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The effect of weed plants with vermicompost on seed germination in tomato *(Solanum lycopersicum)*

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Abstract

Weed plants grow very luxuriously in lotic and lentic type of water bodies and land. They have a devastating effect on water and land quality. Nowadays the aquatic and terrestrial weeds are obnoxious to eradicate from natural environment which create pollution. So the present study was carried out to examine "The effect of weed plants with vermicompost on germination in tomato''. Vermicompost was prepared various concentrations from soil, cow dung, and weeds by using earthworms *(Eudrilus eugeniae).* The pot experiment was conducted with six treatments and one control. The treatment treated with terrestrial *(prosophis juliflora, parthenium hysterophorus)* and aquatic (*Eichhornia crassipes, pistia stratiotes)* weed plants, Cow dung. During composting pH, Electrical conductivity, Nitrogen, Phosphorus, Pottasium, Iron, Manganese, Zinc and Copper were estimated in vermicompost as well as in control compost. The NPK values were highly increased in vermicompost with Prosophis *juliflora*. The vermicompost with weed plants enhance the germination power in seeds of tomato. Significant differences were observed in seed grown in the vermicompost with weed plants as compared to seed grown in soil.

Keywords: Vermicompost, *Eudrilus eugeniae*, *Solanum lycopersicum*, weed plants.

INTRODUCTION

Aquatic weeds enhance loss of water from water bodies such as streams, canal etc. through evapotranspiration. Evapotranspiration from the water bodies with is 30-40% more than weed free surface. Aquatic weeds impede the flow of water in irrigation canal**.** In addition to this, aquatic weed causes water pollution. Which adversely affect the growth and survival of other organisms in the water *Eichhornia* crassipes, *pistia stratiotes* are some of the problematic invasive weeds commonly found in India in Kerala. Remediation of contaminated aquatic environment is important as it is for terrestrial environment. Phytoremediation of the toxic Contaminants can be readily achieved by aquatic macrophytes or by other floating plants since the process involves bio sorption and bioaccumulation of the soluble and bioavailable contaminants from water *(Tyagi TR& Agarwal MH. 2014).*

Manyard (1993) & Brayanlance (1991) reported that their moisture content is reduced progressively during vermicomposting giving final moisture content beand Tween 45% and 60% the, ideal moisture for land-applied compost *(Norman et al., 2005).* Most of the waste is either burnt or used for land filling. Vermicomposting is an ecofriendly method to degrade this organic waste. Earthworm species convert this waste into better end product and provide solution to the problem of organic waste degradation. Vermicompost contains plant hormones like Auxin and Gibberelins and enzymes which believed to stimulate plant growth and discourge plant pathogens. It improves the fertility and water holding capacity of the soil. Vermicompost enhances germination, plant growth and thus overall crop yield *(Bhat M.R & Limaye S.R, 2012).* The benefits of vermicomposting in recycling of Organic waste, viz animal wastes *(Anoop Yadav et al., 2013).* Therefore vermicomposts are widely used in organic farming *(Nattudurai .G et al., 2012).*

Vermicomposting fertilizers have already entered domestic and industrial marketing in countries like Canada, USA, Italy and Japan. Vermicomposting was started in Ontario (Canada) in 1970 and is now processing about 75 tons of refuse per week (*Asha Aalok et al., 2008).* Darwin reported the importance of earthworms in the breakdown of organic matter and release of the nutrients that it contains has been known for a long time *(Clive A.Edwards et al).* Tomato is annual plant with a special importance owing to its extensive industrial and edible use *(Hossein Alieladi et al., 2014).* The worms itself becomes an economically valuable products for the farmers to be sold to fishery, poultry, dairy and pharmaceutical industries *(Rajiv K.Sinha,et al.,2009).* Earthworms are often referred to as farmer's friends and polughmente *(Muthukumaravel, et al., 2008).*

In modern agriculture the chemicals and pesticides are being applied in discriminately with desire of getting higher yield which deteriorate the soil fertility as well as crop quality. But in recent years the chemicals fertilizers have produced undesirable effects on the soil *(Gandhi & Sivagama Sundari, 2012).* So the present study was carried out to investigate the effect of vermicompost prepared from different aquatic and terrestrial weeds like (*Eichhornia crassipes),(*

Pistia stratiotes), *(Prosophis juliflora)*,and *(Parthenum hysterophorus)* on seed germination of tomato.

2. MATERIALS AND METHOD

2.1 WEEDS COLLECTION

The aquatic weeds *Eichhornia crassipes*, *Pistia stratiotes* and the terrestrial weeds *Prosophis juliflora*, *Parthenum hysterophorus* were collected from local area and local ponds. The weeds were collected and chopped into small pieces and dried in shadow place. The amount of weeds vegetation was used separately for the preparation of vermicomposting. These materials were maintained 60% moisture condition. Then sufficient amount of water was sprinkled to maintained the moisture conditions. The materials turned up 10 days for accelerate to make Humus conditions. The Humus collected and put into the clay pot for another studies.

2.2 WORMS COLLECTION

African night crawler variety and also epigeic species *Eudrilus eugeniae* was obtained from Periyar Maniyammai College, Vallam. This worms collected in good conditions maintained in a rearing box by feeding Cow dung for further studies.

2.3 EXPERIMENTAL SETUP

Vermicompost were prepared in clay pots [15 inch height & 12 inch - width]. The clay pots filled with sandy soil, followed by dried coconut epicarp up to 1/4th of pots height. The pot maintainted 100% of soil as a control I, and another one was maintainted 100% cow dung pre compost as control II and another one is 50% soil & 50% cowdung pre compost as control III . This all setup maintainted 10 days with 60% moisture condition. Epigeic species *Eudrillus eugeniae* was introduced at 10th day for each pots controls as well as treatments.

Separately the individuals were released to 50 adult in each pots. Each pot were covered with jute gunny sheets and kept under complete shade. Moisture was adjusted to 60% conditions. Moisture of the earthworms feed mixture was maintained between 50%-60% by spraying water regularly. The formation of vermicasting was observed after one week from the date of introducing earthworms. The vermicomposting was completed within 15 days and finally, completely decomposed fine, darken coloured granular materials were obtained.

2.4 SEED INTRODUCTION

The tomato seedlings planted in pots and applied different weed vermicompost as uniform dosage by soil application. The water sprinkled required amount regularly.

2.5 ANALYSIS OF PHYSICO-CHEMICALS AND BIOLOGICAL PROPERTIES

Different sample were collected from each pot from 0-15 cm depth and the precomposts are analyzed. Analyzing the parameters of such as, N, P, K, Fe, Mn, Zn, Cu, pH, Electrical conductivity, calcium carbonate, that was showed on table I.

3. TABLE

TABLE-I

Physical and chemical properties of different precompost

S.NO	PARAMETERS	C-I	C-II	C-III	T1	T2	T3	T4
1.	pH	8.7	7.8	8.2	8.2	8.3	8.4	8.2
2.	Electrical conductivity(dSm^{-1})	0.1	0.5	0.6	0.5	0.5	0.2	0.1
3.	Nitrogen-N	60.2	43.4	56	44.8	49	70	39.2
4.	Phosphorus-P	84.4	130	100.8	136.5	97.5	124	97.5
5.	Potassium-K	200	115	187.5	165	140	170	152.5
6.	Iron-Fe (ppm)	9.1	8.5	7.0	7.1	6.5	8.2	4.9
7.	Manganese-Mn (ppm)	3.7	4.2	3.9	4.0	4.7	5.1	3.5
8.	Zinc-Zn (ppm)	0.7	0.8	0.9	0.7	0.9	2.3	1.1
9.	Copper-Cu (ppm)	0.4	1.0	0.9	0.3	0.7	0.5	0.8

CI = Cow dung Precompost

CII= Soil Precompost

CIII = Soil Precompost + Cowdung Precompost

T1 = Eichhornia Precompost

T2 = Pistia Precompost

T3 = Prosophis Precompost

T4 = Parthinum Precompost

4. FIGURES

Fig.1:Graph showing the Nitrogen level of weed precomposts and controls

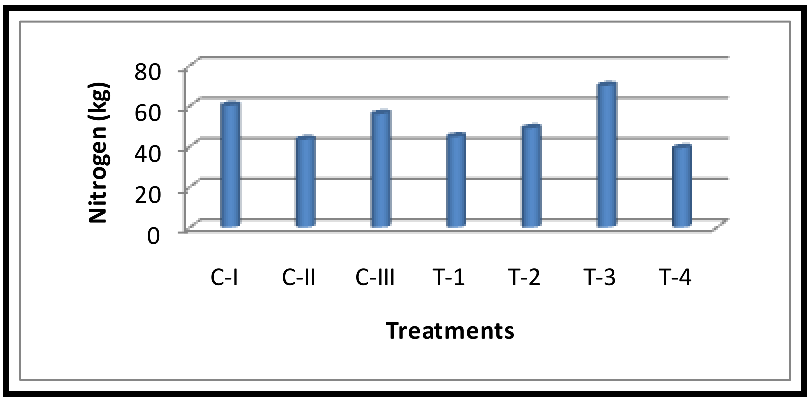


Fig.2:Graph showing the Phosphorus level of weed precomposts and controls

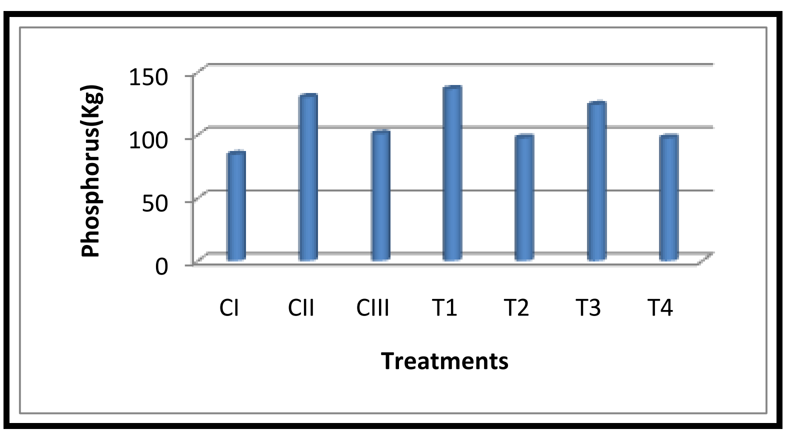


Fig.3:Graph showing the Pottasium level of weed precomposts and controls

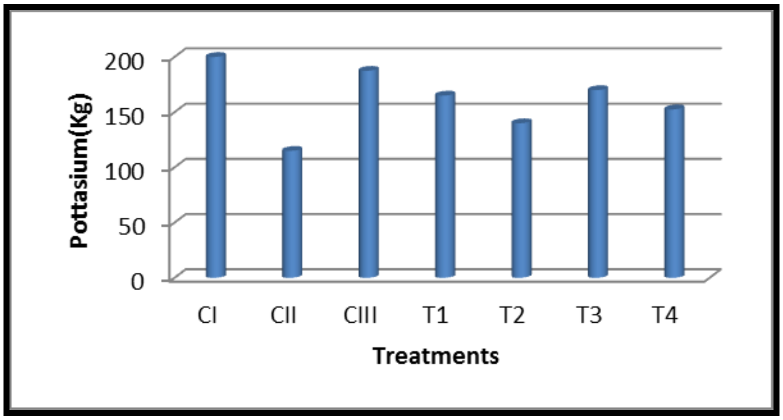


Fig.4:Graph showing the Iron level of weed precomposts and controls

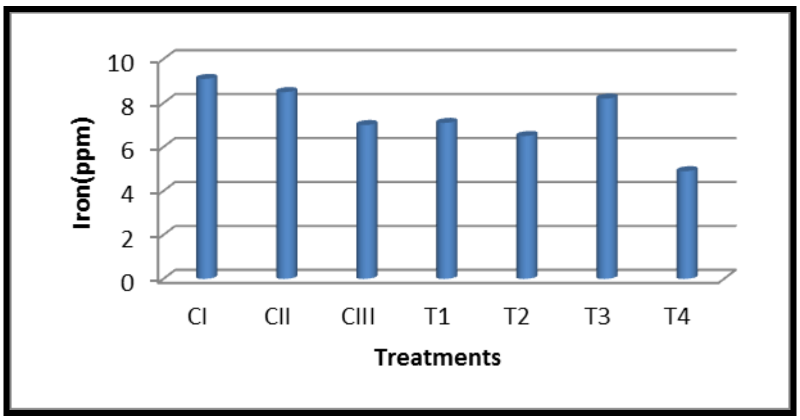


Fig.5:Graph showing the Manganese level of weed precomposts and controls

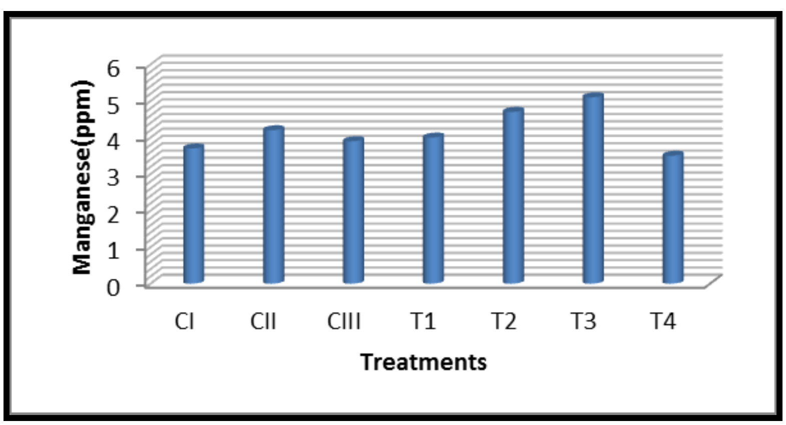


Fig.6:Graph showing the Zinc level of weed precomposts and controls

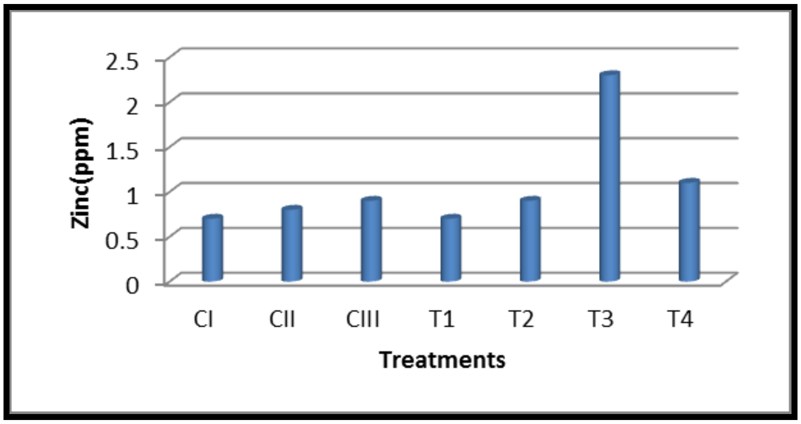


Fig.7:Graph showing the Copper level of weed precomposts and controls

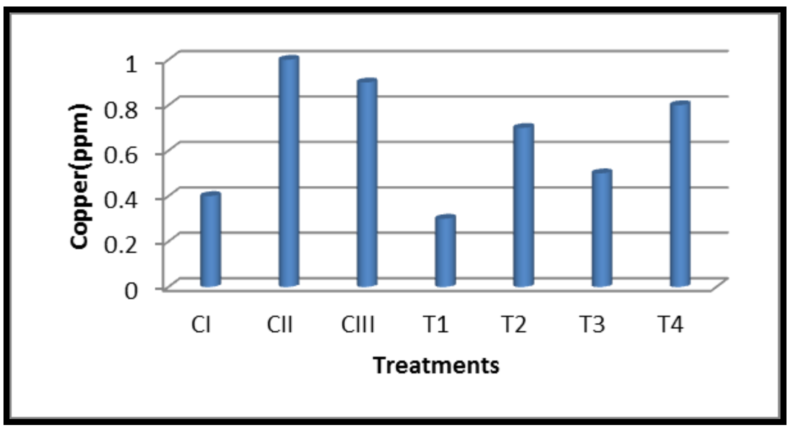


Fig.8:Graph showing the pH level of weed precomposts and controls

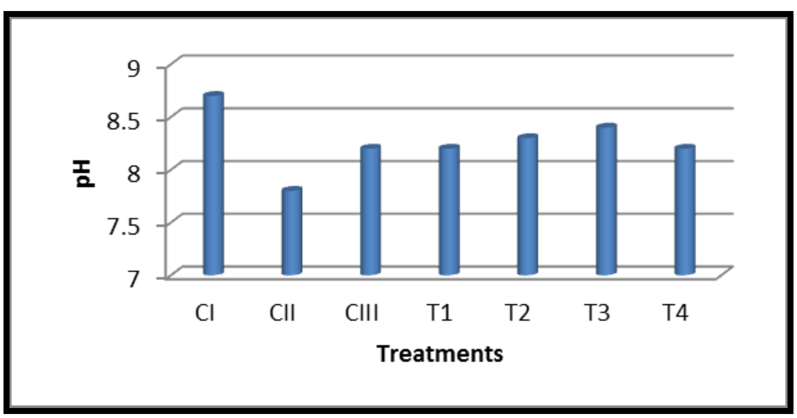


Fig.9:Graph showing the Electrical conductivity level of weed precomposts and controls

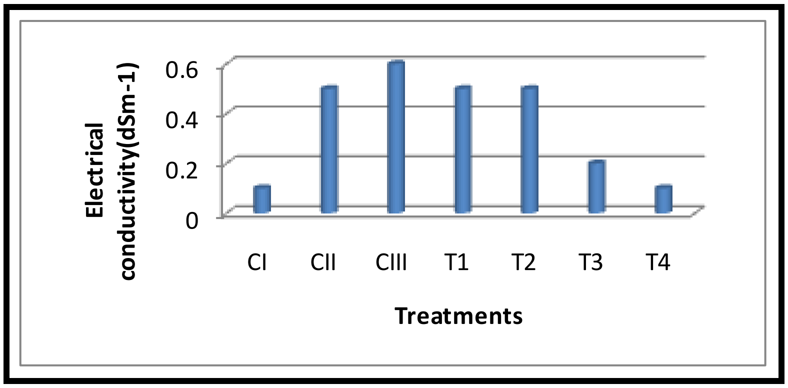
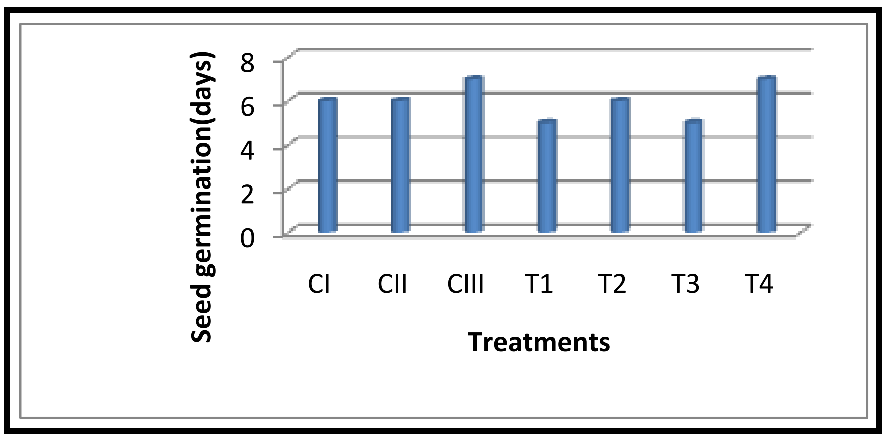


Fig.10: Graph showing the Seed germination level of weed precomposts and controls



5. RESULT

5.1 ANALYSIS OF PHYSICO-CHEMICAL PROPERTIES

A. ANALYSIS OF MACRO NUTRIENTS

`Total Nitrogen (N), Phosphorus (P) and Potassium (K), contents were increased aquatic and terrestrial weeds precompost than controls. Because , terrestrial & aqatic weeds have been most level of macronutrients and micronutrients compared than controls.

NITROGEN

Nitrogen (N) level was high in T3 (Pro.Precompost)=(70/kg), compared than control. but N level was low in T4 (Par.Precompost)= (39.2kg) compared than Control I, II, and III.

PHOSPHORUS

The Phosphorus (P) level was significantly increased in precompost of T1 (E.Precompost)=(136.5/kg) followed T3 (Pro. Precompost)= (124/kg) and compared controls, but P level was low in (CI. Precompost)=(84.4/kg).

POTTASIUM

The K level was increased in (CI.Precompost)=(200/kg), followed other treatments T3 (Pro.Precompost)= (170/kg), and T1 (E. Precompost)= (165/kg) of vermicompost. But low level of K was decreased in T2 (Pis.Precompost) and T4 (Par.Precompost)= (97.5/kg) compared than control.

The total macro nutrients mean values increased in T3 and T1 treatments compared than controls.

B.ANALYSIS OF MICRO NUTRIENTS

IRON

Micronutrient Iron (Fe) level was high in CI (C.Precompost)= (9.1 ppm) compared than other treatments. Fe level was low in T4 (Par.Precompost)= (4.9 ppm).

MANGANESE

Manganese (Mn) level was significantly increased in T3 (Pro.Precompost)= (4.7ppm) and Mn level was low in T4 (Par.Precompost)= (3.5 ppm).

ZINC

Micronutrients Zinc (Zn) was significantly increased in T3 (Pro.Precompost)= (2.3 ppm) compared than controls. But Zn level were very decreased in T1 (E.Precompost)= (0.7 ppm) and C I(C.Precompost)= (0.7 ppm).

COPPER

Copper level was increased in T4 (Par.Precompost)= (10.5ppm) compared than control.

Micro nutrients Iron (Fe), Manganese (Mn), Zinc (Zn), and Copper (Cu) mean values increased in T3(Pro. Precompost) compared than controls.

C.ANALYSIS OF pH & EC

Control I precompost shows high value in pH (8.8) and followed T3 (Pro.Precompost)= pH (8.4). The electrical conductivity was increased in CIII (S+C.precompost)= (0.6/dSm-1) followed other precompost T1 (E.Precompost)=(0.5/dSm-1) ,T2(Pis.Precompost)= (0.5/dSm-1) & CII(S.Precompost)= (0.5/dSm-1).

5.2 SEED GERMINATION

The seed germinated in first T1 and T3 at end of the 5th day. In 6th day T2, CI, and CII seeds are germinated. Last at the end of the week CIII and T4 seeds are germinated.

6. DISCUSSION

The result of physicochemical parameters like pH, Electrical conductivity, Calcium carbonate, Nitrogen, Phosphorus, Pottasium, Iron, Manganese, Zinc, Copper are showed in table I. Low level (7.8) of pH recorded in C II and the high level (8.7) of pH recorded in C I. The amount of Nitrogen and Phosporus is high in treatments than compared to controls. The level of Manganese and Zinc also high in the treatments compared to the controls. The seedlings of tomato quickly germinated in the treatments compared to control. The availability of Micro & Macro nutrients enhance the germination power of the seedling.

So the present investigation clearly reveals that physicochemical properties of weed vermicompost play a major role in the seed germination, and also the conversion of aquatic weed biomass into vermicompost is an effective and ecofriently technology to the vegetable crops germination.

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