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Impact of Jivamrut on the Growth Parameters of Sugarcane and Soil Health in Shirol Taluka, Kolhapur District

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A B S T R A C T

This study explores the impact of Jivamrut, an organic bio-fertilizer, on sugarcane growth and soil health in Shirol Taluka, Kolhapur District. Two fields of 1 acre each were selected: one treated with Jivamrut and the other left untreated. The application of freshly prepared Jivamrut in June involved a mixture of 40 liters of Jivamrut with 200 liters of water. Various growth parameters such as chlorophyll intensity, leaf size, cane length, bud development, and cane thickness were measured. Soil health was evaluated by assessing microbial counts, nutrient availability, and organic carbon content. Results indicated that the Jivamrut-treated field showed significant improvements in sugarcane growth and soil quality compared to the untreated field. This study highlights the potential of Jivamrut as a sustainable and eco-friendly alternative to chemical fertilizers, contributing to both agricultural productivity and soil health

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INTRODUCTION

Sugarcane is one of the most significant crops in India, contributing to the agricultural economy and supporting a variety of industries, particularly in the production of sugar and biofuels. However, conventional farming practices often rely on chemical fertilizers and pesticides, which may harm the environment and degrade soil health over time. In contrast, sustainable farming methods such as Zero Budget Natural Farming (ZBNF) focus on improving soil fertility through organic inputs like Jivamrut, a bio-fertilizer made from cow dung, cow urine, jaggery, gram flour, live soil, and water.

Jivamrut enhances microbial activity in the soil, improves nutrient availability, and boosts plant growth by providing essential nutrients. Its use can reduce dependency on chemical fertilizers, lower farming costs, and promote long-term soil fertility. This study investigates the impact of Jivamrut on sugarcane growth and soil health in Shirol Taluka, Kolhapur District, where sugarcane cultivation is prevalent. By comparing a field treated with Jivamrut to an untreated control field, the research aims to assess the growth parameters of sugarcane and the changes in soil microbial populations, nutrient availability, and organic carbon content. This research aims to demonstrate that Jivamrut can serve as an effective, eco-friendly alternative to conventional farming inputs.

LITERATURE REVIEW

1. **Jivamrut and Soil Fertility**: According to a study by Suneja et al. (2020), organic farming practices using inputs like Jivamrut improve soil microbial diversity and enhance soil organic matter. The fermentation process in Jivamrut increases nitrogen-fixing bacteria populations, which enhances nutrient cycling (Singh & Sharma, 2020). Similarly, the use of cow dung and urine provides key micronutrients that contribute to better soil health (Mahajan et al., 2021).
2. **Effect of Jivamrut on Crop Yield**: A research paper by Ramesh and Srinivas (2022) observed that the application of Jivamrut on crops such as wheat and rice led to better root development, larger leaf size, and improved overall plant growth. The study indicated that the increase in chlorophyll content directly correlated with better growth rates and higher yields.
3. **Government Recommendations**: The Indian Government, through the Ministry of Agriculture and Farmers Welfare, has promoted organic farming methods like ZBNF, which include the use of Jivamrut, to enhance soil health and reduce dependency on chemical fertilizers (Government of India, 2021). The government website on natural farming practices advocates for the use of Jivamrut as a key component in maintaining healthy soil and improving crop productivity.

METHODOLOGY

1. **Study Area Selection:** Two 1-acre plots of land were selected in Shirol Taluka, Kolhapur, which are known for sugarcane cultivation. One plot was treated with Jivamrut and the other left untreated.

2. **Preparation of Jivamrut:** Freshly prepared Jivamrut was made by mixing 10 kg of cow dung, 10 liters of cow urine, 2 kg of jaggery, 2 kg of gram flour, 1 kg of live soil, and 200 liters of water. The mixture was fermented for 3-5 days in a shaded area.
3. **Application:** 40 liters of Jivamrut were diluted with 200 liters of water and applied to 1 acre of sugarcane crops in June. The untreated plot received no treatment.
4. **Growth Parameters Measurement:** Parameters such as chlorophyll intensity (SPAD meter), leaf size, cane length, bud development, and cane thickness were measured over a period of 6 months.
5. **Soil Health Assessment:** Soil samples were taken from both the treated and untreated plots before and after the treatment to measure microbial counts, nutrient levels (N, P, K), and organic carbon content.

Preparation of Jivamrut:

1. **Cow Dung (10 kg):** Source of nitrogen-fixing bacteria and phosphate-solubilizing microbes.
2. **Cow Urine (10 liters):** Provides micronutrients like nitrogen and potassium.
3. **Jaggery (2 kg):** Acts as a sugar source for microbes during fermentation.
4. **Gram Flour (2 kg):** Provides proteins and amino acids.
5. **Live Soil (1 kg):** Introduces beneficial microorganisms.
6. **Water (200 liters):** For mixing and sustaining microbial activity.

Observation:

Table 1. Sugarcane Growth Parameters in Treated VS Untreated Plot

Parameter	**Treated Plot**	**Untreated Plot**
Chlorophyll Intensity	45.8 SPAD	38.4 SPAD
Leaf Size (cm)	15 x 12	12 x 9
Cane Length (cm)	180	145
Bud Development (count)	12	8
Cane Thickness (cm)	3.5	2.8

Table 2. Soil Microbial Count Before and After Treatment

Soil Sample	**Microbial Count (cfu/g)**	**Before Treatment**	**After Treatment**
Treated Plot	Nitrogen-fixing Bacteria	5.2 x 10^6	8.3 x 10^6
Untreated Plot	Nitrogen-fixing Bacteria	4.8 x 10^6	4.9 x 10^6

Table 3. Soil Nutrient Availability (N, P, K) Before and After Treatment

Soil Sample	Nitrogen (kg/ha)	Phosphorus (kg/ha)	Potassium (kg/ha)
Treated Plot	150	40	210
Untreated Plot	120	35	180

Table 4. Organic Carbon Content Before and After Treatment

Soil Sample	Organic Carbon (%)	Before Treatment	After Treatment
Treated Plot	2.5	2	2.7
Untreated Plot	2	1.9	2.1

RESULT

The results of this study indicate that Jivamrut application significantly improved both sugarcane growth and soil health. Sugarcane plants in the treated plot exhibited higher chlorophyll intensity, larger leaf size, increased cane length, more developed buds, and greater cane thickness compared to the untreated plot. These improvements reflect the positive impact of Jivamrut on the photosynthetic capacity and overall growth of the plants.

Soil health also showed considerable enhancement in the treated plot. Microbial counts, especially nitrogen-fixing bacteria, increased significantly, leading to better nutrient cycling. The nutrient availability, including nitrogen, phosphorus, and potassium, was higher in the treated plot, ensuring that the plants had access to essential nutrients for growth. Additionally, organic carbon content increased, contributing to improved soil fertility.

These results confirm that Jivamrut is an effective organic alternative to chemical fertilizers, promoting both plant growth and long-term soil health.

DISCUSSION

This study highlights the potential of Jivamrut as a bio-fertilizer in enhancing both crop growth and soil health. The positive results observed in the treated plot can be attributed to the synergistic effects of its ingredients, particularly the beneficial microbes and organic matter, which promote soil fertility and improve plant growth. These findings are consistent with previous studies that show the benefits of organic farming practices, including the use of natural bio-fertilizers. However, challenges such as the standardization of preparation and application rates need to be addressed in future research. Additionally, long-term studies are required to assess the sustainability and economic viability of Jivamrut in large-scale farming systems. Overall, the use of Jivamrut aligns with the principles of sustainable agriculture and can contribute to reducing the environmental impact of conventional farming practices.

CONCLUSIONS AND RECOMMENDATIONS

The application of Jivamrut has demonstrated significant benefits for both sugarcane growth and soil health in this study. Sugarcane plants in the treated plot showed improvements in key growth parameters such as chlorophyll

intensity, leaf size, cane length, bud development, and cane thickness. Additionally, soil microbial populations, nutrient availability, and organic carbon content were all enhanced following Jivamrut application. These findings suggest that Jivamrut is a sustainable and effective alternative to chemical fertilizers, capable of improving crop productivity and maintaining soil fertility. Given its positive impact, Jivamrut should be considered a viable option for organic farming, particularly in regions like Kolhapur where sugarcane is a major crop. Future research and standardization of its use in various crop systems could further promote its widespread adoption

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