

REVIEW ON EFFECT OF LIQUID BIO-FERTILIZER

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ABSTRACT

The liquid bio-fertilizers are suspensions having agriculturally useful microorganisms, which fix atmospheric nitrogen and solubilise insoluble phosphates and make it available for the plants. The use of this bio-fertilizer is environment friendly and gives uniform results for most of the agricultural crops and directly reduces the use of chemical fertilizer by 15 to 40%. A bio-fertilizer is a substance containing living microorganisms that, when applied to seeds, plant surface, or soil, colonize the rhizosphere or interior of the plant and promote growth by increasing the supply or availability of nutrients to the host plant. They have the potential to increase soil health and productivity by reducing use of agro chemicals and increasing soil fertility. They can be applied by spraying or fertigation and are usually concentrated and needs dilution before application.

I. INTRODUCTION

In a long-term agriculture system, chemical fertilizers can be replaced with Bio-fertilizers, which are affordable, harmless to the environment, and renewable sources of plant nutrients. Bio-fertilizers are also a great way to reduce growing costs and start organic farming. Bio-fertilizers take on particular importance in the current environment of very costly chemical fertilizer costs. (Majeed.. et al., 2013).

In order to improve plant nutrition, promote plant growth, and promote the breakdown of plant wastes, Bio-fertilizers-biologically active products with living microorganisms on a proper carrier are used on soil. Due to their higher advantages than costs, capacity to recycle plant nutrients, and beneficial to nature, Bio-fertilizers are becoming more and more important. (Sowmya pogula 2018).

The natural, organic fertilizers called Bio-fertilizers give plant's important nutrients and living microbes. They take part in non-pollution, organic, sustainable, and green farming practices. In addition to chemical fertilizers, Bio-fertilizers give an affordable and sustainable supply of plant nutrients for sustainable agriculture. They are necessary for agriculture's management of phosphorus and nitrogen. (Nitin B. Wable and Rahul K. Khandelwal 2023).

Microbes that fix nitrogen and solubilize phosphate can both be found in Bio-fertilizers. Either seed treatment or field-wide applications during cultivation provide it to the soil. Specific beneficial microorganisms found in liquid Bio-fertilizers have the ability to fix, solubilize, or mobilize plant nutrients through their biological activity. Developing liquid Bio-fertilizers is one of the most interesting and promising technologies. (A.S. Mahakalkara et al., 2023).

II. COMPOSITION AND PRODUCTION OF LIQUID BIO-FERTILIZER

In increasing the fertility of soil and productivity in agriculture, bio-fertilizers are a safe and helpful option for harmful chemical fertilizers. Adding bacteria which gives important nutrients like nitrogen, phosphorus, potassium, zinc, and silica, they improve plant immunity, growth, and development. (Shaista nosheen et al., 2021).

The environment, animals, humans, and helpful bacteria are all affected by chemical- based fertilizers. That are made up of microorganisms such as fungi, bacteria, and protozoa increase soil fertility. Many kinds of crops, like rice and oats, are benefited by these processes, which change insoluble nutrients into soluble forms. (Muhammad salman akram et al., 2020).

The study looked at how Klebsiella oxytoca in liquid organic fertilizer and Bio-fertilizer affected the growth of Brassica integrifolia, Brassica rapa chinensis, and Ipomoea aquatic plants. The results showed that, with a small amount of nutrient content, organic fertilizer increased soil nutrients, microbial activity, and plant growth properties. Liquid organic fertilizer was more effective in activating B. rapa chinensis, and the amount of chemical applied had a positive correlation with the microbial activity. Improving soil nitrogen levels and

increasing *Ipomoea aquatica* productivity can be done by combining 50% chemical fertilizer with liquid fertilizer. (Nguyen Thi Huynh Nhu et al., 2018).

Fermenting soil microbe increases plant productivity and growth, resulting in Bio-fertilizers. These eco-friendly, low cost nutrients have the ability to support long-term agricultural production. They are divided into several types that fix nitrogen, phosphate activates phosphate, and phosphates displace phosphate. The manufacture of Bio-fertilizers involves both invisible and solid-state fermentation. (Harish suthar et al., 2017).

Microbial-based nutrient inputs show scope for long term possibility and productivity of the global food chain. Because they improve soil health and yields in agriculture, carrier-based Bio-fertilizers are widely used. But there are still questions about their duration. Because of their simple transportation, dedication, storage stability, and environmental protection, liquid forms of Bio-fertilizers have become more and more popular. A substance found thickener, and transports are used in a fresh liquid formulation technology method. The solutions were physio-chemical and biological characteristics were examined after 16 months of storage at various temperatures. (Aman Jaiswal et al., 2023).

Numerous nutrients, such as organic carbons, nitrogen, and water components, are necessary for Nitrogen-fixing bacteria and blue green algae don't need sources of carbon or nitrogen. (Satish mohod et al., 2015).

Bio-fertilizers are simple to apply, safe for the environment and the growing population increases the demand of bio-fertilizers. Four types of formulation of bio fertilizer such as liquid, granular, carrier based and cell suspension are found. (Sana saif et al., 2021).

III. EFFECT OF SOIL AND PLANT HEALTH

Three different Bio-organic fertilizers were evaluated in terms of their impact on soil fertility, tea yield, and the quality of spring and autumn green tea. Compared to traditional chemical fertilizers, Bio-organic fertilizers raised soil pH, potassium, and total nitrogen and phosphorus content while decreasing soil bulk density. The yield and quality of tea were enhanced by the Bio-organic fertilizers, resulting in higher levels of polyphenols, amino acids, and caffeine. (Wenbin Lin et al., 2023).

An environmentally friendly way to improve soil fertility, health, and crop yield is through the use of Bio-fertilizers. By releasing nutrients from unusable forms, they make available nutrients to the plants absorption. Since bacteria are key to soil fertility, organic farming is using more and more Bio-fertilizers availability of micro-organisms, which is growing the global market. (K.C. Kumawat et al., 2021).

Bio-fertilizers improve soil nutrient levels through nitrogen fixation, phosphate and potassium mineralization, and antibiotic production, making them an economical and environmentally friendly supply of plant nutrients. They support environment friendly farming practices even though they can't completely replace chemical fertilizers. (Krishna kumar et al., 2020).

Liquid bio-fertilizer improves plant productivity and control soil health. Liquid bio-fertilizer handles agro-adverse problems and finds solutions for nutrient management using hydroponics and Bio-fertigation. It is well-liked by farmers and the agro-market since it provides products with a long shelf life, beneficial microbiological viability, and are free of contamination. Liquid bio-fertilizer growing in popularity throughout the world because of its helpful microorganisms and eco-friendly practices. (Richa 2023).

Garden rue seedling growth, yield, and survival were investigated in a pot experiment using liquid Bio-fertilizers. The research discovered that when compared to a single treatment and control, the combination of *Azospirillum lipoferum*, *Pseudomonas striata*, and *Pseudomonas fluorescens* greatly enhanced seedling growth, yield, and survival. The results show that the growth and yield of seedlings can be improved by using these Bio-fertilizers. (R. C. Vijendrakumar et al., 2014).

Three cultivars of flax-Syrian, Egyptian, and Iraqi-across examined with Bio-fertilization treatments, three applications of chemical NPK fertilizer, and a control treatment. The number of main branches, secondary branches, fruit branches, capsules, seeds, seed production, oil yield, and plant height were among the characteristics in which the Syrian cultivar performed best. In terms of plant height, the number of main branches, secondary branches, fruit branches, capsules, seeds, seed yield, oil yield, and seed weight, the bio-mixture treatment produced the best results. In the qualities under study, the interaction between the two components was significant. Aside from plant height, the Syrian cultivar demonstrated the best performance in

the bio-mixture treatment. Both seed weight and Bio-fertilizer treatment were strong points for the Egyptian cultivar. (Elaf Kh.F. Al-Sudani M.H.K. Al-Baldawi 2018).

IV. IMPACT BIO FERTILIZER ON NUTRIENT CYCLING

The fermentation of natural K-reserves, biological potassium fertilizer (BPF) increases the availability of potassium in the soil. Bacteria and fungus known as K-solubilizing microorganisms (KSMs) are responsible for solubilizing K from insoluble minerals. KSMs can increase the K supply to plants by 34%-38%. Applying KSM increased crop output by 17%; however, it worked best in light-textured soils with extended gestation times. (B. B. Basak et al., 2022).

In order to solve both economic and environmental concerns, fertilizer usage efficiency, is critical in agriculture. Enhancing soil capacity and supporting environmentally friendly farming could be achieved using a Bio-fertilizer that blends, organic, and biological elements. Combining microorganisms with coating technology many help farmers make more money by lowering expenses and applying less fertilizer. (Didiek Hadjar Goenadi et al., 2018).

The demand for agricultural products has increased due to urbanization, making the use of organic or Bio-fertilizers necessary to raise yields. Soil fertility is decreased by inorganic fertilizers. Because they utilize less nitrogen and phosphate stocks, Bio-fertilizers, or incorporated bacteria, are a promising technique for sustainable farming systems. They serve as bio-control agents, fix nitrogen from the atmosphere, enhance the uptake of water, and access nutrients. Bio-fertilizers offer a broad range of research opportunities in organic farming and free of stress since they protect plants from infections, salt, and drought stress. (Asoegwa et al., 2020).

V. EFFECTS ON CROP QUALITY AND NUTRITIONAL VALUE

The results of the study showed that mango trees, canopy spread, fruit weight, yield, and biochemical characteristics were all considerably enhanced by panchagavya treatments and Bio-fertilizers. For the maximum fruit weight, yield, and biochemical characteristics, the treatment with *Azotobacter chorococcum*, *Azospirillum brasilense*, and panchagavya 3% was used. It also displayed the highest number of soil bacteria and the nutrients that were available to the soil and leaf. (S.sau et al., 2017).

The improper application of chemical pesticides, fertilizers, and insecticides makes it more difficult to produce sufficient food for the world's population in the twenty-first century. (Vijay Singh Meena et al., 2017).

VI. CHALLENGES AND FUTURE DIRECTIONS

As a weed, disease, and insect control method with little impact on the environment or human health, bio fertilizers and pesticides are going to capture attention on a global scale. However, the growth of these measures is made difficult by their cost, market limitations and low public awareness of their method of action and related governmental challenges. Farmers, politicians, the government, and manufacturers all need to be more aware of this. (Maria Ajmal et al., 2018).

Bio-fertilizer is an environmentally friendly option for chemical fertilizers that increase crop yields while preserving the lithosphere and enhancing the biosphere. It releases growth hormones and restores soil with minerals. Nitrogen-fixing, phosphate solubilizing, phosphate mobilizing, potassium solubilizing, and sulphur oxidizing Bio-fertilizers are different categories of Bio-fertilizers. Microbes must be mass-cultivated in order for them to work properly. The development of genetically modified and mutant bacteria for sustainable agriculture should be the main focus in the future. (Tanushree Chakraborty and Nasim Akhtar 2021).

VII. CONCLUSION

The present study conclude that liquid bio-fertilizers have the capacity to replace the traditional chemical fertilizers (up to 25%) and carriers based bio-fertilizers and are important in restoring the soil health. Bio-fertilizers make sure nutrients are up taken by the plants. Some nutrients that are limited for plants are made available by the bio-fertilizers. Also do not leave the residual effects like that of the chemical fertilizers. Also, liquid bio-fertilizer can be made from wastes and by-products of some industries as they could be a suitable and low-cost option for the growth of the cells instead of using specially made media. Application of bio-fertilizers results in increased and water uptake, root development, vegetative growth and nitrogen fixation.

VIII. REFERENCES

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