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Vermicompost and Its Importance in Plant Growth Promotion

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Abstract

Vermicompost, the byproduct of earthworms breaking down organic materials, has attracted a lot of interest as an environmentally responsible and sustainable substitute for synthetic fertilisers. By strengthening the physical, chemical, and biological qualities of the soil, this biologically active substance increases soil fertility. Vermicompost, which is rich in important nutrients and advantageous microorganisms, increases microbial activity, improves soil structure, and increases nutrient availability to support plant growth. Research shows that using it improves crop productivity, plant growth, and seed germination. Additionally, vermicompost improves soil health by encouraging a healthy soil biota, lowering the need for chemical inputs, and promoting environmentally friendly farming methods. The value and application of vermicompost in promoting plant growth are discussed in this article.

Keywords: Vermicompost, Sustainable agriculture, Organic farming, Earthworms, Soil microbes

Introduction

Vermicompost is the end result of the non-thermophilic biodegradation of organic materials by the combined action of earthworms and related bacteria. It is a finely divided, peat-like substance with low C:N ratio, high porosity, aeration, drainage, water holding capacity, and microbial activity. By mechanically blending the organic substrate, earthworms change its chemical and physical state, creating a larger surface area that is more conducive to microbial breakdown. Vermiculture is the term for growing earthworms in organic wastes, while vermicomposting is the process of digesting organic wastes by earthworms. There is a noticeable trend towards the efficient recycling and use of organic leftovers through the deployment of innovative technologies, primarily based on biological processes.

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As a result, it is feasible to protect the natural products, preserve the resources that are now available, and, in certain situations, reduce the consequences of pollution and fight disposal issues. Vermicomposting is a cutting-edge biotechnology that turns agricultural and industrial wastes into high-quality products that can be used to enhance the fertility and soil structure of organic farming.

Nutritional Quality of Vermicompost

Compared to FYM, vermicompost has a larger amount of nutrients, making it a good source of nutrients. It is a safe source of nutrients for organic farming. All of the vital nutrients required by plants are abundant in vermicompost. Well-rotted vermicompost has a nutrient value of 1.2% to 2.5% for nitrogen, 0.9% to 1.7% for phosphorus, and 1.5% to 2.5% for potassium. It has a great impact on the general growth of the plant, promotes the development of new shoots and leaves, and enhances the produce's quality and shelf life. Vermicompost is loose, easy to work with, handle, and store, and doesn't taste unpleasant. It stops soil erosion and enhances soil aeration, structure, and water-holding ability.

In addition to improving the soil environment, vermicompost is rich in helpful microflora, including fixers, P-solubilizers, and microflora that break down cellulose. Earthworms and their cocoons are found in vermicompost, which also boosts their number and activity in the soil. Vermicompost is devoid of harmful substances, weed seeds, and other contaminants. Additionally, vermicompost reduces the prevalence of illnesses and pests and speeds up the breakdown of organic materials in the soil. It is rich in vitamins, enzymes, and hormones such as gibberellins and auxins.Vermicompost @4 t ha−1 and FYM @25 t ha−1 application results in a significantly increased total yield of potato tubers, according to reports.

Potential Species of Earthworms for Vermiculture

Dendrodrilus rubidus, Lumbricus rubellis, Eisenia foetida, and Dendrobaena veneta are the two primary earthworm species raised in worm farms. Vermicompost is made frequently with the help of these worms. Because these species exhibit traits including high rates of organic waste processing, high rates of reproduction, and tolerance to a wide range of environmental conditions.

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Role Of Vermicompost in Plant Growth and Development

Source Of Plant Nutrients:

Previous research has demonstrated that vermicompost not only increases plant uptake of nutrients but also supplies all essential nutrients in ways that are accessible to plants. The application of humic acids made from vermicompost resulted in a significant accumulation of N, P, K, Ca, and Mg in the root and shoot system, which was connected to the uptake of nutrients by plants. Additionally, the combined application of inorganic fertiliser and vermicompost boosted the amount of nutrients in the plant body. P2O5-enriched vermicompost outperformed other treatments in terms of yield and absorption of important nutrients such as N, P, K, Ca, and Mg.

Vermicompost as soil supplement:

In addition to providing nutrients and helpful bacteria to the soil, vermicompost also alters the physio-chemical characteristics of the soil, promoting improved crop growth and development. Vermicompost added to an agricultural soil at a rate of 20 t ha over the course of two years has been found to considerably improve soil porosity and aggregate stability. Vermicompost application at a rate of 15 t ha significantly (P 0.05) increased soil contents of total organic carbon and nutrients, decreased soil pH, improved bulk density, total porosity, and electrical conductivity in comparison to the control plots (without vermicompost). These effects were assessed on the physio-chemical properties of the tomato (Lycopersicum esculentum var. Super Beta) field.

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Vermicompost has a favourable impact on soil qualities, losses, and restoration. It reduces soil loss (31.2%) and improves soil quality when compared to unmodified soil.

Plant growth, yield and fruit quality:

When added to soil, vermicompost can stimulate plant growth and raise yield. Petunia germination, flowering, and growth were all enhanced by the substitution of vermicompost made from various sources in various ratios into the soilless nutritive medium Metro-mix 360. had investigated how vermicompost affected tomato (Lycopersicum esculentum L) growth, yield, and quality. When tomatoes were grown in soil supplemented with vermicompost instead of soil not fortified with vermicompost, they showed a significant increase in growth, yield, and quality metrics.

Dosage-dependent vermicompost addition to soil improves plant yield and soil characteristics. An increase in the overall yield of tomato wafound when 500g/m of vermicompost is applied to cow dung can be due to the improved soil quality caused by the vermicompost treatment. showed that 100 days after transplanting, tomato yields increased significantly when the ratio of vermicompost to soil was 1:1, 1:2, or 1:3.

Suppression of plant diseases

Vermicompost aids in the reduction of plant infections and the mitigation of plant illnesses. According to Singh et al. (2008), strawberry plots amended with 7.5 t/ha vermicompost derived from vegetable waste showed lower rates of physiological disorders like grey mould (2.7%), fruit malformation (4.1%), and albinism (4.6%), as well as higher yields of marketable fruit (58.6%). Application of vermicompost reduced Leucinodes orbonalis infection on Solanum melongena, according to Chandrakumar et al. When it comes to fungal diseases, Orlikowski (1999) found that adding vermicompost extracts to three ornamental plants dramatically decreased the pathogen Phytophthora cryptogea's sporulation. When solid vermicompost was added to tomato seeds, the infection caused by Phytophthora nicotianae and Fusarium lycopersici (Szczech, 1999) was greatly decreased.

additionally demonstrated a substantial reduction in common potato scab by applying vermicompost. Since plant root infections are more likely to occur in soils with little organic matter, adding an organic amendment has been shown to successfully control plant diseases. Vermicompost has also been shown to have exceptional potential for improving host plant health and acting as a control agent against the root-knot nematode.

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When to Use Vermicompost?

While Planting the Seeds

Because vermicompost is rich in nutrients and promotes the growth of young plants, it's a great supplement for starting seeds. If you are beginning seeds inside, just add a tiny bit to the seed-starting mixture. To sow seeds outside, just sprinkle it into the drilled seed holes or down the trench. Fill each planting hole with a small amount of compost. If the plants begin to develop quickly, you can add a half-inch layer of compost around the base of the plants. For best results, apply a 1/2 inch layer of compost to "heavy feeder" plants like tomatoes, maize, and squash once a month!

While plants are growing

Add high-nutrient soil amendments while the plants are actively growing. It makes the most sense for the plants when you put it in the garden bed, but that's not to say you shouldn't do it at any time. Vermicompost has exceptional water-holding qualities that are beneficial to both ornamental and vegetable plants in the spring, summer and autumn. To utilise your compost tea as a top dressing, simply apply it to the drip line of any plant. The drip line starts at the longest outward branch of the plant and extends around its circumference.

The area where water would 'drop off' and settle on the ground surrounding a plant (or tree) is known as the drip line. Imagine spraying water onto a plant or tree from the top. Here, the little roots take in a lot of water and nutrients.

Conclusion

Vermicompost has been demonstrated to improve soil, plant growth, and overall health in a number of ways. Furthermore, it is seen as a possible substitute for hazardous chemical herbicides and fertilizers in agricultural cultivation. In order to produce healthier foods and provide a better choice for managing organic solid wastes, it is becoming more and more popular as a major component of organic agriculture. A bright future for vermicompost use in organic farming systems is provided by research on earthworm-microbe interactions, the exploration of potential species of earthworms in vermiculture technology, the use of various high-nutrient organic substances, an efficient vermiculture system, dose-specific use of vermicompost, and integrated use of vermicompost with other inorganic fertilizers.