ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 8, Issue, 8, pp. 19025-19028, August, 2017

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

EFFECT OF VERMICOMPOST ON GERMINATION AND GROWTH OF BLACK NIGHTSHADE (*SOLANUM NIGRUM LINN.*) PLANT

Karthiyayini R and Vijayalakshmi A*

Department of Botany, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-641043, Tamilnadu, India

DOI: http://dx.doi.org/10.24327/ijrsr.2017.0808.0614

ARTICLE INFO

Article History:

Received 05th May, 2017
Received in revised form 21st June, 2017
Accepted 06th July, 2017
Published online 28th August, 2017

Key Words:

Vermicompost, *Azospirillum,* Plant growth, Humic substance

ABSTRACT

Green revolution enhanced the quality and increased production of food crops and vegetables by engaging the modern agro technology**.** The present study was aimed to understand the effect of vermicompost on the germination and plant growth of black nightshade (*S. nigrum*). The different treatments significantly influenced the seed germination, seedling growth and number of leaves/ plant. The fresh and dry weight of the *S. nigrum* plant was more in 20 g vermicompost supplemented pots.

INTRODUCTION

India is an agricultural country, majority of the Indians are engaged directly or indirectly on agriculture and agriculture related activities. Agriculture can be defined as the practice of crop and animal production on planned land units. Peoples cannot survive without fruitful agriculture. Early records show that man had been using various kinds of organic waste such as animal and vegetable manures, sewage waste, dung and urine of animals, fowl manures, even dead animal matter, green manure crops, wood ashes, lime, salt etc for enriching the soil. The principal goal of agriculture is the production of high quality, safe and affordable food for ever-increasing worldwide population. Furthermore, agricultural growers and producers have the additional constraints of economic profitability and sustainability.

Nowadays the farmers are using heavy doses of chemical fertilizers and pesticides to get a enhanced yield of various field crops. These chemical fertilizers and pesticides reduce soil fertility and cause health problems to the consumers. Due to hostile effects of chemical fertilizers, interest has been stimulated for the use of organic manures (Follet *et al*., 1981). The green revolution in India promoted the indiscriminate use of chemical fertilizer and pesticides to obtain a better crop yield. In course of time, the tropical soil after receiving such chemicals turned unproductive due to lack of proper amendments of organic matters (Kale, 1995). The best alternative of the present day's environmental desperation is to make proper use of the available unutilized organic biodegradable wastes in order to convert them in to compost within a short period (Edwards, 1998).

Solanum nigrum Linn. (Black nightshade) is a famous medicinal plant and also a leafy vegetable belonging to the family Solanaceae. It is a common, short-lived perennial shrub. The leaf and fruits are used as traditional medicines with high neutraceutical, antiseptic, antidysentric and antidiuretic properties and it also used for the treatment of many skin diseases, kidney disorders non- communicable diseases and many other common ailments (Preeth *et al.,* 2010)

MATERIALS AND METHODS

Collection and Preparation of leaf litter vermicomposting

Leaf litter was collected periodically from the Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore and kept in large plastic containers. The collected leaf litter was sun dried, cut into small pieces of 4 to 5 cm length and kept ready for composting. Compost mixture was prepared in the ratio of 1:1 (w/w) of lead and cow dung (13kg)

Corresponding author:* **Vijayalakshmi A
Department of Botany, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-641043, Tamilnadu, India

in round pot, sprinkled with water to maintain moisture content and was allowed for pre-digestion.

Pre-digestion of consort mixture has been carried out for 21 days with regular mixing and turning of the mixture for pre-decomposition by the microbes. On 21Stday of pre-digestion, the weight of the predigested compost mixture is noted. After 21 days of pre-digestion, 10 kg of predigested mixture was transferred to the mud pot and 100 clitellate adult (45 days old) added to the content. Sample of the epigenic earthworms, *Eudrilus eugeniae* (Kinberg) were obtained from Tamil Nadu Agriculture University, Coimbatore, Tamil Nadu and maintained under laboratory conditions. The acclimatized earthworms were used for periodical vermicomposting of leaf litter collected from the college campus. *Eudrilus eugeniae* (total biomass of 520g) were introduced into each container containing the predigested mixture.

Vermicomposting was allowed for 90 days with regular sprinkling of water to maintain the moisture content (65-70% RH) in the mixture. At the end of 90 days of vermicomposting, the vermicompost from the container were spread separately on a polythene sheet. From the vermicompost adult worms and young ones were handpicked and isolated. The vermicompost thus obtained by composting leaf litter was dried and used for further study.

Biometric Studies

Treatment set ups under pot culture

Pots of 7kg capacity (25cm X 22cm) were individually filled with growth medium containing soil + sand (1:1 ratio) along with supplemented substrate for different treatments. The treatment details are as below

- To- Control (only sand and soil)
- T1- sand + soil + vermicompost(15g)
- T2- sand + soil + vermicompost (20g)
- T3.-sand + soil + vermicompost (15g) + Azospirillum
- T4- sand + soil + vermicompost (15g) + Azatobactor

Seed Sowing and Maintenance of Experimental set up

Fifteen seeds of *S. nigrum* were sown with equal spacing between the seeds at uniform depth of 3cm in each treatment pots individually after moistening the soil and ten replications were maintained. The culture medium in bags were watered regularly twice (in the morning and evening) and kept in sunlight. Care was taken to avoid damage to the treatment set ups.

Seed Germination

The day of sowing was taken as the first day and the treatment set up were observed for germination in the morning every day. The total number of seeds germinated on each day was counted and recorded. In addition the germination percentage and plant height were observed for 30,45 and 60 days old plants.

Germination Percentage

After 30 days of sowing the number of normal seedling germinated were counted and expressed in percentage. The germination percentage was calculated by using the formula outlined by ISTA (1999).

$$\text{Germination percentage} = \frac{\text{No of seeds germinated}}{\text{Total no of seeds sown}} \times 100$$

Length of the plant

At the end of the 30, 45, and 90 days after sowing, the length of plant was measured and the average length was calculated and represented in cm.

Shoot Length

The length of the shoot from the base to the tip of the shoot was measured using the centimeter scale and the mean length was expressed in cm.

Root Length

The root length of the root was measured from the root collar region to the tip of the root using the centimeter scale and mean length was expressed in cm.

Number of Leaves

The plant samples were collected periodically (30, 45 and 60 days) and the number of leaves were counted and recorded.

Determination of fresh weight and dry weight

At the end of the 30, 45, and 90 days after sowing, the fresh weight (FW) and dry weight (DW; determined by oven drying at 70 °C for 24 h) of the plants were noted.

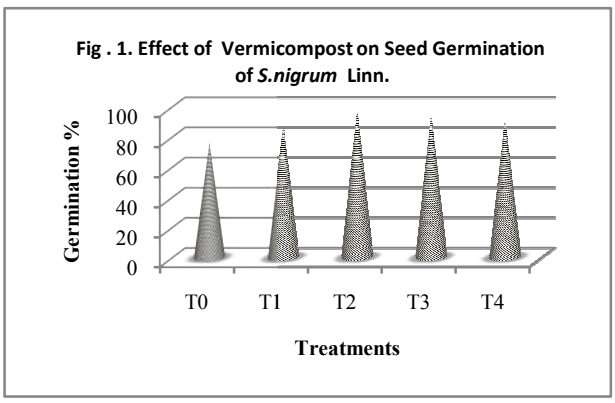
Statistical Analysis

Standard errors of means (of three replicates) were calculated for all the parameters. Data obtained were subjected to one way analysis of variance (ANOVA) in SPSS for windows 16.0.20. Least Significant Differences (LSD) among means were used to test the significance of difference between treatment means at different levels of probability (P≤0.05 and 0.01).

RESULT AND DISCUSSION

Seed Germination

Germination is one of the critical phases in the life cycle of a crop which is subjected to numerous environmental factors (Copper 1979). The natural environment is favored for growth and development of the plant communities. The effect of environment on germination is quite difficult, because the external and internal factors modify the patterns of germination, seedling growth as well as the yield (Rout *et al.*, 2000).

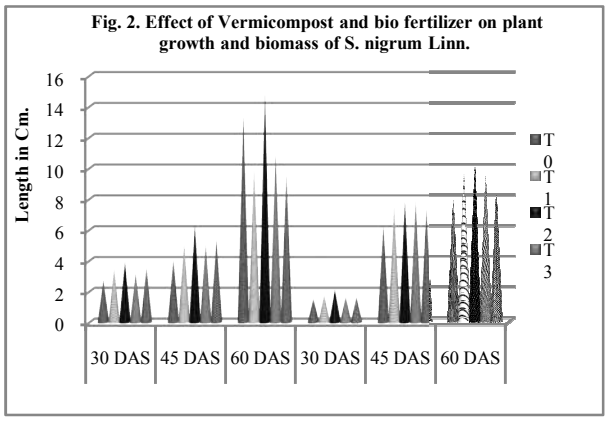


In the present study seed germination percentage have increased in all the treatment when compare to control. The highest seed germination percentage was observed with T2 (sand + soil+ vermicompost (20g)) applied plants (Fig.1).The substitution of vermicomposting in soil has often linked with increasing germination percentage and yield parameters of various crop species even at small substitution rates (Bachman and Metzger 2008). The vermicompost contain humified organic matter, which stimulates seed germination and plant growth (Dell'Amico *et al*., 1994). It is also reported that the growth regulating materials present in the vermicompost could be the possible reason for the increased germination, growth and yield (Atiyeh *et al.,* 2002).

Plant growth

Vermicompost contains most of the micro and macronutrients in easily available forms to the plant and large amount of useful microorganisms, which influence on plant growth and yield (Theunissen *et al.,* 2010)

In present study, the plant growth (root and shoot length) was significantly increased with the application of vermicompost and vermicompost + *Azospirillum*, when compare to control (Fig. 2). Whereas the maximum number of leaves were observed in vermicompost supplemented biofertilizer (*Azospirillum*) treated plants. Arunkumar (2004) had also reported that the substantial increase in the growth parameters like plumule length, leaf number and leaf length of *Amarathus dubius* grown in soil added vermicompost sludge when compared to sludge amended soil. Parr and Colacicco (1987) reported about the solid and liquid vermicompost and its different active substances, which influence the germination and seedling growth of different vegetable crops.



Tomati *et al.,* (1983) observed the significant effects of vermicomposts on growth parameters of *Begonia* species and *Coleus* species, especially in root growth, lengthening of internodes and time of flowering. Similar findingswere absorbed by Arancon *et al*.,(2003) in tomatoes (*L. esculentum*), bell peppers (*Capsicum anuumgrossum*), strawberries (*Fragariaananasa*) and peppers (*Capsicum annuum*) by the application of vermicompost prepared from different wastes (food and paper wastes).

Whereas biomass content (fresh and dry weight) was significantly high in vermicompost 20 g supplemented pots (Table 1). The present findings support earlier reports, that soil enriched with vermicompost has diverse microbial population, which are not found in chemical fertilizers, and nutrient depleted native soils (Kale *et al.,* 1992).

CONCLUSION

Vermicompost have a good source of plant growth promoting substances. A close perusal of the data obtained from the above-mentioned results reveals that the vermicomposting is one of the novel techniques used to get rid of the menace caused by organic wastes and vermicompost along with bio fertilizers have tremendous scope to wrest the present day agriculture out of food and nutrition crisis. Hence, this study confirmed that the usage of vermicompost significantly increases the plant growth.

Acknowledgement

The Authors wish to express their sincere and heartfelt gratitude to Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore for providing funds to carry out this research project.

Table 1 Effect of Vermicomposton Leaf Number and Biomass Contents of *S. nigrum* Linn.on 30, 45 and 60 Days After Sowing.

Treatment	No. of leaf			Fresh weight (mg/g)			Dry weight (mg/g)		
	30	45	60	30	45	60	30	45	60
T0	4.0± 0.0	12.0±2.5	12.0 ± 1.0	1.1 ± 0.1	1.2 ± 0.2	2.4 ± 0.6	0.05 ± 0.08	0.07 ± 0.36	0.10 ± 0.05
T1	4.7± 0.6	12.7± 0.6	15.3 ± 1.5	1.1 ± 0.1	1.4 ± 0.1	1.7 ± 0.6	0.02 ± 0.02	0.08 ± 0.05	0.17 ± 0.03
T2	6.7 ± 0.6	14.7± 0.6	15.7 ± 2.5	1.3 ± 0.1	1.7 ± 0.3	2.8±0.5	0.01±0.00	0.49 ± 0.25	0.49 ± 0.03
T3	7.0 ± 1.0	15.3 ± 0.8	16.5 ± 0.6	1.1 ± 0.1	1.2 ± 0.2	2.7 ± 0.4	0.07 ± 0.10	0.23 ± 0.17	0.16 ± 0.03
T4	6.3 ± 0.6	12.3 ± 0.8	13.0±0.6	1.2 ±0.4	1.4 ± 0.2	2.6 ±0.1	0.01 ±0.00	0.09 ± 0.01	0.16 ± 0.01
SEd	0.5676	1.1785	1.4220	0.1591	0.1500	0.4023	0.0490	0.1510	0.0272
CD(P<0.05)	1.3090	2.7177	3.2793	0.3669	0.3459	0.9277	0.1129	0.3483	0.0627
CD(P<0.01)	1.9047	3.9545	4.7716	0.5339	0.5033	1.3499	0.1643	0.5067	0.0913

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How to cite this article:

Karthiyayini R and Vijayalakshmi A.2017, Effect of Vermicomposton Germination And Growth of Black Nightshade (Solanumnigrum Linn.) Plant. *Int J Recent Sci Res.* 8(8), pp. 19025-19028. DOI: http://dx.doi.org/10.24327/ijrsr.2017.0808.0614

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