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Effect of Vermicomposted Vegetable and Fruit Wastes on the Vegetative and Yield Parameters of Lablab [*Lablab Purpureus* (L.) Sweet]

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ABSTRACT

Background: Organic farming are degradation of organic materials and less use of chemical fertilizers and pesticides. Vermicomposting is the process of introducing earthworm species into the compost. It behaves as eco-friendly manure and gives good health to soil.

Methods: The present study was conducted at Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore over a period of 3 months from March to May 2019. There are 8 treatments namely T_1-T_8 and control. The effect of incorporation of vegetable and fruit wastes biocompost on the vegetative parameters such as shoot length, root length, number of leaves, fresh weight and dry weight on 15, 35, 55 DAS and yield characters *i.e.* number of pods/plants, number of seeds/pods, pod length, weight of the seed, pod fresh weight and dry weight on 75 DAS in Lablab [*Lablab purpureus* (L.) Sweet] were analysed.

Result: The results from study revealed that T_8 treatment showed significant increase in shoot length (113.7, 124.5 and 135 cm), root length (13.2, 18.5 and 27 cm), number of leaves (22, 39 and 48), fresh weight (4.911, 15.693 and 21.244 g) and dry weight (0.652, 2.156 and 3.234 g) on 15, 35, 55 DAS and yield parameters such as number of pods/plants (40), number of seeds/pods (6), pod length (13 cm), weight of the seed (4.060 g), pod fresh weight (7.425 g) and dry weight (1.382 g) on 75 DAS in Lablab over control. The study concluded that T_8 treatment is an effective manure which can be used to enhance plant growth, provide better yield which will be beneficial for farmers.

Key word: *Lablab purpureus* (L.) Sweet, Root length, Shoot length, Vegetable and fruit wastes.

INTRODUCTION

Next to china, India is the largest producer of fruits and vegetables in the world. About 18% of the output is wasted every year. In Tamil Nadu, 61% of the fruits and vegetables are wasted due to lack of proper storage facilities in the state. Organic farming is the degradation of organic matter to produce eco-friendly compost or manure. Organic farming is important since it does not use chemical fertilizers and pesticides in farming. Municipal solid waste is easily available and very useful for soil fertility. Organic waste and the biofertilizers are the alternate sources that meet the nutrient requirement on crops. India produces about 3000 million tons of organic waste which can be degraded and produce eco-friendly manure for sustainable environment (Achsah and Prabha, 2013). Vermicomposting is a cheap low-cost biotechnological process of composting where species of earthworm is introduced to produce a better end product. Vermicompost application promoted the plant growth and also protects the crops from the pest and diseases (Sinha *et al.,* 2010). Chemical fertilizer may apply to increase the yield of the crop for a short duration but it will also affect the soil fertility, soil degradation and deteriorate the environment. Nutrient content of the vermi-compost is much higher. Earthworms are responsible for breaking down of complex substances in the organic waste into simple water-soluble substances (Datar *et al.,* 1997). Vermicomposting is in the same line with the principle of healthy environment because it has the value of resource conservation and sustainable practices, as a process for handling organic residue which is an alternative approach in waste management, which is not dumped or incinerated but recycled (Aalok *et al.,* 2008). Vermicompost improves soil structure, soil moisture holding capacity, vegetative growth and enhance crop yield. Lablab [*Lablab purpureus* (L.) Sweet], Var. Co. (Gb) 14 is a bushy, or climbing and branching, herbaceous, annual plant. It is commonly known as hyacinth bean and belongs to a family Fabaceae. Lablab is an ancient crop and has been documented by the archaeobotanical finder in India before 1500 BC (Fuller, 2003). Lablab is the third most important vegetables in the

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central and western part of Bangladesh after eggplant (*Solanum melongena*) and taro (*Colocasia spp.*) and is reported to have a total production area of approximately 48,000 ha (Rashid *et al.,* 2006). It produces a twining stem that can be 6 - 9 meters long. The plant is best known for its edible seed. The present study is carried out to analyse the effect of vegetable and fruit wastes as manure on the biometric characters such as root length, shoot length, number of leaves, fresh weight and dry weight in leaves and yield parameters in seeds of Lablab.

MATERIALS AND METHODS

Composting is the biodegradation of organic matter to produce a better manure. Vermicomposting is the introduction of earthworm species into the compost and incorporated into the soil to increase the yield of plant. Vermicomposting was carried out during winter season (November-January). The pot culture study was conducted during March to May 2019 at Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu.

Collection of waste

The vegetable waste is collected from in and around Saibaba Colony, Coimbatore, Tamil Nadu. The fruits waste is collected from outside and inside the campus fruit stall of Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore (11.0196°N, 76.9504° E) in large quantity. It is cut into small pieces, sun dried and stored in polythene bag.

Collection of seed

The seeds of Lablab [*Lablab purpureus* (L.) Sweet] were obtained from Tamil Nadu Agriculture University, Coimbatore, Tamil Nadu. Seeds were selected for pot culture studies with three replications in each treatment.

The experimental treatment

A pot culture experiment, filled with 7 kg of sandy loam clay soil was carried out. Around 10 seeds were sown and 5 healthy plants were maintained in pot for the study. Three replications were maintained. The treatments given were

C - Control

T_1- Vegetable Wastes + cow dung + *Eudrilus eugeniae* (5 t ha).

T_2- Vegetable Wastes + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha).

T_3- Vegetable Wastes + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

T_4- Vegetable Wastes + cow dung + *P. eous* + *T. asperelloides* + *Eudrilus eugeniae* (5 t/ha).

T_5- Fruit Wastes + cow dung + *Eudrilus eugeniae* (5 t/ha).

T_6- Fruit Wastes + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha).

T_7- Fruit Wastes + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

T_8- Fruit Wastes + cow dung + *P. eous* + *T. asperelloides* + *Eudrilus eugeniae* (5 t/ha).

Vegetative parameters

The plant was uprooted on 15, 35 and 55 day after sowing (DAS) to evaluate its vegetative parameters such as root length, shoot length, number of leaves, fresh weight and dry weight in leaves of Lablab plant.

Yield parameters

The yield parameters such as number of pods/plants, number of seeds/pods, pod length, weight of the seed, pod fresh weight and dry weight were analyzed on 75 day after sowing (DAS).

Statistical analysis

The data collected on vegetative parameters in leaves on 15, 35 and 55 day after sowing (DAS) and yield parameters in seeds on 75 day after sowing (DAS) were analysed using one way and two-way ANOVA.

RESULTS AND DISCUSSION

Vegetative parameters

The results of the present study predicted the effect of composts by different treatments on vegetative parameters of Lablab [*Lablab purpureus* (L) Sweet]. The results as showed in Fig 1 and 2, a highest shoot length was observed in T_8 treatment (113.7, 124.5 and 135 cm) which is followed by T_4 treatment (86.8, 98 and 109 cm) and control (41.2, 63.5 and 76.5 cm) on 15, 35 and 55 day after sowing (DAS). A significant increase in root length was observed in T_8 treatment (13.2, 19.3 and 27 cm) when compared to T_4 treatment (10, 18.5 and 23.5 cm) and control (5.7, 6.3 and 7 cm) on 15, 35 and 55 Day After Sowing (DAS). Maximum number of leaves was observed in T_8 treatment (22, 39 and 48) which is followed by T_4 treatment (21, 35 and 44) and control on 15, 35 and 55 day after sowing (DAS). The fresh weight of the plant was observed highest in T_8 treatment (4.911, 15.693 and 21.244 g) which is followed by T_4 treatment (4.044, 8.523 and 13.048 g) and control. Similar results were also observed in dry weight, significant increase in T_8 treatment (0.652, 2.156 and 3.234 g) when compared to T_4 (0.554, 1.526 and 2.309 g) treatment and control (0.124, 0.260 and 0.375 g) on 15, 35 and 55 day after sowing (DAS).

The present investigation agrees with the previous work on *Cyamopsis tetragonoloba* where application of vermicompost increases the shoot length (Pavithra and Lakshmi Prabha, 2014). The result is in par with Joshi *et al*. (2016) who observed significantly higher plant height recorded at 60 DAS (59.37 cm) and at harvest (62.00 cm) of the crop with the application of treatment RDF (20- 40-0 kg NPK ha^{-1}) compared to treatment (Control).

The present study was also in agreement with the results in peanut where an increase in plant height (16.83) with the application of soil + 100% compost peanut shells was observed (Omidi *et al.,* 2017). The maximum shoot length and root length was observed in treatments S4-vermicompost of *Phumdi* (Dey *et al.,* 2019). A significant increase in shoot length and root length was observed in T_4

treatment- Fruit Waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5t/ha) when compared to Control (plain soil) on 15, 35 and 55 DAS in black gram (Pinky Raihing and Vijayalakshmi, 2020).

The previous study reported that maximum number of leaves was obtained 6.43 for pig compost, 7.25 for chicken compost, over control 6.23 (Coulibaly *et al.,* 2019). The number of leaves recorded was far higher in Ecodrum compost treatment (13.66) amended pot media as against other treatments and control (8.66) in Chinese kale which also coincides the results of our study (Al-Sabbagh *et al.,* 2020). Similar results were found in Nasar *et al*. (2019).

The experimental results were also on par with findings that the application of municipal waste compost (20 t/ha) significantly enhanced the fresh weight (shoots-195.2gm, roots-62.3gm) and dry weight (shoots-51.2gm, roots-13.5gm) of tomato crop (Mehdizadeh *et al.,* 2013) and the fresh weight and dry weight of radish which was maximum in S_M(Soil Medium) (50% of compost) 8.14 gm, 0.78 gm which is followed by S_H (Soil High) (100% of compost) 7.91 gm, 0.73 gm and S (control) 4.87 gm and 0.41 gm (Afriyie and Amoabeng, 2017).

Yield parameters

As shown in Table 1, maximum number of pods/plants was observed in T_8 (40) treatment, followed by T_4 (35) when compared to control (16). The pod length and number of seeds/pods are significantly increased in T_8 (13 cm and 6) treatment followed by T_4 (12.30 cm and 5.20) treatment. The fresh and dry weight content of the pods observed maximum in T_8 treatment (7.425 and 1.382 g) which is followed by T_4 treatment (7.003 and 1.122 g) and control (4.408 and 0.530 g). The weight of the seed showed maximum in T_8 (4.060 g) followed by T_4 (2.813 g) treatment as compared to the other treatments and control (1.771 g) on 75 DAS.

A significant increase in number of pods per plant (11.33 to 16.67), length of pod (4.50 cm to 6.53 cm), single pod weight (0.23 gm to 0.45 gm) and number of seeds per pod (8.00 to 10.00) with the application of Water Hyacinth- Green Manure (200mg) from 50 to 70 DAS over the control in green gram was observed (Padmaja and Jessy Paulose, 2011).

The present study coincides with the result of Yagoub *et al.,* 2012 in *Glycine max* L. which showed an increase in number of pod / plants, number of seeds/pods in compost treatment.

The results is in par with Kumarimanimuthu and Kalaimathi (2020). The present results also coincide with the previous findings that integration of NPK (50%) + FYM (50%) +biofertilizers had significant positive impact on yield per plant (1149 g) and total yield (11.05 t ha^{-1}) of king chilli

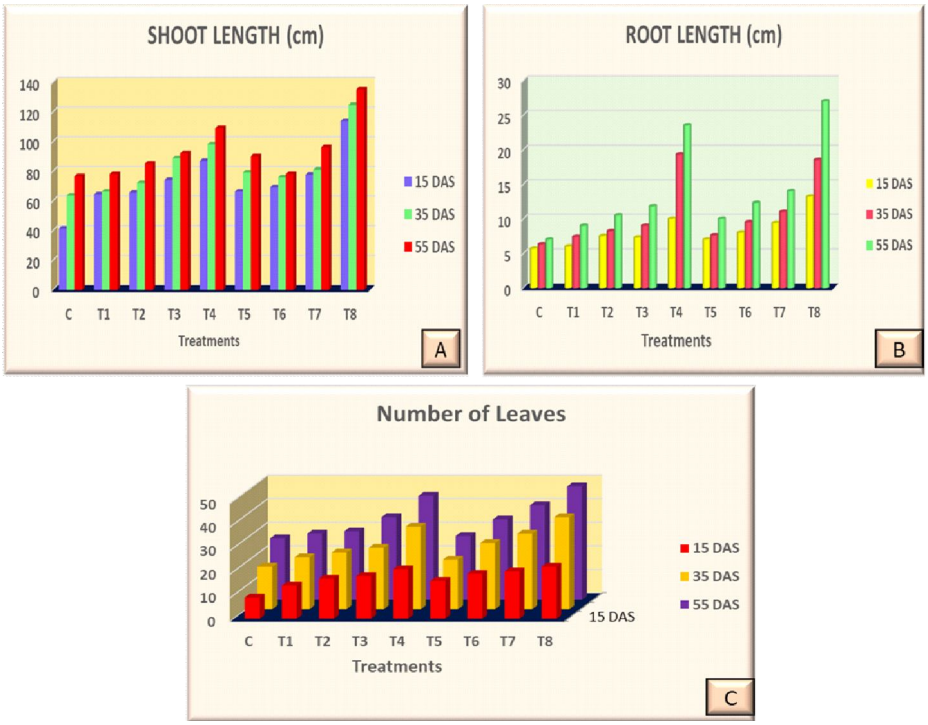
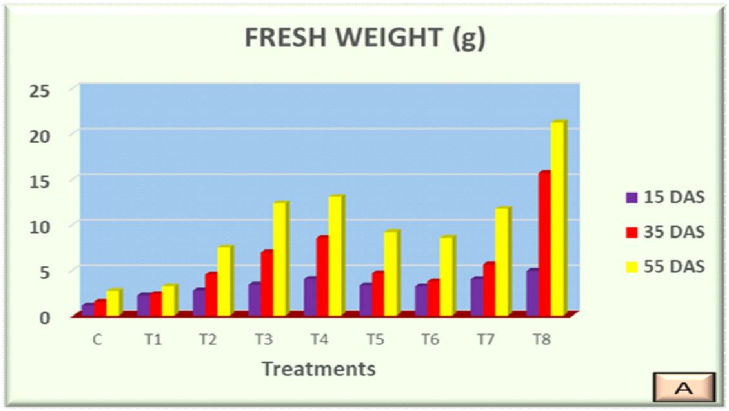


Fig 1: Effect of Composted Vegetable and fruit wastes on vegetative parameters of Lablab: A) Shoot length B) Root length C) Number of leaves.

C- Control, T_1- Vegetable Wastes + cow dung + *Eudrilus eugeniae* (5 t/ha), T_2- Vegetable Wastes + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha), T_3- Vegetable Wastes + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha), T_4- Vegetable Wastes + cow dung + *P. eous* + *T. asperelloides* + *Eudrilus eugeniae* (5 t/ha), T_5- Fruit Wastes + cow dung + *Eudrilus eugeniae* (5 t/ha), T_6- Fruit Wastes + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha), T_7- Fruit Wastes + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha), T_8- Fruit Wastes + cow dung + *P. eous* + *T. asperelloides* + *Eudrilus eugeniae* (5 t/ha)



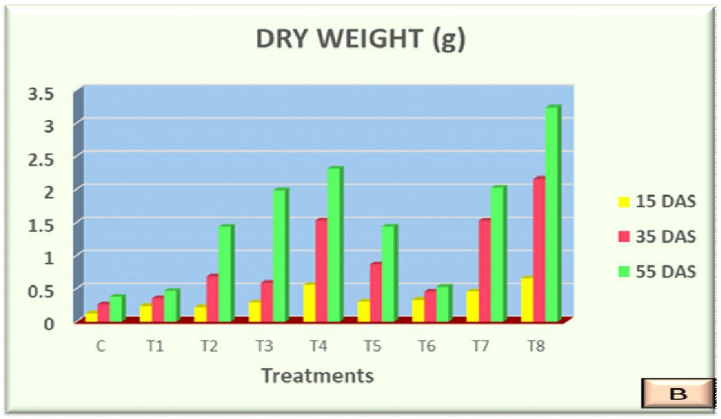


Fig 2: Effect of Composted Vegetable and fruit wastes on vegetative parameters of Lablab: A) Fresh weight (g) B) Dry weight (g). C- Control, T_1- Vegetable wastes + cow dung + *Eudrilus eugeniae* (5 t/ha), T_2- Vegetable wastes + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha), T_3- Vegetable wastes + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha), T_4- Vegetable wastes + cow dung + *P. eous* + *T. asperelloides* + *Eudrilus eugeniae* (5 t/ha), T_5- Fruit Wastes + cow dung + *Eudrilus eugeniae* (5 t/ha), T_6- Fruit Wastes + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha), T_7- Fruit Wastes + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha), T_8- Fruit Wastes + cow dung + *P. eous* + *T. asperelloides* + *Eudrilus eugeniae* (5 t/ha).

Table 1: Effect of Composted Vegetable and fruit wastes on yield parameters of Lablab.

Treatments	Number of pods/plants	No. of seeds/pod	Pod length (cm)	Weight of seed (g)	Pod fresh weight (g)	Pod dry weight(g)
C	16	3	9.00	1.771	4.408	0.530
T_1	20	3	9.30	1.993	4.740	0.800
T_2	23	4	10.40	2.172	6.220	0.886
T_3	26	4	11.10	2.150	5.911	0.980
T_4	35	5	12.30	2.813	7.003	1.122
T_5	24	4	11.30	2.065	5.962	0.865
T_6	32	4	11.60	2.089	6.233	1.070
T_7	30	5	10.50	2.769	6.298	0.946
T_8	40	6	13.00	4.060	7.425	1.382
SEd	1.5870	0.9463	1.2511	0.1451	0.6722	0.1099
CD (P<0.05)	(3.3342)	(1.9882)	(2.6284)	(0.3049)	(1.4123)	(0.2309)

C- Control, T_1- Vegetable wastes + cow dung + *Eudrilus eugeniae* (5 t/ha), T_2- Vegetable Wastes + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha), T_3- Vegetable wastes + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha), T_4- Vegetable Wastes + cow dung + *P. eous* + *T. asperelloides* + *Eudrilus eugeniae* (5t/ha), T_5- Fruit wastes + cow dung + *Eudrilus eugeniae* (5 t/ha), T_6- Fruit Wastes + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5t/ha), T_7- Fruit wastes + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha), T_8- Fruit wastes + cow dung + *P. eous* + *T. asperelloides* + *Eudrilus eugeniae* (5 t/ha).

(Vimera *et al.,* 2012) and in pigeon pea where an increase in weight of pod, number of pods/plants (243 g and 400 g) were noted when poultry manure was used (Birajdar *et al.,* 2018). Similar results were observed by Silpa and Vijayalakshmi (2021).

CONCLUSION

The vermicompost of vegetable and fruit wastes can be used as manure which is eco-friendly and sustainable to environment. The manure produced from the wastes are cost effective and eco-friendly. The study concluded that T_8 treatment showed the maximum increase in vegetative and yield parameters of Lablab. The present study is to propose the possibilities of using the municipal solid waste like vegetable and fruit wastes as manure to enhance the crop productivity which will help the farmers.

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