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Effect of Vermicompost on Growth and Flowering of *Chrysanthemum*

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Abstract

During the years 2017-2018, researchers looked into the impact of vermicompost on *chrysanthemum* growth and flowering. Vermicompost is an outstanding organic manure for improving plant growth and yield. Organic wastes such as cow dung and animal droppings, farm and forest wastes, vegetative waste, and urban municipal solid wastes are aerobically decomposed into vermicompost (MSW). *Eudrilus eugeniae*, also known as the African night crawler, is an earthworm species that was used in the vermicompost. Various experimental plots were examined (Control, T1, T2 and T3). In T3, the number of plants, flowering plants, and buds per plant are all higher. As a result of the results, it can be concluded that using Vermicompost for commercial *chrysanthemum* cultivation is a good idea.

Keywords: Vermi- compost, *Eudrilus eugeniae, chrysanthemum*

Introduction

The use of earthworms to solve various environmental problems, such as waste management and land (soil) improvement, is known as vermiculture technology. Vermicomposting is a low-cost, environmentally sustainable technology for treating degradable organic waste, and it has been available for many years as an alternative substrate. When moving through the worm gut, biodegradable wastes such as farm wastes, livestock wastes, kitchen wastes, market wastes, and so on are converted to nutrient-rich vermicompost. It's essentially the science of breeding and growing earthworms, and it defines the fascinating potential for waste reduction, fertiliser production, and a variety of other future applications (Entre Pinoys, 2012). Vermicompost has no harmful effects on soil, plants, or the climate. Because of its high organic matter content, it enhances soil aeration and structure, reducing soil compaction and increasing water retention potential. It also improves soil nutrient status, both macro- and micro-nutrients, by promoting better root growth, nutrient absorption, and soil nutrient status (Lazcano and Dominguez, 2010).

It's a nutrient-dense, microbiologically active organic amendment produced by the interactions of earthworms and microorganisms during the decomposition of organic waste

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(Dominguez, 2004). Vermicomposting takes about half the time of traditional composting, and vermicompost does not need curing, so it can be used right away (Dominguez *et al*., 1997). Due to the ‘‘Green Revolution," India saw a major rise in agricultural production from the 1960s to the 1980s (Gupta, 1996). Chemical fertiliser use increased after the green revolution, and India achieved agricultural self-sufficiency. The use of chemical fertilisers polluted the soil, water, and air. The residues of these agrochemicals in food products have had negative effects on the health of humans and livestock (Kumar and Bohra, 2006). Because of the detrimental effects of chemical fertilisers and pesticides, researchers are turning their attention to organic amendments like vermicompost, which can improve crop production and protect them from harmful pests without polluting the atmosphere.

Because of the following factors, vermicompost is an outstanding organic manure for improving the growth and yield of many plants: Traditional composts have a lower nutritional value than vermicompost. This is due to the action of earthworms, which has increased the rate of mineralization and the degree of humification (Albanell *et al*., 1988). Porosity, aeration, drainage, and water-holding capability are all high in vermicompost (Edwards and Burrows, 1988). It is suitable for plant growth due to the presence of microbiota, especially fungi, bacteria, and actinomycetes (Tomati *et al.*, 1987). Vermicompost contains nutrients such as nitrates, phosphates, exchangeable calcium, and soluble potassium in plant-available forms (Orozco *et al.*, 1996). Plant growth regulators and other microorganism-produced plant growth influencing materials can also be found in vermicompost. Inorganic wastes collected by earthworms were found to produce cytokinins and auxins (Krishnamoorthy and Vajrabhiah, 1986). Certain metabolites, such as vitamin B, vitamin D, and similar substances, are released into the soil by earthworms.

Compared to traditional thermophilic composts, vermicomposts have superior chemical and biological properties, including ‘plant growth regulators' (which are absent in other composts) and ‘diverse microbial communities' (Galli and tomati, 1995; Edwards, 2004). On a weight basis, it has higher nitrogen availability than traditional compost, and it greatly enhances the supply of many other plant nutrients such as phosphorus (p), potassium (k), sulphur (s), and magnesium (Mg) when compared to connectional compost (Ativeh *et al*., 2000). While conventional compost fails to provide the necessary amount of macro and micronutrients, including the essential NKP (nitrogen, potassium, and phosphorus) to plants in a timely manner, vermicompost does (Subler *et al*., 1998).

Chrysanthemum (Chrysanthemum morfolium) is one of the world's most popular commercial ornamental flower crops, having been cultivated for over 2000 years and

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belonging to the Asteraceae family. It is regarded as the "queen of the east" and is a force to be reckoned with in commercial flower production (Bhatia and Gupta, 2007). *Chrysanthemums* play an important role in ornamental horticulture. Chrysanthemum white is its common name, and *Chrysanthemum morifolium* is its botanical name. It is also known as Vellai Samanthipoo in Tamil. The plant grows tall and erect, making it perfect for use as a border plant, loose flower, or cut flower. It's also used in flower shows in pots. Though the *chrysanthemum* is one of India's most valuable commercial flower crops, yields are low. As a result, the current study focuses on the production of vermicompost and its effect on *Chrysanthemum* plants in field trials.

Materials and Methods

Experimental animal (*Eudrilus eugeniae)*

Eudrilus eugeniae is a type of earthworm that is also known as the African night crawler. It is a large worm that grows at a breakneck pace. Adult earthworms range in size from 10 mm long and 1 mm wide to 3 m long and over 25 mm wide. Each segment has eight setae that are arranged in four pairs ventro laterally. The clitellum is located on the 14th to 18th segments, with two female pores on the 14th segment and two male pores at the 17th and 18th segment joint. From the mouth to the anus, the alimentary canal is a straight line. The vascular system has four pairs of pseudo hearts.

Figure 1: Earthworms (*Eudrilus eugeniae*)

E. eugeniae cocoons have an unusual oval shape, with one side being flatter than the other. The two ends of each cocoon have long, sharply pointed, fibrous tips. The cocoons are soft and greyish-white in colour right after they are formed. The hull hardens quickly, becoming sturdy and leathery, and the colour changes to an orange-brown. The brown colour

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deepens over time, becoming dark brown just before hatching. Cocoons have a 16-17 day incubation period. After incubation in cattle manure, these cocoons produced 2-3 hatchlings per cocoon (Figure- 1).

Collection of the Earth worms

The Adult earthworms were commercially procured from the vermicompost producer Mr. Vetrivel, from Jahir Ammapalyam, Salem.

Maintenance of Adult Earthworms

Vermibeds were produced using ten days (10) old cattle dung for mass culture of *Eudrillus Eugeniae* in this research. The vermin-beds were created in a 40-cm-high, 58.5-cm-diameter earthen cement tank with cow dung and soil at a temperature of 25-27°C and held in the vermicompost unit at Government Arts College, Salem 07. Throughout the research, the culture was constantly monitored and water was sprayed on a regular basis to maintain the optimum moisture level for earthworm survival and development. This stock culture supported mature clitellate worms for experimental purposes.

Figure 2: Maintenance of Mass Culture

Collection of leaf litter

The partially decomposed leaf litter was manually powered with thick wooden rods. According to Reinecke and Enter (1985), the driven materials were sieved separately through a sieve net of about 1mm x 1mm to obtain a medium with particle sizes less than 1mm, which was then sprinkled with water daily to decompose. Even, for proper aeration and decomposition, this waste was switched up and down. This experiment lasted a total of 15 days.

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Preparation of Vermicompost

A cement tank was filled with a pre-decomposed mixture of cow dung and leaf litter for this analysis. As suggested by Martin, 1982 these substrates were put in a cement tank and an appropriate amount of water was added to ensure optimal moisture conditions. The *Eudrillus Eugeniae* obtained from the stock culture were uniformly released on the tank's top. The culture tank was covered with mesh garden cloth to shield the adult earthworms from predators and was maintained by spraying water and earthworm survival. The earthworms used the substrate medium with earthworms that decomposed, and the whole setup was preserved until finely granular vermicompost was prepared and used for the analysis (Figure: 3)

Figure 3: Preparation of Vermicompost

Experimental Plot

The purpose of the experiment was to see how vermicompost influenced the growth and flowering of chrysanthemum plants. Plant saplings were harvested from the nursery and planted in plots. Every experimental plot had a capacity of 2kg and measured 7.5 cm long by 20 cm wide. The experimental plots (T1, T2, T3) were filled with garden soil and vermicompost (P1 -1kg, P2 -2kg, and P3-3kg) and the control plots (T1, T2, T3) were filled with garden soil and vermicompost (P1 -1kg, P2 -2kg, and P3-3kg). In each plot treatment, the total plants were spaced 3cm apart and rooted to a depth of 3cm. Water was applied to keep the moisture level up. Various parameters such as the number of flowers per plant and the number of flowering plants per plot per day were reported for each plot and the observations were recorded for each week via plot experiment. The plant height was measured from the base to the tip of the plant for each plot using a ruler (0.5 cm) at the start of the flowering season, and the percentage of plants was determined.

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Results and Discussion

Total Number of Flowering Plants

When comparing the T3 plots (about 3kg) with vermicompost treatment to the control plot without vermicompost treatment, the T3 plots (about 3kg) with vermicompost treatment had the most flowering plants. These findings are consistent with those of Atiyeh *et al*., (2000). They studied the effects of swine manure vermicompost on the growth and yield of French targets in a greenhouse environment, and found that the medium containing vermicompost provided the highest rate of vegetative growth and the greatest number of flower buds. Aracnon *et al.,* (2006) demonstrated that applying vermicomposts made from paper and food residues to strawberry plants increased yield and enhanced nitrogen and phosphorus uptake. Plant growth controlling substances and other substances formed by microorganisms are found in vermicompost, which aid plant growth.

Table 1: Effects of vermicompost on flowering, budding weight of *Chrysanthemum*

S.No	Experimental Plots	Total Number of Plants	Number of Flowering Plant	Number of Flower Per Plant	Number of Buds Per Plant	Weight of the Flower (in gms)
1	CONTROL	25	03	11	22	1.03
2	T1	23	03	15	24	1.4
3	T2	22	07	31	75	2.07
4	T 3	24	09	13	60	1.20

When Hashemimajd et al. (2006) studied the impact of different vermicomposts on tomato growth and nutrient uptake, they discovered that adding vermicompost to the pot culture media resulted in a higher dry matter yield than compost. Furthermore, adding vermicompost to pot culture media enhanced the physical and chemical properties of the media, which is consistent with the findings of this research.

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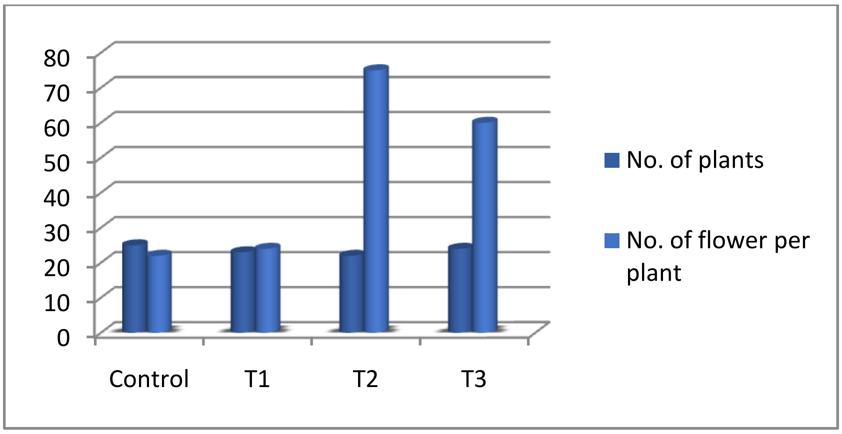
Figure 4: The number of flower per plant growth in control and vermicompost plots.



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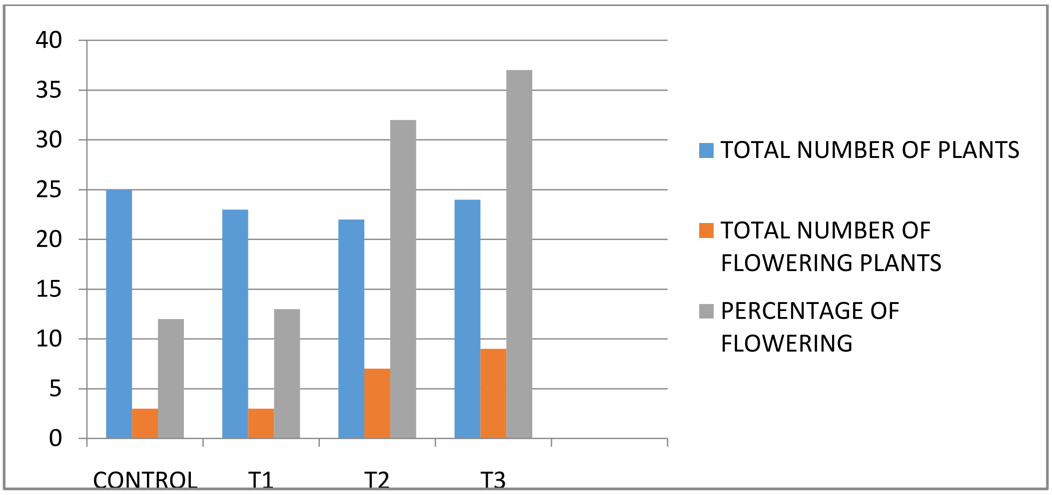
Number of Flower per Plants

The aim of the analysis was to determine the number of flowers per plant treated with vermicompost versus those not treated with vermicompost. The results revealed that the plants in the vermicompost-applied plots produced more flowers and had a higher percentage of flowering plants than those in the control plot. The plants in the vermicompost-treated plots produced more flowers per plant than the plants in the non-vermicompost plot (control plot). The addition of vermicompost in sufficient amounts has a major positive impact on marigold seedling growth and flowering, including plant biomass, plant height, number of buds, and flowers (Edwards *et al*., 1988).

Figure 5: Percentage of flowering in *chrysanthemum* of vermicompost.



Vermicompost has been shown to have effects similar to plant growth hormones and hormone-like compounds (Muscolo *et al*., 1999). Vermicompost has been shown to have a long-term increase in biological activity and can be used to boost seed germination,

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flowering, growth, and yield when compared to commercial culture media that lack enough nutrition (Atiyeh *et al.*, 2000).

Number of Budding Plants in Different Vermicompost Plots

The control plot plants produced 25 buds, while the T1 plot (1 kg/1sq.mt) plants produced 75 buds. The T1 plot had the most buds, followed by T3 plots and T2 plots. In T2 and T3, there were 32 and 60 buds found, respectively. In the control plot without vermicompost, the minimum number of buds (25) was labelled. These findings backed up the findings of Atiyeh *et al.*, (2000), who found that vermicompost boosts biological activity and can be used to improve seed germination, flowering, development, and yield when compared to commercial culture media that lack nutrition.

Figure 6: Shows the Number of buds per *chrysanthemum* plant

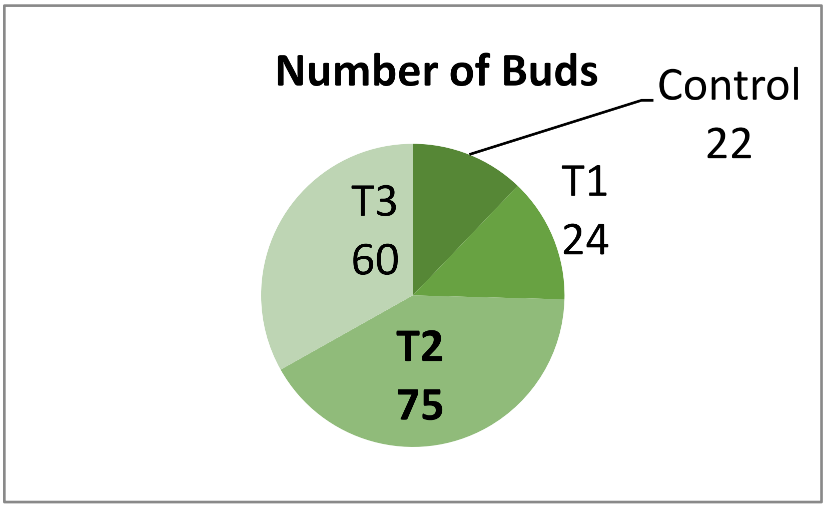

Figure 7: Vermicomposting *chrysanthymum*

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Vermicompost is high in nitrate, phosphate, exchangeable calcium, and soluble potassium, which are all readily available nutrients (Edwards, 1988). Tomati *et al*. (1988) demonstrated that has a significant effect on seed germination through water retention, nutrition supply, and plant hormone production; thus, can have a positive effect on ornamental plant development.

Conclusion

Vermicomposting is a low-cost, environmentally friendly technology that converts biodegradable wastes like leaf litter into nutrient-rich vermicompost. It is an excellent organic manure for improving the growth and yield of many plants, as it contains readily available nutrients such as nitrate, phosphate, exchangeable calcium, and soluble potassium. It has a major impact on seed germination through water retention, nutrition, and the development of plant hormones, and thus can benefit ornamental plants such as chrysanthymum.

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