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Impact of Cocoa Shell and Jack Fruit Peel Waste Biocompost Influence on the Growth and Yield Attributes of *Vigna unguiculata* subsp. *sesquipedalis* (L.)

M. Silpa, A. Vijayalakshmi

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ABSTRACT

Background: The present work was to evaluate biocomposted cocoa shell and jack fruit peel wastes and their effect on the vegetative development and yield parameters of *Vigna unguiculata* subsp. *sesquipedalis* L. Var. NS-620 (Cowpea).

Methods: The experiments were conducted in the Department of Botany, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu, during 2019.The experiments consists of various treatments of biocompost. Different growth stages of the plant sample were analysed for root length, shoot length, number of leaves, number of nodules, number of flowers, plant fresh weight and dry weight on 25, 50 and 75 DAS. The yield parameters of cowpea such as number of pods per plant, length of pod, number of seeds per pod, weight of seeds per pods, pod fresh and dry weight were analysed on 90 DAS.

Result: The experimental result showed that T_8 (Raw Jack fruit peel+10 g *Pleurotus eous*+10 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}) and T_4 (Raw Cocoa shell+10 g *Pleurotus eous*+10 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}) treatment significantly increased the vegetative growth in root length, shoot length, number of leaves/plant, number of nodules, fresh weight and dry weight on 25 to 75 DAS and number of flowers on 45 DAS. Maximum increase in the yield parameters was observed in number of pods/plant, length of pod, number of seeds/pod, weight of seed/pod, fresh weight and dry weight of pod in *Vigna unguiculata* subsp. *sesquipedalis* L. as compared to other treatments and control. The main objective of the study was to develop high yielding and healthy vegetable crops with the help of biocomposted agroindustrial waste without damaging the environment.

Key words: Cocoa shell, *Eudrilus eugeniae,* Jack fruit peel, *Pleurotus eous, Pleurotus florida*, *Vigna unguiculata* subsp. *sesquipedalis* L.

INTRODUCTION

A large amount of agroindstrial waste and related effluents are produced every year through the food processing industries like juice, chips, meat, confectionary, chocolate, fruit industries *etc*. These organic residues can be utilized for different energy sources. We know that population increases continuously so the requirement of food and their uses will also increase. In most countries, many industries of food and beverage have increased remarkably to fulfil the need for food (Sadh *et al.* 2018). The agro-climate of India is very diverse, encouraging the cultivation of numerous crops, including fruit trees, vegetables, ornamental plants, root tubers, medicinal herbs, aromatic plants, spices and plantation crops. India is the world's second-largest producer of fruits and vegetables. It is well-known that huge quantities of lingo-cellulosic biomass are produced every year during cultivation, harvesting, processing and consumption of agricultural products (Pranav *et al*. 2017). Approximately 20% of the production of fruits and vegetables in India is going to waste every year because in India a large amount of apple, cotton, soya bean and wheat, *etc*. are produced. So as the production increased in the country, it also increased the percentage of waste produced from them. These wastes are left and untreated which caused adverse effect on environment as well as human and animal health but the composition of these wastes contains a large number of organic compounds (Rudra *et al.* 2015).

Department of Botany, School of Biosciences, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-641 043, Tamil Nadu, India.

Corresponding Author: M. Silpa, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-641 043, Tamil Nadu, India. Email: silpasvp@gmail.com

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Chemical fertilizers are directly enhancing crop yield because plants directly or indirectly assimilate the nutrients provided by these inorganic fertilizers. The production and use of these fertilizers impart various negative effects on the agricultural ecosystem such as loss of crop genetic diversity, degradation of the soil, reduction in soil microbial diversity, contamination of ground-water resources and pollution of the entire atmosphere. Generally, land degradation directly affects the type of plant grown in the area (Folberth *et al*. 2014). Fertilizer consumption increased exponentially throughout the world, causes serious environmental problems. Fertilization may affect the accumulation of heavy metals in soil and plant system.

Plants absorb the fertilizers through the soil, they can enter the food chain (Savci 2012; Kumar *et al*., 2019).

Application of biocomposted cocoa shell and jackfruit peel improves the availability of macro and micronutrients. This investigation will provide not only an alternate solution for the disposal of agroindustrial waste which also minimizes the application of inorganic fertilizers to vegetable crops and encourage small-scale producers and organic farming.

Cocoa (*Theobroma cacao* L.) is mostly grown as an intercrop in coconut and areca nut gardens in India. Commercial cultivation of cocoa started in India in 1970. At present, cocoa is grown in four major states Kerala, Karnataka, Andhra Pradesh and Tamil Nadu (Praveena *et al*. 2018). Cocoa shells are one of the by-products of cocoa beans obtained in the chocolate industry. These by-products are usually considered as waste and left to rot on the cocoa plantation (Christos *et al*. 2019). Jackfruit (*Artocarpus heterophyllus*) is the popular fruit in India. It belongs to the family Moraceae, bear fruits which consist of fleshy edible bulb. Its peel is not edible, no commercial use and adds up to the world's agricultural waste (Delos Reyes, 2018). Agroindustrial waste of cocoa shells and jackfruit peel is mostly considered as underutilized waste substances which are usually dumped on open roadsides. These residues create a potential threat to the environment and loss of nutrients in soil could be avoided by recycling the agrowaste through biocomposting. Legumes are one of the important segments of Indian agriculture after cereals and oilseeds. Pulses are not only improving soil health by enriching nitrogen status but also enhance the sustainability of the cropping system. It can fix atmospheric nitrogen with the help of nodules. The nodules are the house of the microscopic rhizobium that converts atmospheric nitrogen to nitrate and ammonia that can be used by plants (Oldroyd *et al*. 2011; Yuvaraj *et al*. 2020; Singh and Chahal, 2020).

The study was to evaluate the influence of biocomposted cocoa shell and jack fruit peel on the vegetative growth and yield performance of *Vigna unguiculata* subsp. *sesquipedalis* L. (cowpea). It belongs to the family *leguminosae* and one of the most popular cosmopolitan vegetable crops grown in Kerala. The traditional vernaculars *viz.* 'Achingapayar', 'Kurutholapayar', 'Vallipayar', 'Pathinettumaniyan', 'Asparagus bean', 'Chinese long bean', *etc*., used to refer to yard-long bean indicate that Kerala is the land of this crop. It is a rich and inexpensive source of vegetable protein. It enriches soil fertility by fixing atmospheric nitrogen. Because of its quick growth habit it has become an essential component of sustainable agriculture in marginal lands of the tropics (Litty Varghese *et al.* 2015).

MATERIALS AND METHODS

Agroindurstiral wastes of cocoa shell and jack fruit peel waste studies were done from March to May 2019 and pot culture experiments of *Vigna unguiculata* subsp. *sesquipedalis* L. (Cowpea) during August to October 2019 at Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu, India.

Collection of agroindustrial wastes

The cocoa shell and jack fruit peel waste were collected in large amounts from Calicut and the Wayanad district of Kerala. The collected wastes were smashed into small pieces. It was sun-dried and stored in gunny bags.

Preparation of biocompost

The composting processes consist of 4 square feet wide and 1-metre depth of eight pits. *Pleurotus eous* and *Pleurotus florida* spawns are used for the easy decomposition of raw cocoa shell and jack fruit peel waste. After 30 days the vermicomposting process was also adopted.

The following treatments are used for each pit.

Treatments	Biocompost combinations
C	Control, (No manure).
T_1	Biocompost 1 (Raw cocoa shell + *Eudrilus eugeniae* 5 t/ha^{-1}).
T_2	Biocompost 2 (Raw cocoa shell + 20 g *Pleurotus eous*+*Eudrilus eugeniae* 5 t/ha^{-1}).
T_3	Biocompost 3 (Raw cocoa shell+ 20 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}).
T_4	Biocompost 4 (Raw cocoa shell+10 g *Pleurotus eous*+10 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}).
T_5	Biocompost 5 (Raw Jack fruit peel+ *Eudrilus eugeniae* 5 t/ha^{-1}).
T_6	Biocompost 6 (Raw Jack fruit peel + 20 g *Pleurotus eous*+*Eudrilus eugeniae* 5 t/ha^{-1}).
T_7	Biocompost 7 (Raw Jack fruit peel + 20 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}).
T_8	Biocompost 8 (Raw Jack fruit peel +10 g *Pleurotus eous*+10 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}).

Preparation of vermicomposting trays

After 30 days pre-digested cocoa shells and Jack fruit peels were treated with fifteen exotic earthworms (*Eudrilus eugeniae*). Water was sprayed regularly to maintain the moisture content of each tray. These vermicomposting trays were kept undisturbed for 60 days. After the 90th day, biocomposted samples were taken and sieved.

Pot culture experiments and application of treatments

Twenty-seven pots were filled with 5 kg of red sandy loam soil. Eight biocompost treatments were applied to the respective pots and mixed thoroughly. Control was maintained. Seeds of *Vigna unguiculata* subsp. *sesquipedalis* L. (Var. NS-620). were collected from private seed centre Calicut. Viable cowpea seeds were selected and five seeds were sown in each pot with three replications. After germination three healthy plants were maintained in each pot.

Vegetative parameters

On the 25, 50 and 75 DAS *Vigna unguiculata* subsp. *sesquipedalis* L. plants were uprooted from the pot and the following vegetative characters were noted such as root length (cm), shoot length (cm), number of leaves, number of nodules, number of flowers/plant, plant fresh weight (gm) and plant dry weight (gm).

Yield parameters

On the 90th day, the plants were uprooted from the respective pots and the following yield parameters were observed. Number of pods/plant, length of pod (cm), number of seeds/ pod, weight of seeds/pods, Pod fresh weight (gm) and pod dry weight (gm).

Statistical analysis

The experimental data obtained on 25 DAS, 50 DAS, 75 DAS for vegetative growth and on 90 DAS for yield parameters were subjected to sigma stat 3.1 (one-way and two-way ANOVA).

RESULTS AND DISCUSSION

Vegetative growth on 25, 50 and 75 DAS

Root and shoot length

A gradual increase in root length was observed in all the treatments as shown in Table 1. The maximum root length was observed in T_8- Raw jack fruit peel+10 g *Pleurotus eous*+ 10 g *Pleurotus florida* + *Eudrilus eugeniae* 5 t/ha^{-1} (21.35 cm, 23.17 cm, 27.66 cm) closely followed by T_4- Raw cocoa shell+10 g *Pleurotus eous*+10 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1} (19.23 cm, 20.12 cm and 22.57 cm) as compared to the control (9.0 cm, 10.6 cm and 12.4 cm) on 25,50 and 75 DAS respectively. The treatment T_8 showed a remarkable increase in shoot length (92.18 cm, 122.17 and 135.58 cm) on all the three days examined, followed by T_4 (86.22 cm, 120.66 cm and 130.52 cm) when compared to control (23.17 cm, 71.13 cm and 78.24 cm).

Sakthivigneswari and Vijayalakshmi, (2016) reported that influence of raw coir pith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* and raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* has increased the root and shoot length of black nightshade. The maximum shoot length (86.6) and root length (41) was observed in treatments S4 which is followed by other treatment when compared to control observed by Dey *et al*. (2019).

Number of leaves

An appreciable increase in number of leaves/plant was recorded in all the treatments (T_1 to T_8) from 25 to 75 DAS. The highest number of leaves were shown in T_8 (19.65, 29.50 and 37.54) treatment followed by treatment T_4 (18.00, 27.57 and 35.26). Minimum numbers of leaves were noted in control (8.00, 12.24 and 18.00) on all the three days as prsented in Table 1. Al-Sabbagh *et al*. (2020) recorded that application of vermicompost and NPK fertilizer was significant (60.99) on the number of leaves of *Solanum lycopersicum* among different treatments. 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 by Kashem *et al*. (2015). Similar result was reported by effect of compost from different animal manures on maize (Coulibaly *et al*. 2019).

Table 1: Effect of biocomposted cocoa shell and jack fruit Peel waste on the vegetative parameters of *Vigna unguiculata* subsp. *sesquipedalis* (L.).

Treatments	Root length (cm)			Shoot length (cm)			Number of leaves			Number of nodules		
	25 DAS	50 DAS	75 DAS	25 DAS	50 DAS	75 DAS	25 DAS	50 DAS	75 DAS	25 DAS	50 DAS	75 DAS
C	9.0	10.6	12.4	23.17	71.13	78.24	8.00	12.24	18.00	9.00	15.00	8.35
T_1	11.16	12.73	13.35	35.14	86.39	92.17	10.33	14.42	24.15	11.06	19.00	10.54
T_2	12.7	14.32	15.43	49.33	97.74	104.36	11.40	17.48	26.35	15.32	21.00	12.25
T_3	14.5	15.54	17.12	60.53	106.18	109.15	13.21	19.37	29.18	17.00	24.00	15.00
T_4	19.23	20.12	22.57	86.22	120.66	130.52	18.00	27.57	35.26	24.13	30.00	21.00
T_5	15.13	16.28	18.30	64.12	111.87	117.23	14.57	20.66	27.21	17.06	25.00	16.00
T_6	15.29	17.26	19.35	69.48	112.54	119.42	15.61	21.59	30.16	18.43	26.00	18.00
T_7	16.34	18.22	20.61	71.35	116.36	121.70	16.50	23.12	32.00	19.10	28.00	19.00
T_8	21.35	23.17	27.66	92.18	122.17	135.58	19.65	29.50	37.54	27.46	33.00	25.00
SED		0.27992			0.50322			0.27459			0.28048	
CD (p<0.05)		0.56120			1.00890			0.55052			0.56232	

**Significant at (P<0.05); DAS-Days after sowing.

Where C-Control, (No manure) T_1 (Raw cocoa shell+*Eudrilus eugeniae* 5 t/ha^{-1}), T_2 (Raw cocoa shell+20 g *Pleurotus eous*+*Eudrilus eugeniae* 5 t/ha^{-1}),T_3 (Raw cocoa shell+ 20g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}), T_4 (Raw cocoa shell+10 g *Pleurotus eous*+10 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}),T_5 (Raw Jack fruit peel+ *Eudrilus eugeniae* 5 t/ha-^{1}),T_6 (Raw Jack fruit peel+20 g *Pleurotus eous*+ *Eudrilus eugeniae* 5t/ha^{-1}),T_7 (Raw Jack fruit peel+20 g *Pleurotus florida* + *Eudrilus eugeniae* 5 t/ha^{-1}),T_8 (Raw Jack fruit peel +10 g *Pleurotus eous*+10 g *Pleurotus florida* + *Eudrilus eugeniae* 5 t/ha^{-1}).

Number of nodules

Number of nodules showed a remarkable increase up to 50 DAS compared to other days after that it declined. Maximum number of nodules were recorded in T_8 Raw jackfruit peel+ 10 g *Pleurotus eous*+10 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1} (27.46, 33.00 and 25.00) treatment followed by T_4- Raw cocoa shell+10 g *Pleurotus eous*+10 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1} (24.13, 30.00 and 21.00) as compared to the control (9.00, 15.00 and 8.35) on 25, 50 and 75 DAS. The results were depicted in Table 1.

Espiritu (2011) reported that application of composted coir pith inoculated with 0.5% Azotobacter+0.5% *Trichoderma harzianum* w/v significantly enhanced the number of nodules in mung bean. Vermicompost @ 5 t/ha+RDF-100% (T_9) recorded maximum nodules per plant (4.17) in *Vigna unquiculata* L walp as compared to other treatment combinations by Verma *et al*. (2018).

Number of flowers

The combined application of Raw jackfruit peel+10 g *Pleurotus eous*+10 g *Pleurotus florida*+*Eudrilus eugeniae* (T_8) and Raw cocoa shell+10 g *Pleurotus eous*+10 g *Pleurotus florida*+*Eudrilus eugeniae* (T_4) biocompost showed a significant result in increasing the number of flowers (21.00 and 19.67) per plant of *vigna unguiculata* subsp. *sesquipedalis* (L.) when compared to the control (8.00) on 45 DAS as shown in Table 2. Nalluri *et al*. (2018) reported that application of groundnut shell compost promoted the highest number of flowers in brinjal plant in T_2 treatment. Similar results were found in tomato plant. Chaudhary and Mishra, (2019).

Fresh weight and dry weight of plant

A remarkable increase in the fresh weight content was registered in the treatment T_8 (5.491 gm, 9.811 gm and 32.516 gm) closely followed by T_4 (5.136 gm, 7.371 gm and 28.460 gm) on 25, 50 and 75 days after sowing. The lowest plant fresh weight content was observed in control (2.288 g, 3.276 g and 8.165 g). The maximum plant dry weight content was recorded in T_8 (0.855 gm, 1.489 gm and 3.020 gm), followed by T_4 (0.796 gm, 1.130 gm and 2.187 gm) on 25, 50 and 75 DAS. The minimum plant dry weight content was noted in control (0.293 gm, 0.638 gm and 0.977 gm) on selected three days (Table 2). The application of vermicomposted weed plants waste using *Eudrilus eugeniae* was increase in fresh weight content (6.6 g) and dry weight content (2.2 g) of brinjal plant by Sivakumar and Karthikeyan, (2016). Ameeta *et al.* (2019) reported that integrated treatment of organic and inorganic fertilizer (Spinach+Mustard oil cake (MOC) @ 5 t/ha+Sesame oil cake (SOC) @ 5 t/ha+NPK@30kg/ha) significantly increases the fresh and dry weight of *Spinacia oleracea* L**.**

Yield parameters of cowpea (90 DAS)

The yield parameters of *vigna unguiculata* subsp. *sesquipedalis* (L.) in Table 3 revealed the overall increased growth in treatment T_8 (Raw jackfruit peel+10 g *Pleurotus eous*+10 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}) followed by T_4 (Raw cocoa shell+10 g *Pleurotus eous*+10 g *Pleurotus florida* + *Eudrilus eugeniae* 5 t/ha^{-1}) as compared to control. A highest number of pods/plant was recorded in T_8 (28.67) followed by T_4 (26.00) on 90 DAS as compared to the control (9.00). Similarly, the length of the pod was increased in T_8

Table 2: Effect of Biocomposted cocoa shell and jack fruit Peel waste on the vegetative parameters of *Vigna unguiculata* subsp. *sesquipedalis* (L.).

Treatments	Plant fresh weight (gm)			Plant dry weight (gm)			Number of flowers
	25 DAS	50 DAS	75 DAS	25 DAS	50 DAS	75 DAS	45 DAS
C	2.288	3.276	8.165	0.293	0.638	0.977	8.00
T_1	3.164	4.004	13.157	0.424	0.827	1.234	11.00
T_2	3.825	4.320	15.208	0.467	0.880	1.523	13.00
T_3	4.282	5.097	17.349	0.489	0.944	1.588	16.00
T_4	5.136	7.371	28.460	0.796	1.130	2.187	19.67
T_5	4.415	5.701	18.238	0.562	0.968	1.706	12.00
T_6	4.422	5.797	20.564	0.574	0.989	1.960	15.00
T_7	4.640	5.906	22.183	0.639	1.012	1.989	17.00
T_8	5.491	9.811	32.516	0.855	1.489	3.020	21.00
SED		0.09072			0.00096		0.8315
CD (p<0.05)		0.18189			0.00193		1.7469

** Significant at (P<0.05); DAS-Days after sowing.

Where C-Control, (No manure),T_1 (Raw cocoa shell+*Eudrilus eugeniae* 5 t/ha^{-1}), T_2 (Raw cocoa shell+20 g *Pleurotus eous*+*Eudrilus eugeniae* 5 t/ha^{-1}), T_3 (Raw cocoa shell+20 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}), T_4 (Raw cocoa shell+10 g *Pleurotus eous* +10 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}),T_5 (Raw Jack fruit peel+*Eudrilus eugeniae* 5 t/ha-^{1}),T_6 (Raw Jack fruit peel+20 g *Pleurotus eous*+*Eudrilus eugeniae* 5 t/ha^{-1}), T_7 (Raw Jack fruit peel+20 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}),T_8 (Raw Jack fruit peel+10 g *Pleurotus eous* +10 g *Pleurotus florida*+ *Eudrilus eugeniae* 5 t/ha^{-1}).

Table 3: Yield parameters of *Vigna uunguiculata* subsp. *sesquipedalis* (L.) influenced by biocomposted cocoa shell and jack fruit peel waste (90 DAS).

Treatments	Yield parameters 90th DAS					
	Number of pods/plant	Number of Seed/pod	Pod length (cm)	Weight of seed/pod (g)	Pod fresh weight (g)	Pod dry weight (g)
C	9.00	11.00	20.60	0.883	1.184	0.852
T_1	14.00	12.00	23.80	0.994	2.188	0.648
T_2	16.00	14.00	26.30	0.969	2.638	0.980
T_3	18.00	16.00	26.30	0.981	2.571	1.403
T_4	26.00	22.00	27.37	1.757	5.439	2.651
T_5	19.00	15.00	40.70	1.309	2.854	1.477
T_6	21.00	16.00	28.20	1.523	2.945	1.830
T_7	23.00	17.00	30.50	1.569	2.987	1.853
T_8	28.67	24.00	48.60	1.919	6.796	2.707
SED	0.8165	0.8749	0.8336	0.0008	0.1574	0.1414
CD (p<0.05)	1.7154	1.8381	1.7513	0.0017	0.3306	0.2971

** Significant at (P<0.05); DAS-Days After Sowing.

Where C-Control, (No manure), T_1 (Raw cocoa shell+*Eudrilus eugeniae* 5 t/ha^{-1}), T_2 (Raw cocoa shell+20 g *Pleurotus eous*+*Eudrilus eugeniae* 5 t/ha^{-1}), T_3 (Raw cocoa shell+ 20 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}), T_4 (Raw cocoa shell+10 g *Pleurotus eous* +10 g *Pleurotus florida*+*Eudrilus eugeniae* 5t/ha^{-1}), T_5 (Raw Jack fruit peel+ *Eudrilus eugeniae* 5 t/ha-^{1}), T_6 (Raw Jack fruit peel+20 g *Pleurotus eous*+*Eudrilus eugeniae* 5t/ha^{-1}), T_7 (Raw Jack fruit peel+20 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}), T_8 (Raw Jack fruit peel+10 g *Pleurotus eous*+10 g *Pleurotus florida*+*Eudrilus eugeniae* 5 t/ha^{-1}).

(48.60 cm) and T_4 (40.70 cm) treatments increased significantly over the control (20.60 cm). The maximum number of seeds/pod was seen in T_8 (24.00) followed by T_4 (22.00) over the control (11.00). A substantial increase in the weight of seeds/pod was examined in T_8 (1.919 gm) and T_4 (1.757 gm) as compared to the control (0.823 gm).

Among the treatments a significant increase in the pod fresh weight was observed in T_8 (6.796 gm) and T_4 (5.440 gm) when compared to the control (1.185 gm) and the pod dry weight was highest in T_8 (2.707 gm) followed by T_4 (2.652 gm) treatment over the control (0.853 gm) respectively. The combined use of vermicompost and 25% municipal soild waste compost significantly enhanced the number of fruits at the harvest period over control in *Lycopersicum esculentum* recorded by Birajdar *et al*. (2018). Similar results were reported by Pinky and Vijayalakshmi (2020) in black gram. Deepa *et al*. (2016) reported that RDF (fertilizer 20-40-0 NPK kg ha^{-1}) was significantly higher the number of green pods per plant (79.60) and number of seeds per pod (13.45) in *Vigna unguiculata* (L.) Walp. Application of jeevamrutha and panchagavya resulted in better growth attributes in cowpea by Reshma *et al.* (2019). Similar results were reported Shinde and Hunje, (2019) in Kabuli Chickpea and brinjal plant by Munish Palia *et al.* (2021). These results are closely confined with the findings of Nasar *et al.* (2019); Mithra *et al.* (2019); Mehran *et al.* (2020); Kumarimanimuthu and Kalaimath, (2020).

CONCLUSION

The result from this experiment concludes that application of treatment combination T_8 (Raw jackfruit peel+10 g *Pleurotus eous* + 10 g *Pleurotus florida* + *Eudrilus eugeniae* 5t/ha^{-1}) and T_4 (Raw cocoa shell + 10 g *Pleurotus eous* + 10 g *Pleurotus florida*+*Eudrilus eugeniae* 5t/ha^{-1}) exhibited improved root length, shoot length, number of leaves, nodules, flowers, fresh weight and dry weight of plant. Besides yield parameters like the number of pods/plant, length of pod, number of seeds/pod , weight of seed/pod , fresh weight and dry weight of pod in *Vigna unguiculata* subsp. *sesquipedalis* (L.) as compared to other biotreatment combinations and control. The present investigation revealed that application of various organisms (T_4 and T_8) bioconverted the cocoa shell and jack fruit peel waste to produce good quality organic manure which can be effectively used for healthy vegetable crop production and support small scale farmers to grow crops in less expensive way without damaging the environment.

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