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Role of Beejamrutha, Jeevamrutha and Vermicompost in Natural Farming

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Abstract

A report from NITI Aayog says that natural farming is the need of the hour as the cost of production of food grains has escalated drastically due to increased cost of agricultural inputs viz., chemical fertilizers, pesticides, fungicides, and herbicides**.** In the Indian context, natural farming is a local low-input climate-resilient farming system that advocates the complete elimination of synthetic chemical agro-inputs. Natural farming allows for a wide range of agroecological practices - composting, mulching, green manuring, crop rotations, intercropping, tree intercropping, livestock integration - and takes a holistic approach to farming systems. Collaborative efforts focused on agroecology and organic farming are crucial to bridge the gap and ensure these ancient weapons play a vital role in sustainable food production for the future.

Introduction:

Green revolution has made the country self sufficient in food production. Even it made us to export food grains to other countries. But it made the soil hungry as the depleted nutrients are not replenished in full. . Modern intensive farming has played a vital role in increasing the crops' productivity viz., 109% for rice, 208% for wheat, 157% for maize, 78% for potatoes, and 36% for cassava which helped to feed the exploding population and to overcome the crisis of food deficits (Wiebe et al., 2021). This has adversely impacted the crop response ratio and created an imbalance of nutrients in the soil. The crop response ratio has reduced from 58 percent in the last six decades. The ideal ratio of the three major plant nutrients viz., Nitrogen, phosphorus, and Potassium of 4:2:1 is disrupted. The concerns of such problems against the environmental and agricultural sustainability in the country prompted the scientists and policymakers to seek appropriate alternative strategies to ensure more sustainable food production with a pollution-free environment.

In this context the holistic approach of crop production through natural way become order of the day to restore and sustain the soil health and crop production. "Natural farming is a chemical-free traditional farming method. It is considered as an agroecology based diversified farming system which integrates crops, trees and livestock with functional biodiversity". On the soil surface the organic matter has to decompose gradually over a period of time. For the successful natural farming there are four main components (pillars) are proposed and are as follows.

1) Bijamrita / beejamrutha for seed treatment

2) Jivamrita / jeevamrutha to supply of nutrient to plants through enhanced microbial activity

3) Acchadana - mulching - crop residue management for weeds, nutrients and water

4) Whapasa - soil aeration and moisture conservation

Vermicompost role in the nutrition of agricultural fields has attracted attention of researchers worldwide only in recent decades. Waste management is considered as an integral part of a sustainable society, thereby necessitating diversion of biodegradable fractions of the societal waste from landfill into alternative management processes such as vermicomposting.

Numerous studies have shown that natural farming is more productive, sustainable, water efficient, and better for the ecology of farms and the soil. It is regarded as a profitable agricultural method with the potential to boost employment and rural development (Devarinti,2016; Tiwari & Raj, 2020).

Natural farming seeks to address food hunger,farmer distress, health issues brought on by pesticide and fertilizer residue in food and water, global warming, climate change, and natural disasters. Additionally, it may provide jobs, which would stop young people from rural areas from moving. As the name implies, natural farming is the art, practice, and science of working with nature to accomplish much more with less.

Challenges and Future Prospects:

Despite their many benefits, the widespread adoption of Beejamrutha, Jeevamrutha and Vermicompost faces challenges. Modern agricultural systems heavily promote chemical inputs, which poses a barrier to the acceptance of traditional practices. Additionally, standardization of formulations and scientific validation is necessary to

effectively integrate these methods into mainstream agriculture. Looking ahead, initiatives promoting agroecology and organic farming are crucial in bridging the gap between traditional wisdom and contemporary agricultural practices. Collaborative efforts between farmers, researchers, and policymakers can facilitate the adaptation and scaling-up of Beejamrutha, Jeevamrutha and Vermicompost, ensuring their role in sustainable food production for generations to come.

Beejamrutha

Beejamrutha is for treating the seeds and protecting from the soil borne pathogens and to give an initial thrust to the plants to grow faster and healthier. By soaking the seeds in Beejamrutha, it gives a protection to the seeds or act as a defence mechanism against seed related diseases, leading to improved germination rates.

Beejamrutha is a proportionate mixer of water, cow dung, cow urine, lime, and forest soil. In the content of Beejamrutha the action of local cow dung is a potent natural fungicide, cow urine is having robust antibacterial properties and soil give the required microbial load. Research indicates that beejamrutha enriched with beneficial microorganisms offers protection against harmful soil-borne pathogens.

Preparation

The composition includes 20 liters of water, 5 kg of cow dung, 5 liters of cow urine, 50 g of lime, and a handful of soil.

1. In a plastic or cement tank, mix all the ingredients. Stir the mixture with a wooden stick, rotating it clockwise to infuse positive energy.
2. Cover the tank with a jute sack or poly net, ensuring it's positioned in a shaded area, shielded from direct sunlight and rain.
3. After a day, the beejamrutha will be ready for seed treatment. Preparation Time: 12-24 hours Storage: Use the beejamrutha for seed disinfection. It can be stored for up to 7 days.

Jeevamrutha

The soil contains nutrients, but they are inaccessible to plant roots. Jeevamrut, an organic fertilizer, contains beneficial microorganisms that convert these nutrients to a usable form when added to the soil. It can be sprayed or added to irrigation every 10-15 days until the soil improves.

Jeevamrutha is an organic alternative to chemical fertilizers, rich in nutrients like carbon, nitrogen, phosphorus, and calcium. It boosts soil microorganisms, enhancing soil fertility and crop yield. It's made from cow dung and urine, promoting nutrient availability and microbial activity. This leads to more earthworms and fertile soil.

Jeevamrutha is a bio-fertilizer that enhances plant growth by stimulating soil microbes and earthworms. It includes important microorganisms like rhizobacteria, cyanobacteria, mycorrhizal fungi, and nitrogen-fixing bacteria. This product catalyzes nutrient conversion and helps fight plant diseases. Subash Palekar recommends Jeevamrutha for nutrient conversion in plant roots. It contains PGPR, cyanobacteria, Solubilizing Bacteria (PSB), mycorrhizal fungi, and Nitrogen fixing bacteria, aiding nutrient absorption and disease control. It's effective for the first 3 years, after which the system stabilizes.

Soil microorganisms actively impact fertility by cycling nutrients like carbon and nitrogen essential for plant growth. Jeevamrutha is a fermented culture that not only provides nutrients but also stimulates microbial activity and earthworms. It's beneficial against fungal and bacterial diseases. According to Palekar, it's necessary for the initial 3 years of transition to a self-sustaining system.

Method and application of liquid jeevamrutham

Preparation

To make jeevamrutha, follow these steps: Fill a barrel with 200 liters of water. Add 10 kg of fresh local cow dung and 5 to 10 liters of aged cow urine. Include 2 kg of natural jaggery, 2 kg of pulse flour, and a handful of soil from the farm's bund. Mix the solution thoroughly and let it ferment for 48 hours in the shade. Now, your jeevamrutha is ready to be applied. For one acre of land, 200 litres of jeevamrutha is sufficient. Apply it to the crops twice a month either through irrigation water or as a 10% foliar spray. This process should continue every 15 days until the soil is enriched. During the 48-hour fermentation process, aerobic and anaerobic bacteria in the cow dung and urine multiply as they consume organic ingredients, including pulse flour. Adding a handful of undisturbed soil serves as an inoculate of native microbes and organisms to the mixture. Precautions to be taken: Avoid using brass or copper materials for the barrel. After fermentation, Jeevamrutha should be applied within 15 days, but it's most effective when used between 7 to 12 days after fermentation.

For application

- During ploughing or prior to the final ploughing for every acre of land, spread 200 kg of Ghana-Jiwamrita evenly across the soil.

- During the last ploughing, ensure the soil covers it like a mulch. If applying during ploughing isn't feasible, use it as a basal application during sowing.

- For each acre, use 100 kg of Ghana-Jiwamrita for broadcasting.

Uses of Jeevamrutha

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).

Vermicomposting

Vermicomposting is a specialized form of composting that utilizes earthworms to decompose organic waste materials. Earthworms consume and break down the organic matter, producing nutrient-rich castings or vermicompost. Vermicomposting is ideal for managing food scraps, kitchen waste, crop residues, animal dung, and other organic materials.

Vermicomposting is a process that utilizes earthworms to decompose organic wastes and convert them into nutrient-rich compost. It is an effective and sustainable method of recycling organic materials while producing high-quality fertilizer for plants. The worms used in vermicomposting are *Eudrilus eugeniae, Eisenia fetida* or *Lumbricus rubellus*, it consumes the organic matter and excrete nutrient-rich castings, which are also known as worm castings or vermicompost. The details of vermicomposting process are listed below.

Selecting a vermicomposting system

There are various vermicomposting systems available, ranging from simple home setups to larger-scale commercial systems. The selection of a system depends on the amount of organic waste generated and the available space.

Choosing the bedding material

The bedding material provides a favourable environment for the worms and helps retains moisture. Suitable bedding materials include shredded newspaper, cardboard, coconut coir, straw, or a combination of these. The bedding should be moistened before adding the worms and organic waste.

Introducing the worms

Once the bedding material is prepared, the worms can be introduced. Red worms are most commonly used in vermicomposting due to their high consumption rate and ability to thrive in organic waste environments. The number of worms required depends on the size of the vermicomposting system and the amount of organic waste produced. A general guideline is to start with 0.5 kg of worms for every square foot (0.09 square meters) of surface area.

Maintaining the vermicomposting system

Regular maintenance is necessary to ensure optimal conditions for the worms and the decomposition process. Here are some key considerations:

Moisture: The vermicomposting system should be kept moist. Around 60% of the moisture should be maintained. Dry conditions can harm the worms, while overly wet conditions can lead to anaerobic conditions and unpleasant odours

Temperature: Worms thrive in temperatures between 55°F and 77°F (13°C and 25°C). It's important to provide a suitable environment by keeping the vermicomposting system within this temperature range. Insulating the system in colder climates or shading it in hotter climates can help regulate the temperature.

Airflow: Adequate airflow is crucial for the worms' health and the decomposition process. Avoid compacting the bedding material and periodically fluff it to maintain proper aeration. Some vermicomposting systems have built-in ventilation or can be manually aerated using a pitchfork or similar tool.

Harvesting the vermicompost

Over time, the worms will convert the organic waste into nutrient-rich castings. Harvesting the vermicompost involves separating the worms from the finished compost.

Using the vermicompost

The harvested vermicompost is a nutrient-rich organic fertilizer and soil amendment. It is recommended @ 5t/ha for all the crops as basal dose. It can be used in various ways:

Garden soil amendment: Mix the vermicompost into garden soil to improve its structure, water-holding capacity, and nutrient content. Apply it as a top dressing or incorporate it during soil preparation.

Potting mix component: Use vermicompost as a component in homemade or commercial potting mixes to enhance plant growth and health.

Conclusion

Beejamrutha, Jeevamrutha and Vermicompost demonstrate the timeless wisdom of natural farming practices. By adopting appropriate recycling

techniques, farmers can improve soil fertility, reduce waste accumulation, and contribute to environmental sustainability. Recycling farm waste not only enhances soil health and nutrient cycling but also minimizes pollution risks and supports the circular economy. Implementing effective farm waste recycling practices is a crucial step towards achieving a more sustainable and resilient agricultural system.

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