from ancient times. These formulations can either be given as individual doses or as combination of two or more. Amritpani, Beejamruth and Jeevamruth helps in the enrichment and revitalization of soil contributing to the better yields. Panchagavya enhances the growth, development, quality, yield and yield attributes of crops. These organic formulations are easily available, easy to prepare, eco-friendly and cost saving when compared with other chemical inputs like fertilizers and pesticides.

Key words: Amritpani, Beejamruth, Jeevamruth, Panchagavya, Organic.

1. Introduction

With the increasing of population, the demand for food is also increasing day by day. Whereas, on the other hand the cultivation area of crops is decreasing day by day and one of the factors responsible for such decrement is due to overuse of chemicals for more yields and productivity in a short time span. Many agricultural systems are facing the problems like depletion of soil fertility, biodiversity, and water resources as the global demand for food, fodder and bio-energy crops growing. In many regions there are large gaps between potential and actual crop yields (Foley *et al.* 2011).The alternative solution to decrease the overuse of chemical fertilizers and pesticides in agriculture is the use of organic extracts prepared from the raw materials derived from farm and animal waste along with the animal products like milk, ghee, honey etc. Some of the organic inputs prepared from organic extracts are Amritpani, Beejamruth, Jeevamruth and Panchagavya. These organic extracts can be given either solely or as a combination of two or more extracts based on the requirement. The use of different combination of organic inputs influences crop field's agricultural properties towards sustainable agriculture (Gachande and Shaikh, 2017).

Amritpani: Amritpani is commonly used as a bio- inoculant and helps in the revitalizing and enrichment of soil. It is prepared by a mixture of cow dung, ghee, honey and jaggery.

Beejamruth: Beejamruth is a mixture of cow urine, cow dung, cow milk, lime and water. It is used for seed treatment, which helps in the better germination, establishment, enhance growth and finally to increase the yield.

Jeevamruth: Jeevamruth is an organic solution which is rich on microorganisms. It is a mixture of cow dung, urine, Jaggery, flour, active soil, and water.

Panchagavya: Panchagavya is a mixture of five products obtained from the indigenous cow. These five products include cow dung, cow urine, cow milk, cow curd and cow ghee. All these are individually called "Gavya" and the word Pancha (Sanskrit) stands for "Five", thus calling it Panchagavya. Along with these five products, some other ingredients like jaggery, sugarcane juice, tender coconut water, ripened bananas and yeast are also used in order to enhance the fermentation and save time.

Application: These organic liquid formulants can be applied in different doses and various forms like foliar spray, soaking, drenching and fertigation based on the requirement and goals.

2. Effect of Liquid Formulations

2.1.Effect of Amritpani on crop:

Amritpani is a bio- inoculant and acts like a tonic that influences the growth, quality and yield and attributes of various crops. It can be used as a combination along with farmyard manure, panchagavya and jeevamruth. Bindumathi, (2008) evaluated the yield and quality parameters of various organic growth promoters like panchagavya and amritpani on brinjal and tomato and observed that amritpani treated plants showed early flowering in brinjal and more number of flowers, followed by less flower drop in tomato when compared with panchagavya treated plants. More *et al.* (2008) also reported that by the application of 5 t ha^{-1} FYM + amritpani + PSB + rhizobium there is a significant higher value for growth attributes, yield and yield attributes of soybean when compared to other combinations such as application of 5 t ha^{-1} farmyard manure, 5 t ha^{-1} farmyard manure + amritpani, 5 t ha^{-1} FYM + Phosphate solubilizing bacteria. Raskar and Wani, (2014) observed that amritpani controls pest in paddy and is a good tonic for crop as it increases the growth of crop. Dwivedi *et al.* (2014) studied the effect on vegetative parameters, flowering, and fruiting with the treatment of organic amendments like amritpani, jeevamruth + vermicompost and farmyard manure in Cape gooseberry. Sakubai *et al.* (2014) studied effect of bio-inoculant mycorrhiza and organic formulations that is panchagavya and amritpani on growth, yield and quality of buckwheat and recommended that the organic treatment (VAM + panchagavya + amritpani 3% drench and spray) for enhanced growth and yield parameters of buckwheat.

2.2.Effect of Beejamruth:

Beejamruth is rich in beneficial micro flora like Azospirillum, Azotobacter, Phosphobacteria, Pseudomonas, Lactic acid bacteria and Methylotrophs and is known to protect the seed from harmful soil and seed – borne pathogens. Thus, it helps in the better germination, seedling growth, plant root and shoot growth, seedling vigour and yield. Chandrakala, (2008) reported that there is a significant effect on dehydrogenase activity of soil with the combined application of farmyard manure and beejamruth + jeevamruth + panchagavya. Sreenivasa, (2009) stated that the organic liquid manures derived from cow products i.e., panchagavya,

beejamruth and jeevamruth contain abundant number of beneficial micro flora like Azospirillum, Azotobacter, Phosphobacteria, Pseudomonas, Lactic acid bacteria and Methylotrophs along with some useful fungi and actinomycetes. Srinivasa *et al*. (2009) concluded that beejamruth contains beneficial microorganisms that protect the crop from harmful soil-borne and seed-borne pathogens. Bacteria were isolated from beejamrutha and tested for their beneficial traits and are capable of N_2-fixation, P-solubilization and IAA, GA production in addition to suppression of Sclerotium. Gore and Srinivas, (2011) concluded that with the application of recommended dose of fertilizer + beejamruth + panchagavya + jeevamruth., there is a significant increase in plant height and root length in tomato. Shakuntala *et al.* (2012) reported that the results revealed that paddy seeds treated with beejamruth 50% recorded higher germination percentage (85.37%), seedling vigour index (2805), dehydrogenase enzyme activity (0.300 OD value) and lowest seed infection (2.64 %) followed by panchagavya 3% compared to untreated control at the end of nine months of storage period. Subramaniyan and Malliga, (2016) reported that the treatment with beejamruth showed significant results on germination percentage, higher morphological parameters like epicotyl & hypocotyl length and radical number along with better results in biochemical contents of *Zea mays* L. Gachande and Shaikh, (2017) concluded that the application of organic inputs like farm yard manure (FYM), beejamruth and jeevamruth has a positive influence on soil nutrient properties which results in the increase in soil fertility in terms of increase in the soil organic carbon, phosphorus, potassium and water holding capacity in cotton field. Bhargavi *et al.* (2019) stated that the seeds treated with beejamruth significantly shows higher root length (1.73 cm), shoot length (5.09 cm) and seedling vigour index (654.64) when compared with the water-soaked seeds and control in black gram. Naikwade Pratap Vyankatrao, (2019) concluded that 100% beejamruth showed high germination percentage, seedling growth and Seed Vigour Index. Jagdale *et al*. (2020) concluded that the applications of organic formulations RDF+ beejamruth + jeevamruth + panchagavya significantly enhanced growth and yield of soybean. Goveanthan *et al*. (2020) concluded that the application of jeevamruth and beejamruth as a 5% spray was observed as a viable organic approach to improve soil and eco-friendly fenugreek production in fenugreek.

2.3.Effect of Jeevamruth:

Jeevamruth constitutes a rich source of nutrients like carbon, phosphorus, potassium along with rich soil microorganisms that helps in fixing the nitrogen, solubilize phosphorus. It increases the uptake of N, P and K , growth and yield parameters like plant height, root length, fruit yield and yield attributes like protein and fiber content which adds to the overall yield results. Sreenivasa *et al*. (2010) and Devakumar *et al.* (2014) opined that jeevamruth serves as the rich source of the microorganisms that fix nitrogen, solubilize phosphorus, also it is the rich source of carbon, nitrogen, phosphorus, potassium and many other micronutrients. Boraiah *et al.* (2017) reported that there is significant higher fruit yield at 60, 70, 80, 90, 100, 110 and 120 DAT, respectively), N-fixers at harvest (during *kharif* and summer, respectively) and P-solubilizer at 60 DAT and at harvest during *kharif* and summer respectively) with the application of jeevamruth when compared with different organic liquid formulations in capsicum. Patel *et al*. (2018) reported that by application of panchagavya (6 % foliar spray) + jeevamruth (soil application of 500 l/ ha) recorded the highest kernel and haulm in ground nut (*Arachis hypogea* L.) and recommended it as an alternate source of nutrients under organic farming for cultivation of *kharif* groundnut. Sornalatha and Esakkiammal, (2018) concluded that the higher growth, yield and quality of crops can be attained by the use of liquid products such as beejamrutha, jeevamruth and panchagavya. Safiullah *et al*. (2018) concluded that the application of jeevamruth (600 L/ ha) generated significantly taller plant, cob width/ plant, green cob and fodder yield and total non-reducing sugar and recommended it for getting higher profitable yield and better quality. Sharada and Sujathamma, (2018) reported that organic fertilizers such jeevamruth were found to increase the crude protein content in grain and lower the fiber and lignin content in straw of *Oryza sativa* L., which determine

the digestability of fodder in animals. Ankit and Eugenia, (2019) suggested that organic liquid formulation, jeevamruth is potent enough to help the plants in proper growth and development under NaCl induced stress conditions. Thatheyus and Rosi, (2020) observed that the application of vermicompost and jeevamruth enhanced growth parameters (germination percentage, shoot length, root length, wet weight, dry weight, chlorophyll content, and protein content) in *A. caudatus*. Goveanthan *et al.* (2020) reported that the plant height, root length and single plant weight are highest with the jeevamruth 5% spray in fenugreek.

2.4.Effect of Panchagavya:

Panchagavya is rich in essential nutrients, microorganisms, growth regulatory substances and insecticidal/ pesticidal properties which would enhances the productivity through the increase in growth of roots, stems, branches and leaves and plays a very important role in the growth and development of plants and contributes to better yield and yield attributes. Xu, (2001) and Swaminathan *et al.* (2007) reported that the Effective Micro Organisms in panchagavya are the mixed culture of naturally occurring beneficial microbes, mostly lactic acid bacteria (Lactobacillus), Yeast (Saccharomyces), Photosynthetic bacteria (Rhodopseudomonas) and certain fungi (Aspergillus). Bharathi, (2005) concluded that panchagavya along with neem seed kernel extract proved as the best in managing *Spodoptera litura* larvae followed by panchagavya plus *Vitex negundo* and calotropis in groundnut and soybean. Subramanian, (2005) reported that the use of traditional panchagavya as manure resulted in the increase of nodule formation by almost 18% to 62%. Perumal *et al.* (2006) detected the presence of growth regulatory substances such as Indole Acetic Acid (IAA), gibberellic acid (GA_3), cytokinins and other essential plant nutrients which act as growth inducers in *Allium cepa*. Choudhary *et al*. (2017) reported that application of panchagavya gave the maximum plant height, higher dry matter accumulation, maximum leaf area index at branching and flowering stages in black gram. Thirumeninathan *et al*. (2017) reported that plant height, higher green forage and dry matter yield, net return and B: C ratio of Fodder cowpea can be secured by foliar spray of panchagavya in Fodder cowpea (*Vigna unguiculata* L.). Suchitra *et al*. (2017)observed the 3% concentration of panchagavya spray resulted in the highest yield parameters such as number of fruits (19), and fruit weight (30.67 mg/fruit) when compared with control as well as other concentrations in *Abelmoschus esculentus.* Boraiah *et al*. (2017) observed that there is a significant influence on yield of capsicum per hectare and higher shelf life of 18.58 days and also higher capsaicin content of 0.32% with panchagavya spray. Jagdale *et al.* (2020) reported that the application of RDF+ beejamruth + jeevamruth+ panchgavya significantly improved the growth and yield attribute like plant height, leaf area, number of nodules per plant, seed yield and straw yield.

3. Conclusion

The organic liquid formulations have multiple uses and play an important role in the growth and development of plants, disease and insect control, gives better yield and related yield attributes contributing to the quality of the produce and thereby decreasing the need for chemical, inorganic and synthetic inputs like fertilizers, pesticides, fungicides, herbicide etc. They not only avoid the use of chemicals but also revitalize the soil and its components which enables the efficient use of the available resources and providing security to the future generations. The raw materials used in the preparation of these organic inputs are easily available to the farmer which is cost saving and can be prepared with little basic skill. Thus, the use of organic liquid formulations in agriculture is not only cost effective, but also user friendly and eco- friendly.

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