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A LABORATORY STUDY OF VERMICOMPOST AND SOIL (V:S) RATIO ON PLANT GROWTH (GRAM, SOYBEAN AND WHEAT)

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Abstract: Plants growth is directly related with the nutrients which are supplied to them. A lot of way to increase the plant growth and vermicomposting is one of them. Vermicompost is the type of fertilizer prepared by using waste and worms. Vermicompost is rich in nutrients, so provide good health to the plants without harming the soil quality. Farmers use various combination of vermicompost in the field according to the soil type and crop plants. The present study is aimed to assess the effect of vermicompost and agricultural soil in different concentrations on the three common plant varieties of Malwa region e.g., Gram (*Cicerarietinum*), Soybean (*Glycine max*), and Wheat (*Triticumaestivum*) in controlled and field conditions. Six different concentrations of vermicompost: agricultural soil (00:100, 20:80, 40:60, 60:40, 80:20, and 100:00) was used for experiments respectively. Five seeds of each variety were used for each treatment in both controlled and field conditions. Results were tested for SD statistically. Results of the present study states that for all three crop plants the similar trends in terms of growth was observed. There was an increase in the growth at the 40:60 ratio of vermicompost and soil respectively.

Keywords: Gram, Soybean, Vermicompost, Wheat

INTRODUCTION :-

Day by day increasing in population, urbanization and industrialization in India causing the adverse effect on agriculture. Side by side garbage, waste and polluted water also causing the alarming situation for near future. For the management of such situation in the country like India is an essential part. Various ecofriendly methods are available with us to reduce the pollution effect without harming the environment and vermicompost is one of them. Compost preparation using worms is called vermicomposting and very popular in all over the world. Vermicomposting is quite potential biotechnology for many waste management applications.

Vermicompost is a nutrient-rich, microbiologically-active organic material that results from the interactions between earthworms and microorganisms during the breakdown of organic matter. It is a stabilized, finely divided peat-like material with a low C:N ratio, high porosity and high water-holding capacity, in which most nutrients are present in the forms that are readily taken up by plants (Dominguez, 2004). Vermicomposts are finely separated peat-like materials with high porosity, aeration, drainage, and water-holding capacity (Edwards & Burrows 1988). They have a vast surface area, providing maximum absorption ability and preservation of nutrients (Shi-wei & Fu-zhen 1991). Vermicomposts contain nutrients in forms that are readily taken up by the plants such as nitrates, exchangeable phosphorus, and soluble potassium, calcium, and magnesium (Edwards & Burrows 1988; Orozco et al. 1996).

Keeping above points in mind the present study was aimed to assess the possible effect of vermicompost on three plant varieties. In these three varieties one plant (wheat) was a monocot, while two other (Gram and Soybean) were dicot. We also want to study a comparative plant growth in studied crop plants.

MATERIALS AND METHODS

For the present study, P.G. Department of Microbiology, Govt. Madhav Science College was selected. Following methods were used during the present study:

1. Seed selection: For the present study seeds of three common plant varieties (e.g., Gram, Soybean, and Wheat) were procured from the local distributors. These crop plants are commonly grown in the Ujjain district of Madhya Pradesh. For each treatment 5 seeds were selected, surface sterilized and used further. In each treatment, sterilized seeds were sown and watered as and when needed.
2. Pot arrangement: Total 6 kg of V:S ratio in the polybags was taken. Three sets of the experiment were conducted with unsterilized soil in combination with varying vermicompost amount. Two controls (positive and negative) were also run along with treatment pots.
3. Studied parameters: To assess the effect of different ratio of the V:S on the plant growth few plant growth parameters were selected in present study. Seed germination, root and shoot length, their dry weight, number of leaves per plant at DAS (Days After Sowing).
4. Statistical analysis: All the parameters of the present study were tested statistically. Standard deviation and test of significance for different data collected during work was tested using Biostat. Software.

RESULTS AND DISCUSSION

For the present work five surface sterilized seeds of all three crop plants (Gram, Soybean and Wheat) were grown in the polybags with different V:S ratio under controlled conditions in the P.G. Department of Microbiology, Govt. Madhav Science College, Ujjain (Madhya Pradesh). For the observation and results every ten days observations were taken into account upto 30 DAS. Number of leaf per plant, height of plants, root and shoot length and their dry weight were set as plant growth parameters. All results are present in the form of graph. Figure 1, 2 and 3 represents effect of vermicompost on soybean, wheat and gram respectively.

Vermicomposting is the method of earthworm's digestion and for this various types of earthworms (e.g., *Eisnia*, *Lumbricus*, *Pyronix*) that work in combination with other useful microbes to decompose manure and is a microbiologically-active, high nutrient content, which may influence plant growth directly or indirectly through different chemical, physical and biological mechanisms. In past few decades, scientists and researchers have become very much interested in vermicomposting (Mitchell et al. 1980; Edwards et al. 1985; Chan & Griffiths 1988; Hartenstein & Bisesi 1989).

In present study we have observed that various treatments have positive effect on shoot length (Figure 1, 2 and 3) after 10, 20 and 30 DAS in all three studied crops. It was revealed that all three plants showed maximum shoot length at 40:60 ratio of Vermicompost: soil. In recent past there are only few research studies that have been emphasized plants growth response in reference to vermicomposts to soil or greenhouse container media (Edwards & Burrows 1988; Wilson & Carlile 1989; Mba 1996; Buckerfield & Webster 1998).

In the case of shoot length maximum shoot length was observed in the wheat at 40:60 (32.47 cm), while lowest shoot length was at 0.8 cm in control of soybean. Most of these studies confirmed that vermicomposts have beneficial effects on plant growth. Vermicompost, whether used as soil additives or as components of horticultural media, improved seed germination and enhanced rates of seedling growth and development.

The variability in the effects of vermicompost may be dependent on the various factors into which it is incorporated, as well as on the physical, chemical and biological characteristics of vermicompost, which vary widely depending on the original feedstock, the earthworm species used (Roberts et al., 2007; Warman and AngLopez, 2010). Nielson (1965) reported the first evidence of the presence of indole compounds in the tissues of *Aporrectodeacaliginosa*, *Lumbricusrubellus*, and *Eiseniafetida*. More recently, El Harti et al. (2001a, 2001b) showed that a crude extract of the earthworm *Lumbricusterrestris* was able to stimulate rooting in bean seeds due to the presence of indole compounds of endogenous origin. Our study is parallel with the research conducted by researchers in the recent past (Javed and Panwar, 2013; Mirakalaei et al. 2013; Sabrina et al. 2013). Reddy et al. (in press, as reported by Ismail, 1995) also found positive results when vermicompost was used for the study of yield parameters in rice crop. In the present study, vermicompost and soil ratio for all three crop plants was ranges between 40:60 to 60:40 in all growth parameters.

Positive effects of vermicompost on plant were studied earlier (Karmegam et al. 1999; Atiyeh et al. 2000b; Zaller 2007). Vermicompost, also stimulate the nutritional quality of some crops along with productivity in terms of seed per plant, and increase in biomass (Lazcano et al., 2011).

CONCLUSION

As mentioned in the result and discussion, present study can give an idea to researchers who want to explore their study in the field of vermicompost and its effect on plant growth especially those are important economically.

Although vermicompost preparation and its use is very traditional method, but due to excessive use of chemical fertilizers and soil conditions now a days this technology can be a good replacement in the ecofriendly manner for the

improvement of plant and soil health.

In the same pipeline it is important that we nurture the earth using vermicompost as modern technology rather nurturing with chemical fertilizers. Use of vermicompost as a black gold will be a gift to the earth with essential symbiotic organisms beneficial to crop plants.

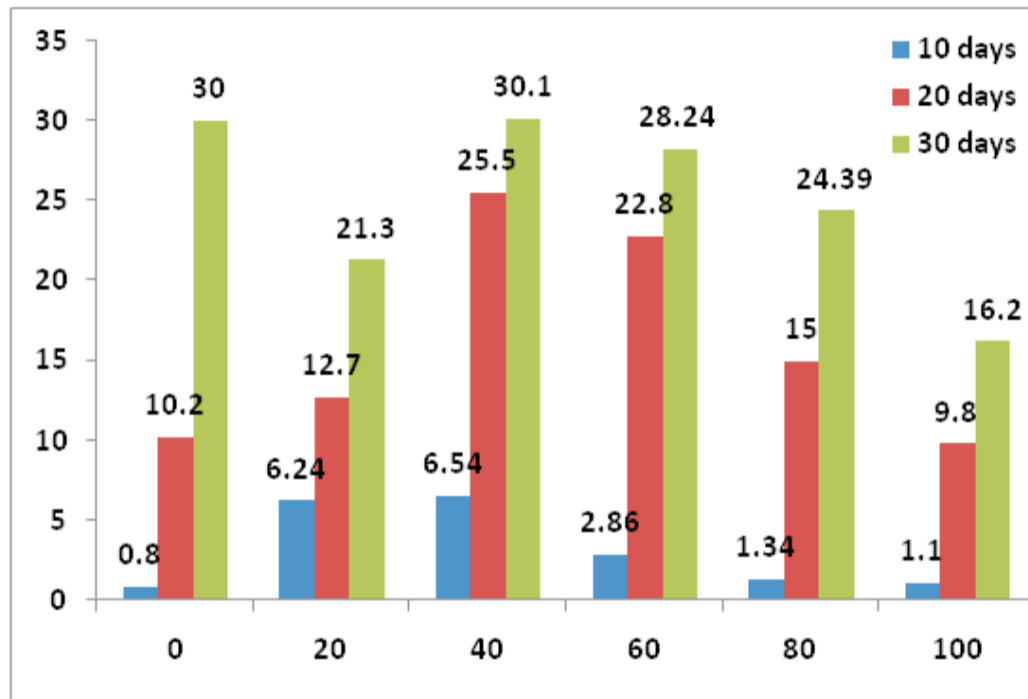


Figure: 1 Effect of vermicompost on shoot length of Soybean plant after 10, 20 and 30 DAS

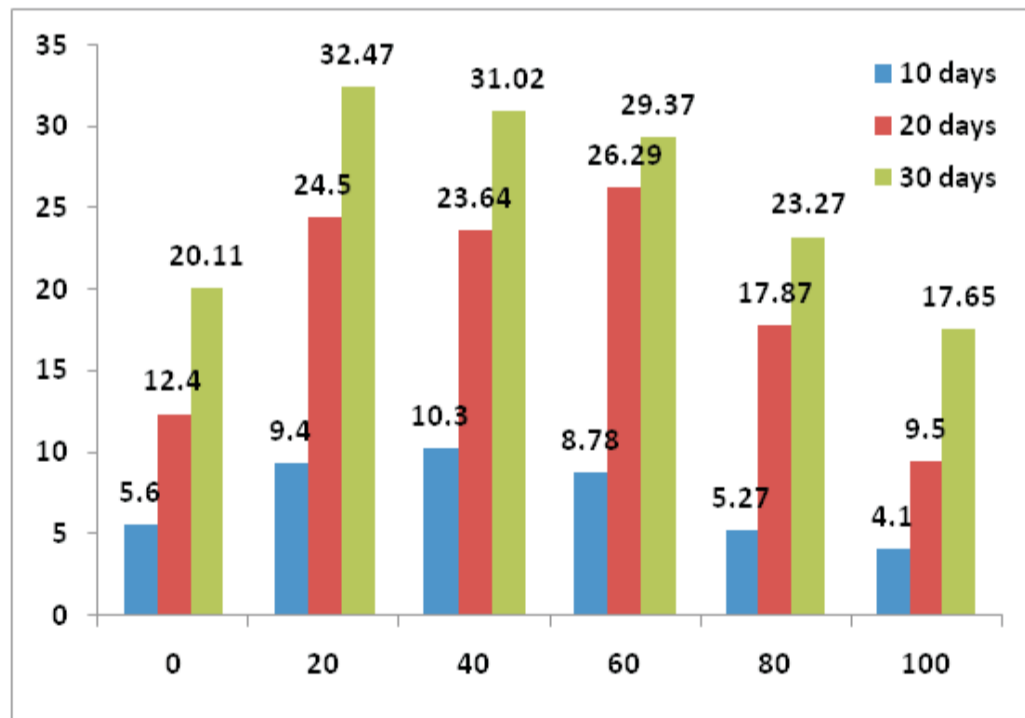


Figure: 2 Effect of vermicompost on shoot length of Wheat plant after 10, 20 and 30 DAS

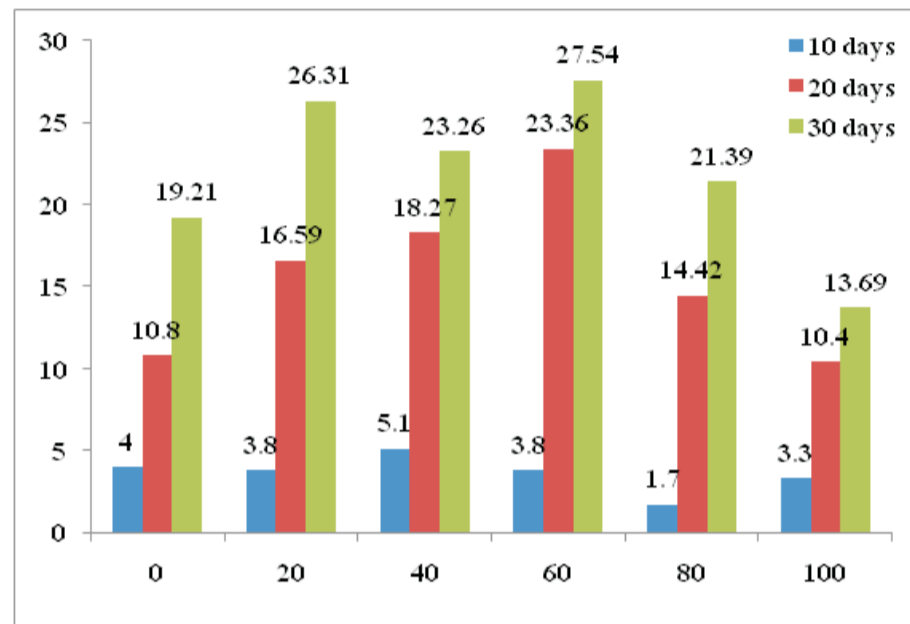


Figure: 3 Effect of vermicompost on shoot length of Gram plant after 10, 20 and 30 DAS

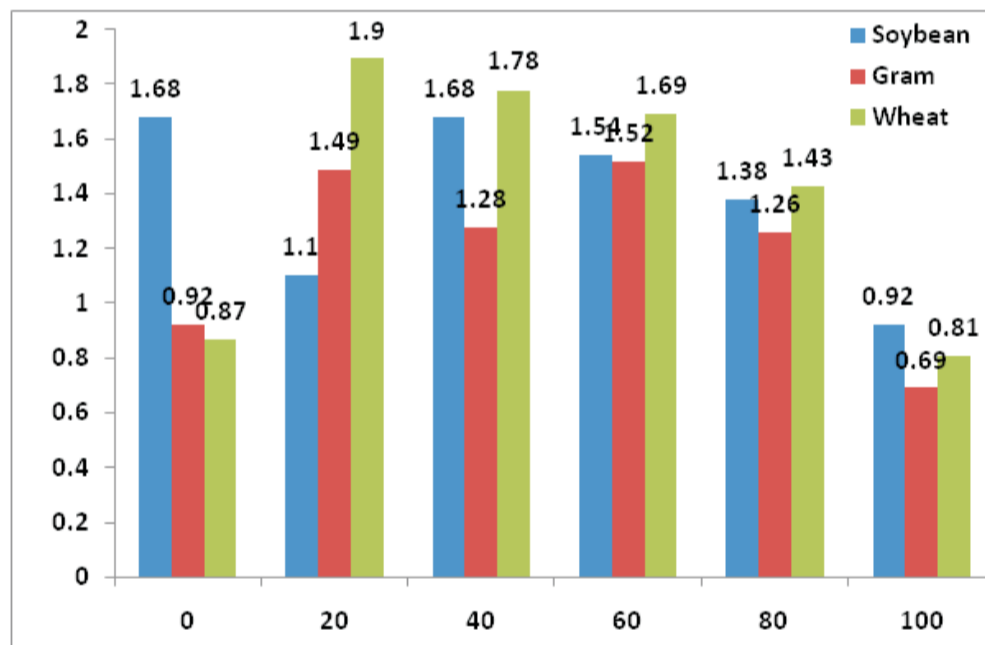


Figure: 4 Effect of different treatment with soil on shoot dry weight of all three plants after 30 DAS

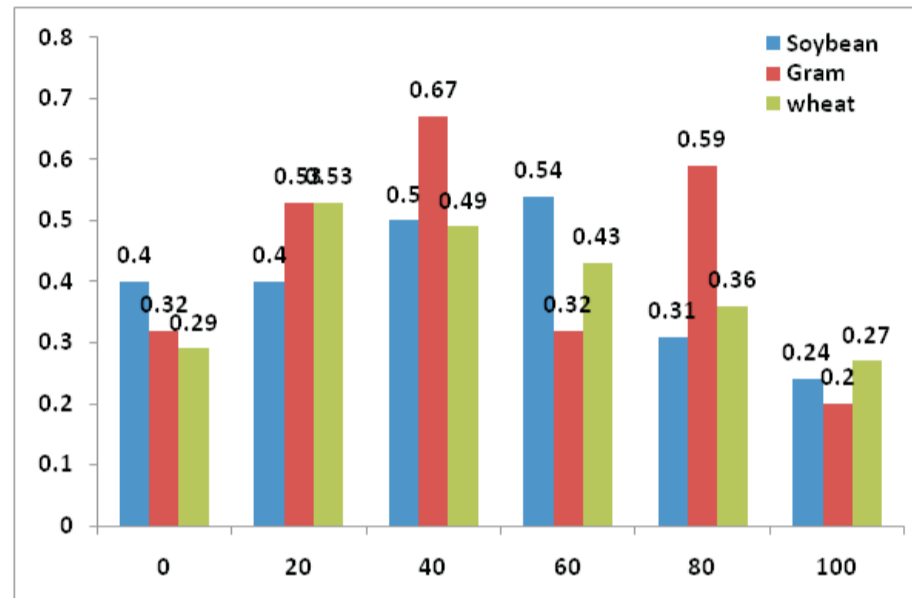


Figure: 5 Effect of different treatment with soil on root dry weight of all three plants after 30 DAS



Photo Plate: 1 Showing growth of plants (Different treatment)



Photo Plate: 2 Showing growth of plants (Different treatment)

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