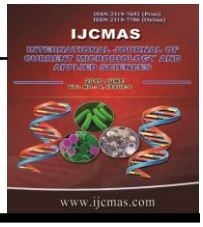
Int.J.Curr.Microbiol.App.Sci (2015) 4(6): 1191-1199

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 4 Number 6 (2015) pp. 1191-1199**
http://www.ijcmas.com



Original Research Article

Impact of vermiculture of *Perionyx ceylanensis* on growth and yield of Green gram (*Vigna radiata*)

R.Gopinathan[1] and M.Prakash[2*]

[1]Resarch and Development Centre, Bharathiar University, Coimbatore, Tamil Nadu, India
[2]Department of Microbiology, Kanchi Shri Krishna College of Arts and Science, Kilambi, Kancheepuram, Tamilnadu, India
**Corresponding author*

Keywords

Vermiculture of *P.ceylanensis*, Green gram, *Vigna radiate*, Pot experiment

A B S T R A C T

Earthworm *Perionyx ceylanensis* and its cast will provide several environmental benefits to the soil and plants by way of producing "chemical free" safe organic food along with protecting flora and fauna. A Pot experiment was conducted to assess the impact of vermiculture of *P.ceylanensis* on growth and yield of Green gram (*Vigna radiate)* with treatments FYM (T1), Vermicompost (T2), Chemical fertilizer (T3), Vermiculture + cattle dung (as feed) (T4) and control (T5) were organized. The experiment was a completely randomized design with 3 replicates. Monitor the plant growth parameter such as shoot length, root length and number root nodules and yield of the plant growth at the interval of 15,30,45,60 and 90 days. Among the Treatments Vermiculture (T4) (*P.ceylanensis*) gives a more impact on growth of Green gram (*Vigna radiate)* than other treatments (T1, T2, T3 and T5).

Introduction

Among the organisms with their living activity in soil, the earthworms are recognized for their important role regarding the improvement of physical and chemical characteristics of soil, and thus increasing its fertility (Aina 1984, Edwards and Bohlen 1996, Abdul Rida and Bouché 1997). One of the agrotechnical events permitted in biological production is the use of products obtained as a result of composting of organic waste with the help of various types of earthworms. (Clive et al. 2006, Gutiérrez-Miceli et al. 2007, Singh et al. 2008).

The Green gram (*Vigna radiata*), alternatively known as mung bean. It is a plant species in the legume family. Green gram is mainly cultivated today in India, China, and Southeast Asia. It is used as an ingredient in both savory and sweet dishes. (Fuller, D. Q.and Harvey, E, 2006). *Perionyx ceylanensis* is a purple red coloured epigeic earthworm, mainly found in biogas slurry, dung pats, composting heaps and decomposing leaf litter heaps. *Perionyx ceyalnensis* is the standard test organism used in terrestrial ecotoxicology, because it can be easily bred on a variety of

organic wastes with short generation times (Prakash, M., and Hemalatha,N.2013.) *Perionyx ceylanensis* is an epigeic earthworm species with a short life cycle, recently explored for its potential in vermicomposting and the effect of vermicompost on plant growth and yield. (Gopinathan.R and Prakash.M, 2013).

Adverse effects of agro-chemicals (like cancer, offspring‟s with neural tube defects and limb anomalies, harm nervous system and Blue baby syndrome) on the health of farmers using them and the society consuming the chemically grown food have now started to become more evident all over the world. Provision of a sustainable environment in the soil by amending with organic inputs can improve the quality and acceptability of crop. Earthworms serve as "nature‟s plowman" and form nature‟s gift to produce good humus, which is the most precious material to fulfill the nutritional needs of crops. (Karmegam, N. and Daniel, T. 2009)

Vermicompost provides all nutrients in readily available form and also enhances uptake of nutrients by plants. The objectives of this research are to determine the growth and yield of Green gram (vigna radiate) as affected by organic manures, chemical fertilizer and vermiculture of *P.ceylanensis.*

Materials and Method

The earthworm, *P. ceylanensis*, originally collected from culture bank of the Department of Biology, Gandhigram Rural University, Tamilnadu was mass multiplied in cow dung and used for the study of vermicompost and vermiculture.

An experiment was laid in Completely Randomized Design to determine the growth and yield of Green gram (*Vigna radiata*) as affected by organic manures and chemical fertilizer and vermiculture.

Treatments Employed were

T1: Farm Yard Manure
T2: Vermicompost
T3: Chemical fertilizer
T4: Vermiculture (*Perionyx ceylanensis*)
T5: Control

The above treatments were replicated thrice in a randomized block design.

The unit plot size was 2.5cm x 2cm. Plants were grown in plots for 12 weeks. Weeding, irrigation, drainage, crop protection and other intercultural operation were done when necessary.

The soil was moistened with water and maintained at 60% of its moisture. The criteria for growth promotion was studied as root, shoot length and other parameters. Data on growth, yield and yield contributing parameters were recorded.

Physiological Observations

Shoot Length

At sampling periods, the seedlings of Green gram (*Vigna radiata*) were plucked out from the plot carefully and washed with tap water to remove the adhering soil.
Shoot length was measured from the base to the tip of the lengthiest shoot.

Root Length

At Sampling Periods; their seedlings of Green gram (*Vigna radiata*) were pulled out from the plot carefully without breakage of roots. Root length was measured from the base to the tip of the lengthiest root.

Number of Nodules

The total numbers of nodules were counted numerically to find out the influence of plant growth promoting bacteria and organics on the root growth.

Yield of Black Gram Plant

The total number of flowers, number of pods and number of seeds present in the each pod were counted numerically to find out the Green gram yield for the influence of microorganisms and organic substrates.

Results and Discussion

The results of various growth and yield parameters are as follows

The results on the Impact of growth parameter of various treatment(T1 to T4) along with an control(T5) in Green gram (*Vigna radiata*) have been presented the data in Table 1 and figure 1a,1b and 1c.

Root Length

All the treatments were significantly increasing their efficiency on the growth of roots. Here, this experiment showed the best performance of T4 (22.5) than T0 as control having 22 cm in 90th day of plant growth.

Shoot Length

This simple experiment was conducted to find out the effect of vermicompost which increased the shoot length over uninoculated control. In this experiment, T4 (39cm) show best performance than T5 as a control (32cm).

Number of Root Nodules

All the treatments were significantly increasing their efficiency on the root nodules of Green gram (*Vigna radiata*) plant. Here, this experiment showed the best performance in T4 compare to control (T5).

Effect of Vermicompost on the Yield of Green Gram (*Vigna Radiata*)

The number of main parameters on the yield of Green gram was significantly influenced by application of vermiculture treatments (Table.2 and Figure 2a, 2b and 2c). The number of flower per plant ranged from 2 to 11. The highest number of pods (18) produced per plant by the application of vermiculture on the 90th day and same was observed in seeds (9) as well as weight of the seeds.

Vermiculture has received considerable attention in recent years internationally for its immense potential in recycling biodegradable waste in popularizing organic farming. Certain species have been identified to be very useful in degradation of organic wastes, viz., *Eisenia fetida, Dendrobaena venata* and *Lumbricus rubellus* from temperate areas and *Eudrillus eugeniae* and *Perionyx excavates* from the tropics (Edwards, 1998).

"Organic fertilizer" produced with earthworm digested organic waste are rich in NKP, micronutrients, beneficial soil microbes- „nitrogen fixing and phosphate solubilizing bacteria" and „actinomycets". They are proving as excellent growth promoter and protector. The changes in physical and biological properties of the parent soil could also be responsible for observed differences which are brought by earthworms. Consistent application of organic fertilizer inputs satisfy the plants demands for growth and yield by enriching the soil. (Sharma.J and Agarwal.S, 2014).

Table1 Effect of Plant Growth Parameters* of Green Gram (*Vigna radiata*)

Treatment	No. of days	Shoot length (cm)	Root length (cm)	No. of Root nodules
T1	**15**	**6.1**	**3.3**	**0**
T2		**7.1**	**4.1**	**0**
T3		**5.7**	**2.9**	**0**
T4		**7.9**	**4.9**	**1**
T5		**5.0**	**2.6**	**0**
T1	**30**	**9.0**	**6.2**	**11**
T2		**13.2**	**8.2**	**14**
T3		**8.7**	**5.9**	**9**
T4		**14.2**	**9.1**	**16**
T5		**8.1**	**5.5**	**8**
T1	**45**	**14.1**	**10.2**	**16**
T2		**20.1**	**11.5**	**19**
T3		**13.6**	**9.9**	**14**
T4		**22.1**	**12.9**	**22**
T5		**13.2**	**9.5**	**13**
T1	**60**	**20.2**	**13.9**	**20**
T2		**26.1**	**15.1**	**23**
T3		**19.1**	**13.1**	**19**
T4		**29.5**	**17.0**	**26**
T5		**18.9**	**12.8**	**17**
T1	**90**	**30.1**	**18.3**	**25**
T2		**37.1**	**20.1**	**28**
T3		**29.2**	**17.6**	**24**
T4		**39.3**	**22.8**	**30**
T5		**28.5**	**16.9**	**20**

T1: Farm Yard Manure, **T2:** Vermicompost , **T3:** Chemical fertilizer , **T4:** Vermiculture (*Perionyx ceylanensis*) , **T5:** Control

*Mean of Three replications

Table.1a Effect of Plant Growth Parameters* of Green Gram (*Vigna radiata*)

Treatment	No. of days	No of Flowers	No of pods Per plant	No of seeds Per pod	Weight of 100 seeds (fresh wt., g)	Weight of 100 seeds (dry wt., g)
T1	**15**	**-**	**-**	**-**	**-**	**-**
T2		**-**	**-**	**-**	**-**	**-**
T3		**-**	**-**	**-**	**-**	**-**
T4		**-**	**-**	**-**	**-**	**-**
T5		**-**	**-**	**-**	**-**	**-**
T1	**30**	**-**	**-**	**-**	**-**	**-**
T2		**-**	**-**	**-**	**-**	**-**
T3		**-**	**-**	**-**	**-**	**-**
T4		**-**	**-**	**-**	**-**	**-**
T5		**-**	**-**	**-**	**-**	**-**
T1	**45**	**2**	**-**	**-**	**-**	**-**
T2		**3**	**-**	**-**	**-**	**-**
T3		**1**	**-**	**-**	**-**	**-**
T4		**4**	**-**	**-**	**-**	**-**
T5		**0**	**-**	**-**	**-**	**-**
T1	**60**	**5**	**4**	**5**	**6.2**	**4.1**
T2		**7**	**6**	**6**	**6.7**	**4.5**
T3		**4**	**3**	**4**	**6.0**	**3.9**
T4		**9**	**8**	**7**	**7.1**	**4.7**
T5		**3**	**2**	**4**	**5.7**	**3.7**
T1	**90**	**9**	**12**	**7**	**7.3**	**5.1**
T2		**10**	**15**	**8**	**7.8**	**5.3**
T3		**8**	**11**	**7**	**7.0**	**4.7**
T4		**11**	**18**	**9**	**8.3**	**5.5**
T5		**7**	**10**	**6**	**6.9**	**4.5**

T1: Farm Yard Manure, **T2:** Vermicompost , **T3:** Chemical fertilizer , **T4:** Vermiculture (*Perionyx ceylanensis*) , **T5:** Control

*Mean of Three replications

Fig.1a Impact on Shoot Length of Green Gram

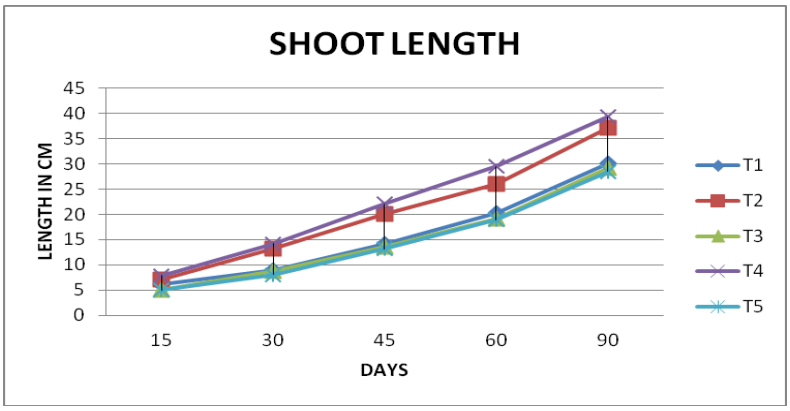


Fig.1b Impact on Root Length of Green Gram

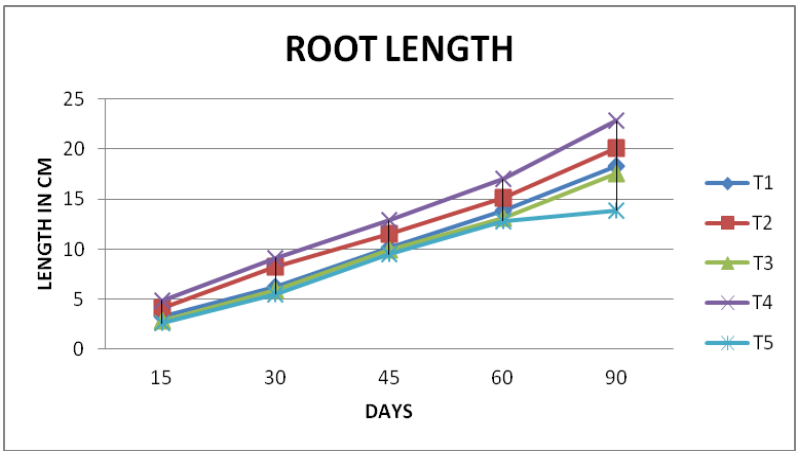


Fig.1c Impact on Number of Root Nodules of Green Gram

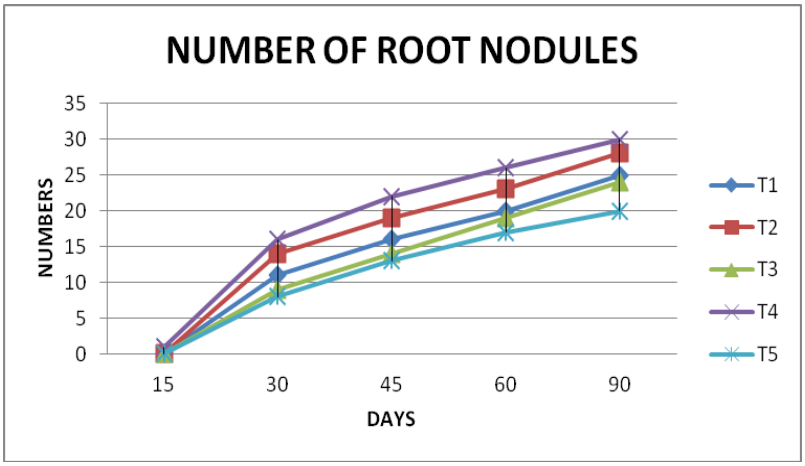


Fig.2a Impact on Number of Flowers of Green Gram

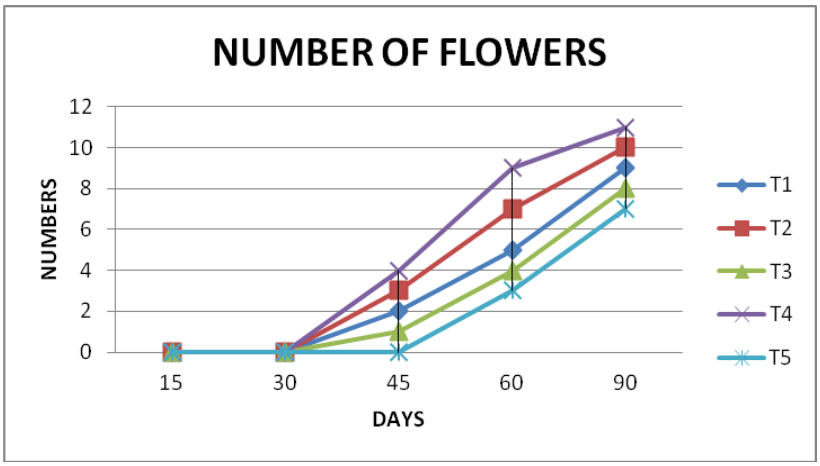


Fig.2b Impact on Number of Pods of Green Gram

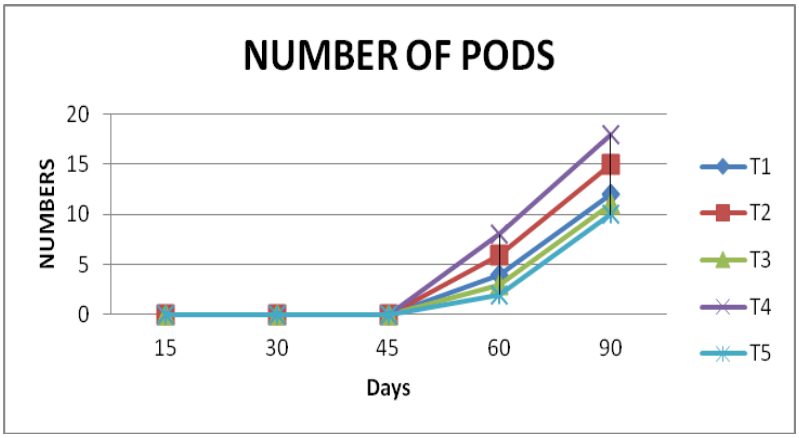


Fig.2c Impact on Number of Seeds of Green Gram

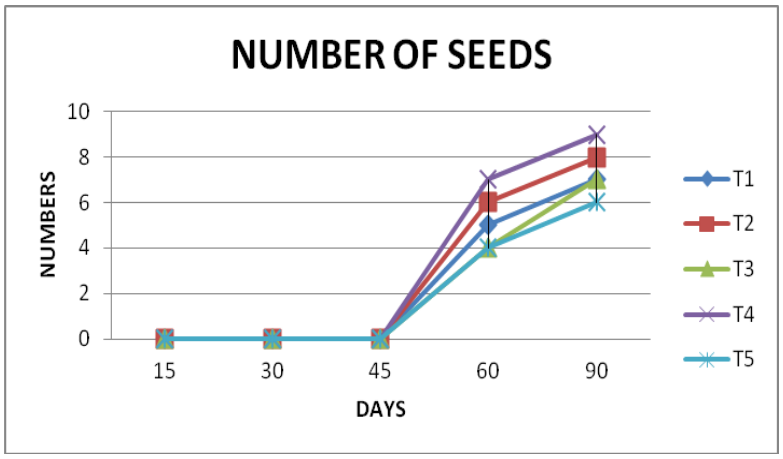
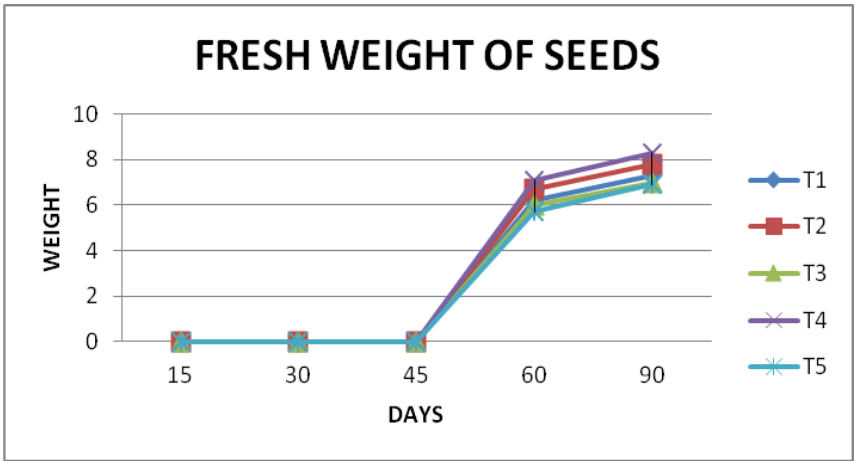


Fig.2d Impact on Number of Fresh Weight of Seeds of Green Gram



All these observation showed that vermiculture can form a increased rate of plant growth, thereby reducing the cost of crop production, improving soil fertility and saving the environment from the ill effects of chemical compounds.(Jadhav AD., 1997). The results clearly indicate that vermiculture by using *P. ceylanensis* can be used in sustainable agricultural practices.

Reference

Abdul Rida A.M., Bouché M.B. (1997): Earthworm toxicology: from acute to chronic tests. Soil Biology and Biochemistry, *29*: 699–703.

Aina P.Q. (1984): Contribution of earthworms to porosity and water infiltration in a tropical soil under forest and long-term cultivation. Pedobiologia, *26:* 131–136.

CliveA., Arancon E., Arancon N., 2006. Mechanisms by which earthworms interact with plant pathogens, plant parasitic nematodes and invertebrate pest arthropods. The 8th Intl. Symp. on Earthworm Ecol., Krakow, Poland, 04-09 September: 237.

Edwards, C.A., 1998. The use of earthworms in the breakdown and management of organic wastes. In: Earthworm Ecology, CRC Press LLC, Boca Raton, FI, pp 327-354.

Fuller, D. Q.; Harvey, E. (2006). "The archaeobotany of Indian Pulses: identification, processing and evidence for cultivation". *Environmental Archaeology* **11** (2): 219–246.

Gopinathan.R and Prakash.M, 2013. Bioconversion of Organic Waste Using Perionyx ceylanensis and enhances performance of microorganisms on Black Gram (Vigna munga L.Heeper) Int.J.Curr.Microbiol.App.Sci (2013) 2 (6) 328-338.

Gopinathan.R and Prakash.M, 2013. Vermistabilization of vegetable waste using *P.Ceylanensis. Int.J.Curr.Res.Aca.Rev.*2013;1(4):121 -128.

Gutierrez-Miceli F., Santiago-Borraz J., Montes MolinaJ., NafateC., Abdu-ArchilaM., OlivaLlaven M., Rincon-Rosales R., Dendooven L., 2007. Vermicompost as a soil supplement to improve growth, yield and fruit quality of tomato (*Lycopersicum*

esculentum). Bioresource Technol. 98(15): 2781-2786

Jadhav AD, Talashilkar SC and Pawar AG. 1997. Influence of the conjunctive use of FYM, vermicompost and urea on growth and nutrient uptake in rice. Journal of Maharashtra Agricultural Universities 22(2):249–250.

Karmegam, N. and Daniel, T. 2009. Investigating efficiency of *Lampito mauritii* (Kinberg) and *Perionyx ceylanensis* Michaelsen for vermicomposting of different types of organic substrates', *Environmentalist*, Vol. 29, pp.287–300

Prakash, M., and Hemalatha, N.2013. Dynamics of Microorganisms during Vermistabilization of organic substrates and enhances performance of Plant Growth Promoting Rhizobacteria on Black Gram. *Int. J. Curr. Microbiol. App. Sci* 2(7):1 71-187.

Sharma.J and Agarwal.S.,2014. Impact of organic fertilizer on Growth, Yield and Quality of Spinach. *Indian Journal of Plant Sciences. Vol. 3 (3) July-September, pp.37-43*

Singh R. SharmaR., Kumar S., GuptaR., Patil R., 2008. Vermicompost substitution influences growth, physiological disorders, fruit yield and quality of strawberry (*Fragaria* × *ananassa* Duch.). Bioresource Technol. 99(17): 8507-8511.