

## Results and Discussion

The results and discussion pertaining to the composting of Vegetable and fruit waste seasonally i.e. winter and summer, FT-IR analysis of the raw and composted sample, biometrics parameters of the test crops Black gram [*Vigna mungo* (L.) Hepper] and Lablab [*Lablab purpureus* (L.) Sweet] during vegetative growth, biochemical analysis, yield parameters, leghaemoglobin content in nodules, pre and post-harvest soil analysis, antioxidant and antibacterial studies were presented in this chapter.

### PHASE I

#### 4.1 COMPOSTING

##### 4.1.1 Microbial population of Vegetable and Fruit waste composted in winter season

There are eight biocompost prepared from vegetable and fruit waste. The treatments consists of C- Control, Compost 1 - Vegetable waste composted using cow dung and *Eudrilus eugeniae* (5 t/ha), Compost 2 - Vegetable waste composted using *Pleurotus eous*, cow dung and *Eudrilus eugeniae* (5 t/ha), Compost 3 - Vegetable waste composted using *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha), Compost 4 - Vegetable waste composted using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha), Compost 5 - Fruit waste composted using cow dung and *Eudrilus eugeniae* (5 t/ha), Compost 6 - Fruit waste composted using *Pleurotus eous*, cow dung and *Eudrilus eugeniae* (5 t/ha), Compost 7 - Fruit waste composted using *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha), Compost 8 - Fruit waste composted using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha). Microbial population was analysed during composting period to assess the quality of the compost. The results was shown in Figure – I, II, III.

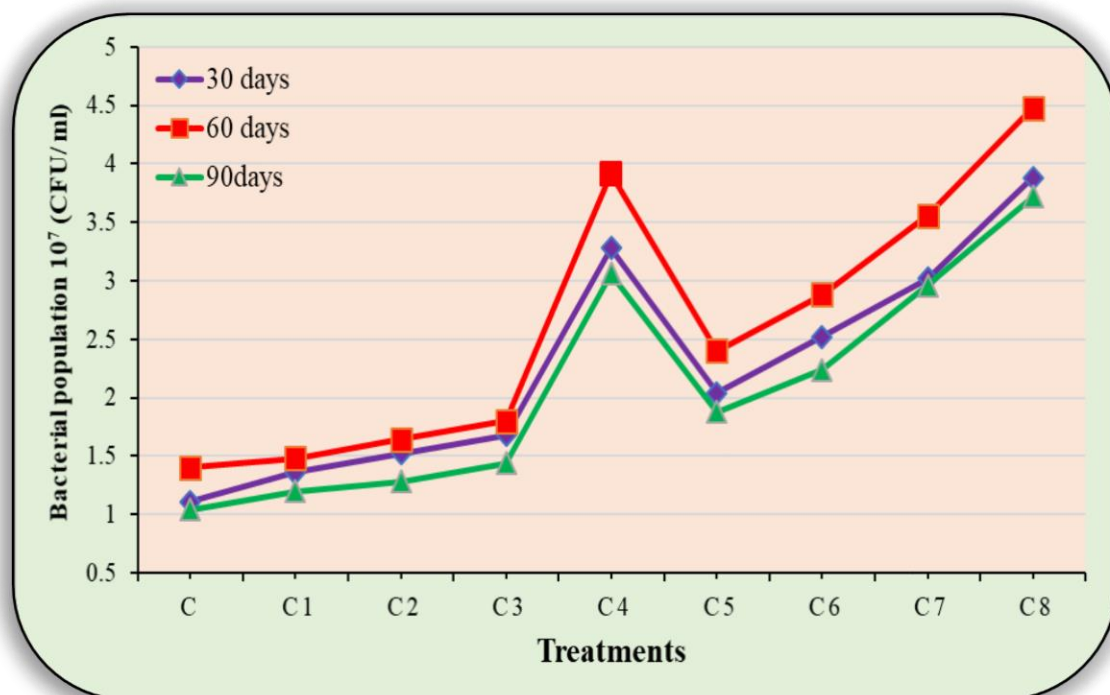
##### 4.1.1a Bacterial population

The bacterial population count increased in C8 ( $3.88 \times 10^7$  CFU/ ml), C4 ( $3.72 \times 10^7$  CFU/ ml) followed by C7 ( $3.28 \times 10^7$  CFU/ ml) when compared to Control ( $1.16 \times 10^7$  CFU/ ml) on 30<sup>th</sup> day. On 60<sup>th</sup> day, remarkable bacterial count was obtained in C8 ( $4.48 \times 10^7$  CFU/ ml) followed by C4 ( $3.92 \times 10^7$  CFU/ ml) and C7 ( $3.56 \times 10^7$  CFU/ ml) when compared to

Control ( $1.40 \times 10^7$  CFU/ ml). Bacterial count declined at the end of composting with maximum bacterial count in C8 ( $3.72 \times 10^7$  CFU/ ml), C4 ( $3.56 \times 10^7$  CFU/ ml) followed by C7 ( $2.96 \times 10^7$  CFU/ ml) over the Control ( $1.04 \times 10^7$  CFU/ ml) on 90<sup>th</sup> day respectively

Figure I

#### Bacterial population during winter composting of Vegetable and Fruit waste



#### 4.1.1b Fungal population

The fungal count was significantly increased in C8 ( $1.52 \times 10^4$  CFU/ ml) which is followed by C4 ( $1.20 \times 10^4$  CFU/ ml) and Control ( $0.45 \times 10^4$  CFU/ ml) on 30<sup>th</sup> day. Remarkable increase in fungal count was observed in C8 ( $1.68 \times 10^4$  CFU/ ml), C4 ( $1.36 \times 10^4$  CFU/ ml) followed by C6 ( $1.28 \times 10^4$  CFU/ ml) and Control ( $0.53 \times 10^4$  CFU/ ml) on 60<sup>th</sup> day. In the last phase of decomposition (90<sup>th</sup> day), favourable number of population was noted in C8 ( $1.38 \times 10^4$  CFU/ ml) followed by C4 ( $1.04 \times 10^4$  CFU/ ml) and C7 ( $1.01 \times 10^4$  CFU/ ml) over Control ( $0.40 \times 10^4$  CFU/ ml).

#### 4.1.1c Actinomycetes population

On 30<sup>th</sup> day, the actinomycetes count was obtained highest in C8 ( $0.46 \times 10^2$  CFU/ ml) followed by C4 ( $0.40 \times 10^2$  CFU/ ml), C7 ( $0.33 \times 10^2$  CFU/ ml) when compared to Control ( $0.16 \times 10^2$  CFU/ ml). on the second phase (60<sup>th</sup> day), remarkable actinomycetes count was noted in C8 ( $0.65 \times 10^2$  CFU/ ml), C4 ( $0.56 \times 10^2$  CFU/ ml) followed by other treatments and Control ( $0.20 \times 10^2$  CFU/ ml) respectively. The actinomycetes count on 90<sup>th</sup>

day, declined as the decomposition process. Maximum actinomycetes count was observed in C8 ( $0.38 \times 10^2$  CFU/ ml) followed by C4 ( $0.36 \times 10^2$  CFU/ ml) when compared to Control ( $0.13 \times 10^2$  CFU/ ml).

Figure - II

Fungal population during winter composting of Vegetable and Fruit waste

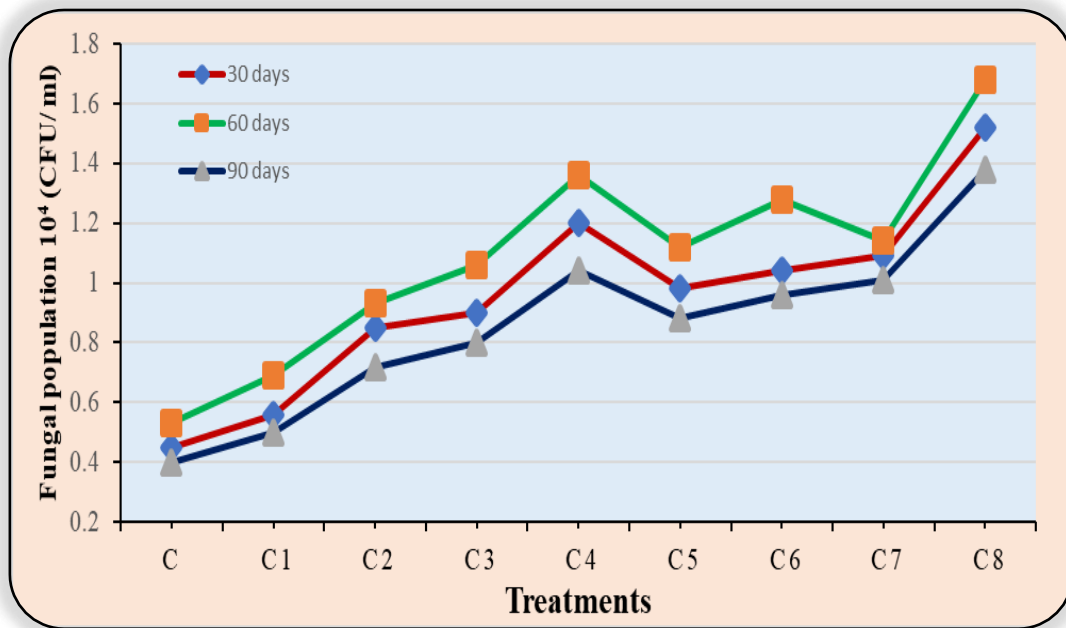
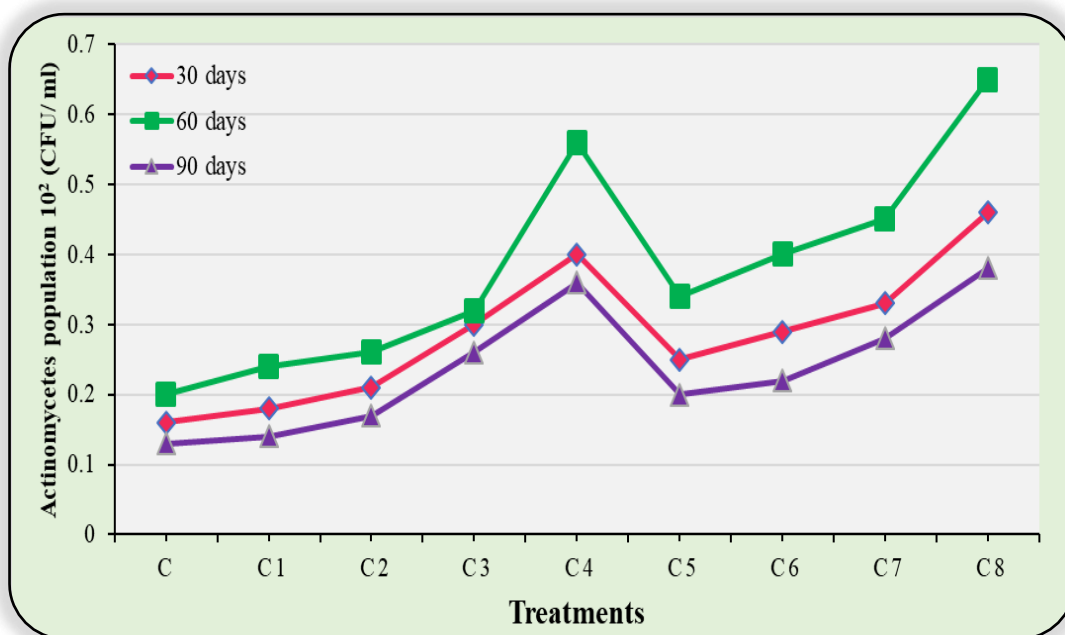


Figure - III

Actinomycetes population during winter composting of Vegetable and Fruit waste



The present finding coincides with Game *et al.*, (2017) who revealed that the population of bacteria and fungi in composting pits grew gradually, with the highest population being observed in the early stages of composting, or between 60 and 90 days of composting in test consortium and commercial consortium treated pits, whereas the uninoculated control pits took 90 to 120 days to reach their maximum population. After that, a progressive increase in the population of actinomycetes and a decrease in bacterial and fungal populations were observed. The actinomycetes population peaked between 120 and 150 days into the composting process.

The current study was in line with Shamini and Fauziah, (2014) investigation of the microbial population of vermicomposted banana stem waste mixed with used tea leaves and found that each vermicomposting setup had an increase in population after the addition of the microbial consortium. When consortium 3I3 (*Pseudomonas alcaligenes*, *Flavobacterium johnsoniae*, and *Bacillus licheniformis*) is applied to all waste in the setup, the most vigorous response can be seen.

The result is on standard with Chandna *et al.*, (2013) who watched that mesophilic microscopic organisms expanded quickly within the first 10 days and the bacterial count was  $1.7\text{-}2.84 \times 10^9$  CFU g<sup>-1</sup>.

The current results are consistent with those of Sarker *et al.*, (2013) who found that at 49 days, pressmud inoculated with a bacterial consortium (T<sub>7</sub>) had the highest microbial load, with total bacterial population of  $90.57 \times 10^4$ /gm, fungal population of  $72.72 \times 10^2$ /gm, and actinomycetes population of  $48.57 \times 10^2$ /gm.

The results was comparable to that reported by Selvamurugan *et al.*, (2013) who found that applying biocompost (5t/ha) increased the populations of bacteria, fungus, and actinomycetes relative to biomethanated distillery waste wash by  $25 \times 10^6$  CFU/g<sup>-1</sup>,  $14 \times 10^4$  CFU/g<sup>-1</sup>, and  $8 \times 10^3$  CFU/g<sup>-1</sup>, respectively.

Similar findings were reported by Viji and Neelananarayanan, (2013) who found that vermicompost harvested from *Eudrilus eugeniae* experimental trays displayed noticeably higher densities of bacteria ( $170 \times 10^6$  CFU), actinomycetes ( $11 \times 10^6$  CFU), and fungi ( $295 \times 10^6$  CFU) than *Perionyx excavates* and *Lampito mauritii*.

The outcome is consistent with Bhardwaj *et al.*, (2015) who report that mixed-culture vermibed (*Eisenia fetida* and *Lampito mauritii*) had the highest overall microbial load when

compared to other vermicompost. Vermicompost noted a highest bacterial population ranging from  $2.88 \times 10^6$  to  $6.68 \times 10^6$  CFU/g and fungal colonies ranging from  $1.8 \times 10^6$  to  $5.5 \times 10^6$  respectively.

#### 4.1.2 Microbial population of Vegetable and Fruit waste composted in summer season

The eight biocompost are prepared from vegetable and fruit waste using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* namely Control, Compost 1, Compost 2, Compost 3, Compost 4, Compost 5, Compost 6, Compost 7 and Compost 8. During the composting period, microbial population was analysed and presented in Figure – IV, V, VI.

##### 4.1.2a Bacterial population

The bacterial population on 30<sup>th</sup> day was significantly higher in C8 ( $4.64 \times 10^7$  CFU/ml) which is followed by C4 ( $4.08 \times 10^7$  CFU/ml) and Control ( $1.28 \times 10^7$  CFU/ml). On 60<sup>th</sup> day, remarkable bacterial count was obtained in C8 ( $4.96 \times 10^7$  CFU/ml), C4 ( $4.56 \times 10^7$  CFU/ml) followed by C7 ( $3.92 \times 10^7$  CFU/ml) when compared to Control ( $1.56 \times 10^7$  CFU/ml). As the decomposition progress, the bacterial count declined slightly on 90<sup>th</sup> day with maximum bacterial count in C8 ( $4.32 \times 10^7$  CFU/ml), C4 ( $3.80 \times 10^7$  CFU/ml) followed by other treatments and Control ( $1.20 \times 10^7$  CFU/ml) respectively.

Figure - IV

#### Bacterial population during summer composting of Vegetable and Fruit waste

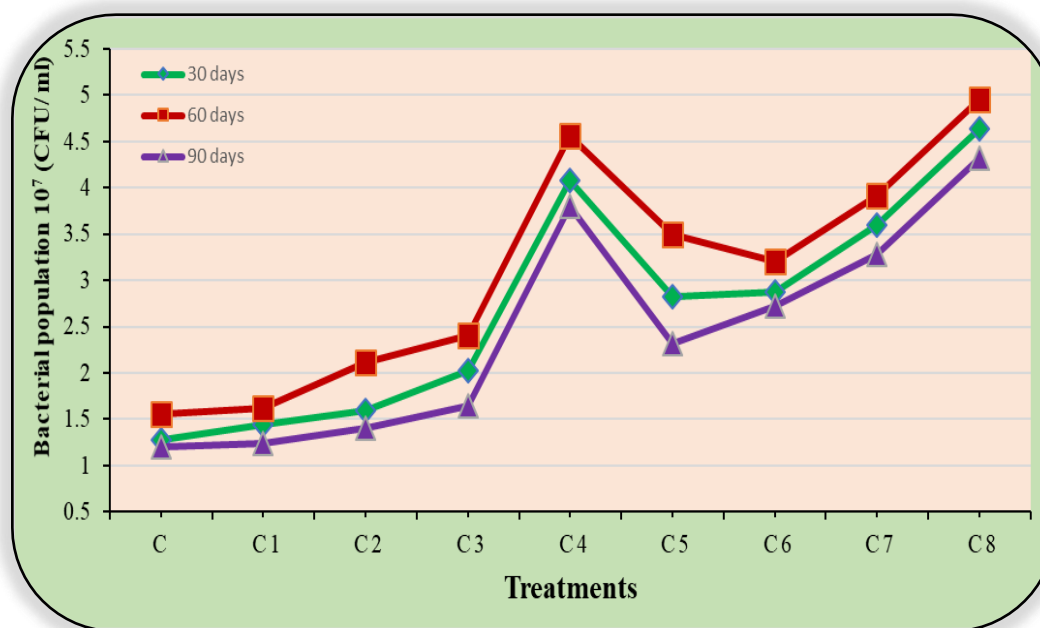


Figure - V

Fungal population during summer composting of Vegetable and Fruit waste

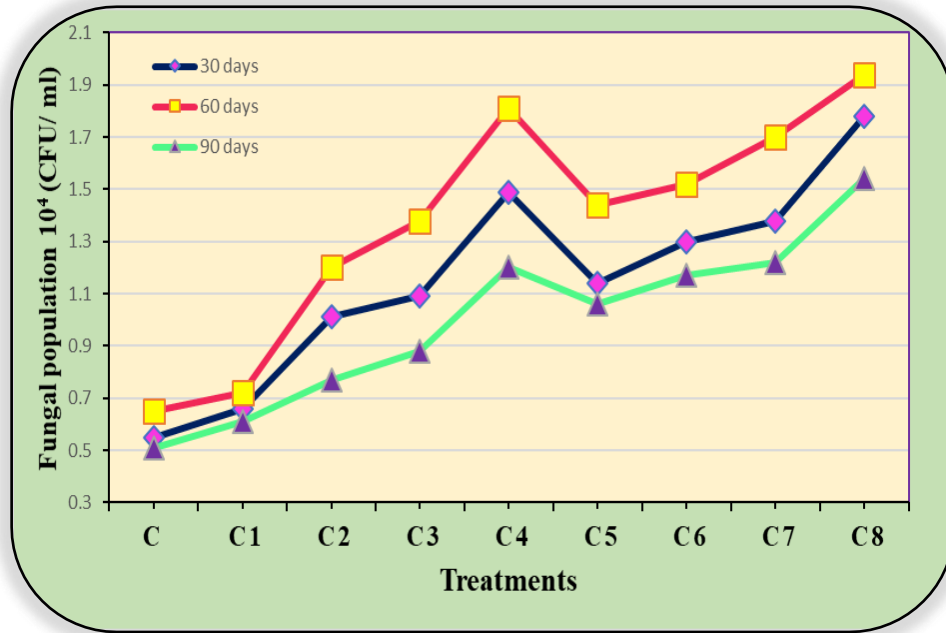
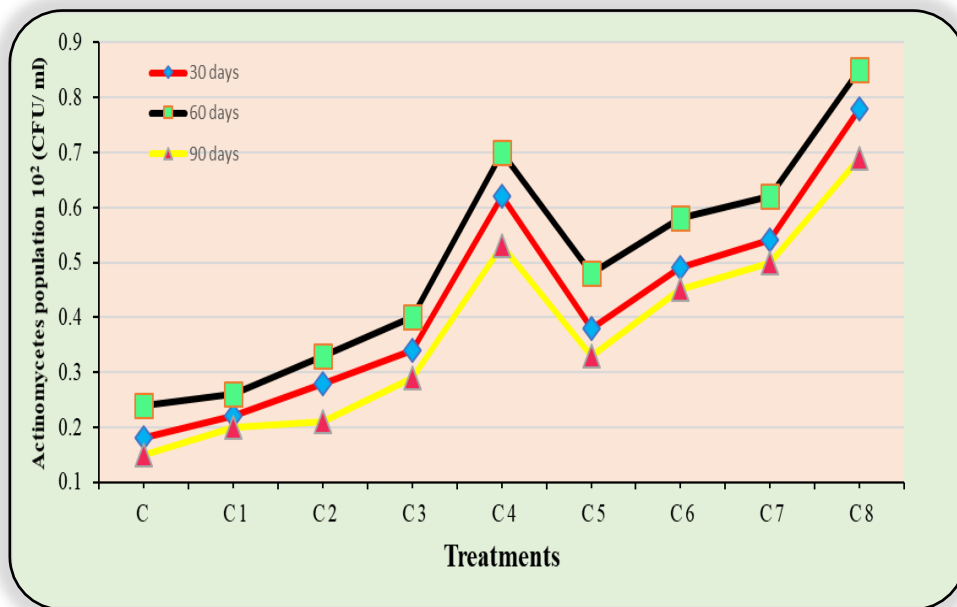


Figure VI

Actinomycetes population during summer composting of Vegetable and Fruit waste



#### 4.1.2b Fungal population

The fungal population showed significant increase in C8 ( $1.78 \times 10^4$  CFU/ ml), C4 ( $1.49 \times 10^4$  CFU/ ml) followed by C7 ( $1.38 \times 10^4$  CFU/ ml) when compared to Control ( $0.58 \times 10^4$  CFU/ ml) on 30<sup>th</sup> day. A remarkable fungal count was noted in C8 ( $1.94 \times 10^4$  CFU/

ml) which is followed by C4 ( $1.81 \times 10^4$  CFU/ ml) and C7 ( $1.70 \times 10^4$  CFU/ ml) over the Control ( $0.66 \times 10^4$  CFU/ ml) on 60<sup>th</sup> day. The fungal count was declined on 90<sup>th</sup> day and maximum fungal population was observed in C8 ( $1.54 \times 10^4$  CFU/ ml) followed by C4 ( $1.32 \times 10^4$  CFU/ ml), C7 ( $1.22 \times 10^4$  CFU/ ml) when compared to Control ( $0.50 \times 10^4$  CFU/ ml) respectively.

#### **4.1.2c Actinomycetes population**

The actinomycetes count was increase significantly in C8 ( $0.78 \times 10^2$  CFU/ ml), C4 ( $0.62 \times 10^2$  CFU/ ml) followed by other treatments and Control ( $0.18 \times 10^2$  CFU/ ml) on 30<sup>th</sup> day. On 60<sup>th</sup> day, remarkable increase in population was obtained in C8 ( $0.85 \times 10^2$  CFU/ ml) followed by C4 ( $0.70 \times 10^2$  CFU/ ml) and other treatments over the Control ( $0.24 \times 10^2$  CFU/ ml). In the last phase of composting (90<sup>th</sup> day), slight decrease in actinomycetes count was noted in C8 ( $0.69 \times 10^2$  CFU/ ml) followed by C4 ( $0.53 \times 10^2$  CFU/ ml), C7 ( $0.50 \times 10^2$  CFU/ ml) when compared to Control ( $0.16 \times 10^2$  CFU/ ml) respectively

Similar findings were reported by Viji and Neelananarayanan, (2013) who found that vermicompost obtained from *Eudrilus eugeniae* experimental trays displayed noticeably higher densities of bacteria ( $170 \times 10^{-6}$  CFU), actinomycetes ( $11 \times 10^{-6}$  CFU), and fungi ( $295 \times 10^{-6}$  CFU), followed by *Perionyx excavates* and *Lampito mauritii*.

The present result was on par with Sequeira and Chandrashekar, (2015) who reported that the highest bacteria count per gram of vermicompost was obtained from mixed organic garbage without cowdung slurry vermicompost ( $634 \times 10^5$  CFU/g<sup>-1</sup>), fungi count was observed in garden trimming leaves vermicompost ( $113 \times 10^3$  CFU/g<sup>-1</sup>) and the actinomycetes count was noted maximum in mixed organic garbage without cowdung vermicompost ( $699 \times 10^4$  CFU/g<sup>-1</sup>).

The bacterial population was found to be the highest under aerobic composting ( $21.1-65.3 \times 10^{10}$  CFU/g), in comparison to vermicomposting ( $19.7-61.6 \times 10^{10}$  CFU/g), while fungi made up a very small portion of the microbial population ( $5-9 \times 10^3$  CFU/g on day 1,  $5-10 \times 10^3$  CFU/g on day 20, and  $4-4 \times 10^3$  CFU/g on day 55). Additionally, vermicomposting produced a greater population of actinomycetes ( $71-237 \times 10^9$  CFU/g) than aerobic composting ( $56-75 \times 10^9$  CFU/g) (Chander *et al.*, 2018).

Similar outcomes were attained by Meena *et al.*, (2019) who observed that T9-Poultry manure sprayed @ 150% RND (recommended nitrogen dose) showed the higher counts of bacteria ( $82.45 \times 10^3$ ), fungi ( $37.82 \times 10^3$ ), and actinomycetes ( $58.23 \times 10^3$ )

respectively. At the end of two-year cropping cycle, the soil biological characteristics demonstrated an increase in the soil microbial counts over their beginning values.

The results are comparable to those of Senthilvalavan and Ravichandran, (2020) who found that System of Rice Intensification plots were superior by registering higher microbial populations and lower microbial populations were noticed with conventional method where the microbial population (Bacteria, Fungi, Actinomycetes) was counted for two years.

The increase in microbial population could be attributed to the creation of favourable temperature and dampness conditions for the development of organisms inside the worm stomach-related tract by the ingestion of nutrient-rich vegetable and fruit wastes that provide energy for the development of microorganisms.

## **4.2 Physico-chemical composition of raw and composted Vegetable and Fruit waste**

### **4.2.1 Physico-chemical composition of Vegetable and Fruit waste composted in winter**

The physico-chemical parameters such as lignin, cellulose, pH, electric conductivity, organic carbon, total nitrogen, phosphorus, potassium, calcium and magnesium were analysed in eight different winter biocompost and control (raw vegetable and fruit waste) to assess the compost maturity. The results are shown in Table-1.

#### **Lignin and Cellulose**

Lignin is a complex natural organic polymer and require long time for natural decomposition because of its structural complexity. During composting process, lignocellulosic materials contribute to air quality, bulking and water retention capacity. Cellulose are the main source of biological transformation, rise in temperature and chemical changes in the compost. Lignin and cellulose of the raw vegetable and fruit waste were 38.8 %, 17.10 %, and 36.5 %, 15.8 % respectively. It was reduced to 6.52 %, 5.33 % in (C8- Fruit waste (F.W.) + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) and 6.86 %, 6.63 % (C4- Vegetable waste (V.W.) + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

The result was consistent with Gong *et al.*, (2017) study that all additive treatments the amounts of lignin and cellulose was reduced. The lowest levels of lignin were found in RPA (rhamnolipid + *Phanerochaete chrysosporium* + Azadobacter) and RP (rhamnolipid + *Phanerochaete chrysosporium*) of 14.10% and 14.53%, respectively. The highest levels were found in CK (Control) of 21.99% where RPA have the lowest cellulose content (22.33%) while CK having the highest (32.47%).

Similar findings were made by Ribeiro *et al.*, (2017) who showed that the decomposition of cellulose is another crucial step in the process of forming compost. From the 23<sup>rd</sup> day through the process conclude, Treatment 1 (*Bacillus cereus*) produced lower amounts of cellulose, with the cellulose content of the compost inoculated with *B. cereus* being 11.5% lower than that of the control.

The results were on par with Chin *et al.*, (2020) finding that combinations with initial C/N ratios between 25 and 35 reported the maximum reduction in holocellulose, cellulose, hemicellulose, and lignin content, whereas mixtures with initial C/N ratios over 50 had the least reduction.

### **pH**

pH value of the compost gives an approximate index of compost maturation and also indicator of decomposition process and stabilization. The compost should range near neutral pH between 6 and 8. The pH value showed maximum in C8 (Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) and C4 (Vegetable waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) of 7.55 and 7.08 when compared to raw sample 5.26 and 4.41 respectively.

The results of the current study are consistent with those of Arumugam *et al.*, (2017) who found that vermicompost with bacterial consortia had a pH increase between 6.14 and 7.56 and vermicompost with a pH increase between 6.18 and 8.01.

Comparing the pH values found in the vermireactors to those in the control reactors, a considerable increase in pH was reported. The physicochemical characteristics of Fruit and Vegetable wastes were significantly altered by vermicomposting (Huang *et al.*, 2012). The findings is consistent with Olukanni *et al.*, (2021) which showed that the pH level ranged from 6.6 to 8.1 during the composting process.

The results coincide with Jain *et al.*, (2019) who noted an increase in pH in the final compost, that had a pH of 7.75–7.76, compared to initial raw materials, with a pH of 6.76–6.77 respectively.

### **Electrical Conductivity**

The electrical conductivity of the raw vegetable and fruit waste was found to be 4.93 millimhos cm<sup>-1</sup> and 6.85 millimhos cm<sup>-1</sup> which gradually decrease to 1.12 millimhos cm<sup>-1</sup> (C8) and 1.52 millimhos cm<sup>-1</sup> (C4) respectively.

TABLE - 1

## Physico-chemical composition of the raw and composted Vegetable and Fruit waste during winter composting

Physico-chemical composition	Treatments									
	RVW	RFW	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>
Lignin (%)	38.8	36.5	9.20	10.21	7.25	6.86	6.90	8.54	7.21	6.52
Cellulose (%)	17.10	15.8	8.12	9.28	8.20	6.63	7.66	8.00	8.59	5.33
pH	4.41	5.26	6.89	5.85	6.23	7.08	5.32	6.54	6.87	7.55
Electrical conductivity (milli mhos cm <sup>-1</sup> )	4.93	6.85	2.05	2.42	2.95	1.52	2.35	2.20	1.58	1.12
Organic Carbon (%)	48.01	40.51	37.23	28.22	25.32	18.03	20.12	22.53	21.32	16.53
N (%)	0.40	0.36	0.78	0.71	0.62	1.02	0.73	0.79	0.61	1.10
P (%)	0.10	0.30	0.35	0.41	0.76	1.62	0.60	1.05	1.21	2.23
K (%)	0.26	0.22	0.31	0.52	0.59	1.35	0.82	0.78	1.20	3.15
Ca (%)	0.72	0.75	0.89	1.21	1.36	3.29	1.95	2.03	2.56	4.18
Mg (%)	0.18	0.20	0.28	0.56	0.74	2.32	0.92	1.22	1.53	2.47
C : N	120:1	112:1	47:1	39:1	40:1	17:1	27:1	28:1	34:1	15:1

Compost 1 - Vegetable waste composted using cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 2 - Vegetable waste composted using *Pleurotus eous*, cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 3 - Vegetable waste composted using *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 4 - Vegetable waste composted using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 5 - Fruit waste composted using cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 6 - Fruit waste composted using *Pleurotus eous*, cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 7 - Fruit waste composted using *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 8 - Fruit waste composted using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha)

The results coincide with Bhat *et al.*, (2017) who reported a decrease in EC value from 3.52 mS/cm to 2.82 mS/cm in final vermicompost.

Similar results were noted by Rajashri *et al.*, (2021) who found that raw groundnut shell and vegetable wastes have an EC value of 2.96 millimhos  $\text{cm}^{-1}$  and that value rises to 16.22 millimhos  $\text{cm}^{-1}$  as composting progresses.

Similar findings were reported by Omidi *et al.*, (2017) who found that after composting, the EC in peanut shells significantly increased by 4.30 dS/m as compared to raw sample (1.38 dS/m).

### **Organic Carbon**

The organic content in the raw vegetable and fruit waste is presented in Table-1. The reduction in the organic carbon might be due to the combined action of fungus and earthworm during decomposition. After biodegradation, the organic content showed a decreasing trend. A significant decrease in organic carbon of 16.53% was observed in C8 against the initial value of 40.51 % as compared to other treatment.

Similar result was observed by Patil *et al.*, (2017) who reported that the organic carbon content was recorded maximum in M1- Coir waste (100%) (28.48%) and minimum in M6- Cow dung (100%) (20.45%) after 180 Days After Inoculation, earthworm species E1- *Eudrillus eugineae* has minimum carbon content (22.95 %) after 180 DAI than E2- *Eisenia foetida* (23.64%).

The findings were in line with Korav *et al.*, (2021) who found that vermicompost contained nutrients such as organic carbon (9.15–17.98%), total nitrogen (1.5–2.10%), total phosphorus (1–1.5%), and total potassium (0.60%).

The results was in conformity with Syarifinnur *et al.*, (2022) who stated that application of 10t vermicompost/ha recorded the highest yield of maize and highest increase in soil organic carbon, total phosphorus, available phosphorus, total potassium, pH and soil total nitrogen.

### **Total Nitrogen, Total Phosphorus and Total Potassium**

As presented in Table-1, the total nitrogen, total phosphorus and total potassium showed an increasing trend where compost 8 (C8) produced from fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) noted a maximum of 1.10 %, 2.23 % and 3.15 % followed by C4 (Vegetable waste

composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) of 1.02 %, 1.62 % and 1.35 % against the raw waste.

The result coincides with Sall *et al.*, (2016) who reported that straw compost has higher nitrogen, phosphorus and potassium than bark compost and had C:N ratio close to 30 respectively.

The present study correlated with the results of Gong *et al.*, (2017) who observed the highest total nitrogen (20.11 g/ kg<sup>-1</sup>), total phosphorus (5.20 g/ kg<sup>-1</sup>) and total potassium (4.39 g/ kg<sup>-1</sup>) in RPA (rhamnolipid + *Phanerochaete chrysosporium* + Azadobacter) and lowest was noted in CK- control (17.00 g/ kg<sup>-1</sup>, 4.37 g/ kg<sup>-1</sup>, 3.30 g/ kg<sup>-1</sup>).

The current results are in line with those published by Patil *et al.*, (2017) who found that treatment M5 (Coir waste: cow dung 20:80) had the highest content of N (1.30%), P (0.52%), and K (0.83%), whereas treatment M1 (Coir trash) had the lowest amount of N (0.97%), P (0.39%), and K (0.57%).

Similar result was reported by Sundaram and Vincent, (2017) who observed that cow dung combinations showed a steady increase in phosphorous content throughout the composting period. The maximum mean value of 4.57 was noted in T5 (Sludge + Coir Pith + Cow Dung) on 120<sup>th</sup> day and total potassium content increased at the end of composting period irrespective of the treatments in which T4 (Sludge + Saw Dust + Cow Dung) reported the maximum mean value of 3.36 on 120<sup>th</sup> day.

### **Calcium and Magnesium**

Micronutrients such as calcium (4.18 %) and magnesium (2.47 %) was maximum in C8 (Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) closely followed by C4 (Vegetable waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) of 3.29 %, 2.32 % respectively.

The present study coincides with Chandna *et al.*, (2013) who reported that nutrient content of calcium, magnesium and sodium was found to be high after 50 days of composting.

The result was on par with Ghinea and Leahu, (2020) who reported that the calcium and magnesium obtained in the compost was decreased in S3 (1163.46 mg/kg Dry Weight)

followed by S2 (998.61 mg/kg Dry Weight) and the highest magnesium content was observed in S3 (493.41 mg/kg Dry Weight) and least was noted in S1 (328.19 mg/kg Dry Weight).

The present study coincides with Othman *et al.*, (2012) who revealed that calcium content was higher in vermicompost of 4.40 % followed by garden compost of 2.27 % and magnesium content was higher in garden compost of 0.57 % and vermicompost of 0.47 %.

### **C:N ratio**

C:N ratio is the most important parameters to determine the degree of compost maturity. A significant reduction in the C:N ratio was observed in compost 8 (C8) followed by compost 4 (C4). The C:N ratio was reduced from 112:1 to 15:1 (raw fruit waste to C8) followed by 120:1 to 17:1 (raw vegetable waste to C4) respectively.

The findings agree with Prakash and Hemalatha, (2013) who found that C: N ratio reduces after 60 days decomposition of pressmud sample inoculated with *Eisenia fetida* significantly from 27.58 to 13.33.

The current finding is comparable with that of Hapsoh *et al.*, (2015) who indicated that household garbage and empty fruit bunches from oil palms have the greatest cellulose/lignin ratios and the slowest degradation rates.

The result was on par with Moustafa *et al.*, (2021) who reported that C:N ratio significantly rise and calculated in cow dung alone treatment (20.40) and lowest ratio was noted in cow dung + banana leave treatment (11.50) as well as fish sludge + sugar cane treatment (11.50).

### **4.2.2 Physico-chemical composition of Vegetable and Fruit waste composted in summer.**

As presented in Table–2, the physico-chemical parameters were analysed in eight different summer biocompost and control (raw vegetable and fruit waste) to assess the maturity of compost.

#### **Lignin and Cellulose**

The lignin and cellulose content of raw vegetable (38.5 % and 19.25 %) and fruit waste (33.22 % and 17.82 %) was reduced to 6.14 % and 5.57 % in compost 8 (Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) and 7.28 % and 6.73 % in compost 4 (Vegetable waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) respectively.

Similar results were supported by Suresh Kumar and Ganesh, (2012) who recorded reduction of lignin (6.24%) and cellulose content (5.65%) as compared to the initial value (34.23 and 27.28%) in the treatment inoculated with coirpith (1kg) + *Phanerochaete chrysosporium* (5 ml) + cow dung (5%) + panchagavya (5%).

The result was consistent with Oviasogie *et al.*, (2013) who observed that raw coirpith has higher amounts of lignin (30.00%) and cellulose (26.52%) content as compared to composted coirpith with urea (5kg t<sup>-1</sup>) or fresh poultry litter as the nitrogenous source (200kg t<sup>-1</sup>) lignin (4.80%) and cellulose (10.10%).

The result was on par with Jaybhaye and Bhalerao, (2015) who revealed that initial paddy straw contains cellulose 31.10% and lignin 14.30%. Paddy straw was rich source of ligno-cellulose which was beneficial for fungal growth. Cellulose decreased from 31.10% to 13.38% and lignin 14.30% to 3.35% respectively.

## **pH**

The pH value was moderately increased in all the treatments over the raw sample. The maximum pH (7.46) was obtained by compost 8 (Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) followed by other treatments and Control.

The present results are on conformity with Franke-Whittle *et al.*, (2014) who reported that pH and total nitrogen increased as the composting progress. The initial pH (7.1) and total nitrogen (1.9%) was increase into 7.5 and 2.1% in mature compost.

The present finding was in conformity with Behera and Satapathy, (2020) who revealed that pH was increased in all the experimental set up with maximum pH was observed in 100% potato peel setups (8.5) when compared to the initial value of 7.98.

## **Electrical Conductivity**

Electrical conductivity is used to measure the amount of nutrient in compost in the form of salts. The electric conductivity value decreased to 1.22 millimhos cm<sup>-1</sup> in C8 (Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) followed by 1.42 millimhos cm<sup>-1</sup> in C4 (Vegetable waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) against raw vegetable (2.65 millimhos cm<sup>-1</sup>) and fruit (2.88 millimhos cm<sup>-1</sup>) waste respectively.

TABLE - 2

## Physico-chemical composition of the raw and composted Vegetable and Fruit waste during summer composting

Physico-chemical composition	Treatments									
	RVW	RFW	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>
Lignin (%)	38.5	33.22	8.24	6.57	8.02	7.28	6.58	8.21	7.97	6.14
Cellulose (%)	19.25	17.82	7.52	8.54	7.21	6.73	7.74	8.36	6.86	5.57
pH	6.48	5.52	7.12	6.84	7.23	7.32	7.20	7.05	6.92	7.46
Electrical conductivity (milli mhos cm <sup>-1</sup> )	2.65	2.88	1.95	1.85	1.92	1.42	1.66	1.68	1.49	1.22
Organic Carbon (%)	47.98	46.58	30.25	25.21	30.50	19.02	30.56	28.30	23.87	17.60
N (%)	0.41	0.43	0.72	0.79	0.80	0.98	0.90	0.92	0.89	1.10
P (%)	0.13	0.15	0.24	0.33	0.40	0.91	0.39	0.36	0.45	1.02
K (%)	0.23	0.19	0.26	0.35	0.28	1.41	0.58	1.21	1.34	3.16
Ca (%)	0.84	0.88	0.93	0.99	1.02	3.68	1.15	1.68	2.13	4.72
Mg (%)	0.27	0.32	0.36	0.58	0.74	2.59	0.95	1.26	1.89	3.51
C : N	117:1	108:1	42:1	31:1	38:1	19:1	33:1	30:1	26:1	16:1

Compost 1 - Vegetable waste composted using cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 2 - Vegetable waste composted using *Pleurotus eous*, cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 3 - Vegetable waste composted using *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 4 - Vegetable waste composted using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 5 - Fruit waste composted using cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 6 - Fruit waste composted using *Pleurotus eous*, cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 7 - Fruit waste composted using *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha)

Compost 8 - Fruit waste composted using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha)

The present result is comparable with Sakthivigneswari and Vijayalakshmi, (2016a) report that vermicomposted corncob + *Pleurotus sajor caju* had a lower EC value of 1.48 millimhos  $\text{cm}^{-1}$  when compared to control of 2.97 millimhos  $\text{cm}^{-1}$ .

The results were on par with Esakkiammal and Sornalatha, (2016) who reported that the EC value of different raw and compost sample was increased from 0.57 to 0.85  $\text{dsm}^{-1}$  in control, 0.61 to 0.91  $\text{dsm}^{-1}$  in E1 (*Mangifera indica* compost), 0.79 to 0.96  $\text{dsm}^{-1}$  in E2 (*Syzygium cumin* compost), 0.67 to 0.87  $\text{dsm}^{-1}$  in E3 (*Vigna radiata* compost), 0.64 to 0.88  $\text{dsm}^{-1}$  in E4 (*Vigna mungo* compost).

The results coincides with Chaudhary and Mishra, (2018) who reported that the electrical conductivity of Kitchen waste compost was less than 2.6 but it increases as the composting progress being 2.4, 3.8, 4.5, 4.8 and 5.2 on 9, 20, 40, 60 and 80 days.

### **Organic Carbon**

The present study revealed that organic carbon content showed a decreasing trend after biodegradation. A significant decrease in organic carbon of 17.60% was obtained in treatment C8 (Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) followed by C4 (Vegetable waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) of 19.02% and other treatments against raw vegetable waste (47.98%) and fruit waste (46.58%). The organic carbon was found to be low at the end product in all the eight treatments when compared to raw sample.

Similar result was investigated by Patil *et al.*, (2017) who observed that the organic carbon content was recorded minimum (20.45%) after 180 DAI in M6 *i.e.* Cow dung (100%) and M1 *i.e.* Coir waste (100%) has recorded maximum (28.48%).

The results is also consistent with Sharma *et al.*, (2017) findings that the addition of EM compost improved soil fertility by increasing the amount of accessible nitrogen and organic carbon.

The result coincides with the finding of Jain *et al.*, (2019) who revealed that maximum reduction in organic carbon content from initial value of 41.0 to 36.3 after 20 days of composting.

### **Total Nitrogen, Total Phosphorus and Total Potassium**

The total nitrogen content, total phosphorus and total potassium was higher in different compost when compared to raw sample. Maximum nitrogen content was noted in

C8 produced from fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) of 1.10 % followed by C4 produced from vegetable waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) of 0.98 % and other treatments when compared to raw sample (0.43 % and 0.41 %). The highest total phosphorus content (1.02 % and 0.91 %) was observed in C8 (Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) and C4 (Vegetable waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) as compared to raw fruit waste (0.15 %) and raw vegetable waste (0.13 %). Total potassium content showed an increasing trend, C8 and C4 treatments achieved the highest content of 3.16 % and 1.41 % when compared to raw sample (fruit- 0.19 %, vegetable- 0.23 %) respectively.

The result coincides with Huang *et al.*, (2012) who observed that vermicomposting decreases total carbon content (42.7–52.4%) and C:N ratios (46.5–61.1%) while increases the electrical conductivity (6.7–69.4%) and total phosphorous content (4.0–52.0%) when compared to control.

The finding is consistent with Owis *et al.*, (2016) who found that pH and EC varied between different heaps and stages of composting plant residue while the nutrient content (total and available forms of N, P, and K) rose significantly with the composting progress. Organic carbon values decreased as the decomposition progress in all the investigated heaps.

The results were consistent with those of Arumugam *et al.*, (2018) who discovered that higher-quality vermicompost had increased magnesium, calcium, potassium, phosphorus and nitrogen content along with a decrease in C/N ratio and carbon when compared to initial values in vermicompost with bacterial consortia than in vermicompost alone.

Similar result was obtained by Haiba *et al.*, (2014) who reported that kitchen wastes vermicompost observed total nitrogen, total phosphorous and potassium of 3.3%, 0.7% and 5.8% while vermicomposted sewage sludge and sawdust noted total nitrogen, total phosphorous and potassium of 2.4%, 0.2%, 0.3%.

### **Calcium and Magnesium**

An increasing trend of calcium and magnesium was noted in different biocompost. The calcium and magnesium content was noted maximum in treatment C8 (Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus*

*eugeniae* (5 t/ha) of 4.72 % and 3.51 % which is closely followed by treatment C4 (Vegetable waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) of 3.68 % and 2.59 % when compared to raw fruit waste (0.88 % and 0.32 %) and raw vegetable waste (0.84 % and 0.27 %) respectively.

The present result coincides with the study of Ravimycin, (2016) who obtained maximum calcium (7.8%) and magnesium content (2.44%) in the vermicompost and farmyard manure compost (4.5%, 1.19%). Combination of pre-composted kitchen waste by adding woodchips and paper noted a higher content of calcium (18%) and magnesium (31%) when compared with the raw feedstock mixtures (Hanc and Pliva, 2013).

The result was on par with Viji and Neelanarayanan, (2013) who obtained a maximum total calcium of 1.98 %, 1.95 %, 1.86 % and total magnesium of 1.78 %, 1.68 %, 1.52 % from vermicompost produced by *Eudrilus eugeniae*, *Perionyx excavatus* and *Lampito mauritii* utilizing Paddy straw (predigested with *Trichoderma viride*) in 50:50 concentration.

#### **C:N ratio**

The carbon nitrogen ratio was analysed to assess the maturity of organic waste decomposition. Significant reduction in C:N ratio was observed in compost 8 (Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) when compared to raw sample. The initial C:N ratio value was 108:1 (raw fruit waste), 117:1 (raw vegetable waste) which was reduced to 16:1 in C8 and 19:1 in C4 respectively.

The present finding correlated with Sundaram and Vincent, (2017) who revealed that C:N ratio decreased drastically in all the treatments throughout the composting period. The treatments T2 (Sludge + cow dung) and T5 (Sludge + coir pith+ cow dung) showed an ideal C:N ratio for good growth parameters on the yield of cowpea.

The C:N ratio of initial cattle dung was 34.53 and as the composting process the C:N ratio was decreased to 33.79 in final vermicompost (Bhat *et al.*, 2017). Vermicompost generated from the studies had a C: N ratio of between 10:1 and 12:1. Both vermicompost and control showed a decreasing trend (Viji and Neelanarayanan, 2014).

The results were comparable with Chin *et al.*, (2020) who found that after 4 weeks of co-composting, C/N ratio was less than 20 for a mixture of 50% Empty fruit bunch + 25% Coffee ground + 25% Pailm oil mill sludge, while the other treatments required longer composting times.

## 4.3 FT-IR (Fourier Transform Infrared Spectroscopy) Analysis

Table – 3

## FT-IR peak of raw and composted Vegetable and Fruit waste

Observed IR frequency (cm <sup>-1</sup> ) and Peak assignment						
RFW	WC8	SC8	RVW	WC4	SC4	Characteristic group
3417	3387	3402	3541	3402	3325	O-H stretching
2931	2831	2823	2916	2839	2908	C-H Stretching
1612	1604	1597	1635	1581	1604	C=H Stretching
1033	1018	1018	1026	1018	1026	C-O-C bending
671	652	655	694	617	648	C-Cl stretching

RFW- Raw Fruit Waste

WC8- Fruit waste composted in winter with consortium of fungus

SC8- Fruit waste composted in summer with consortium of fungus

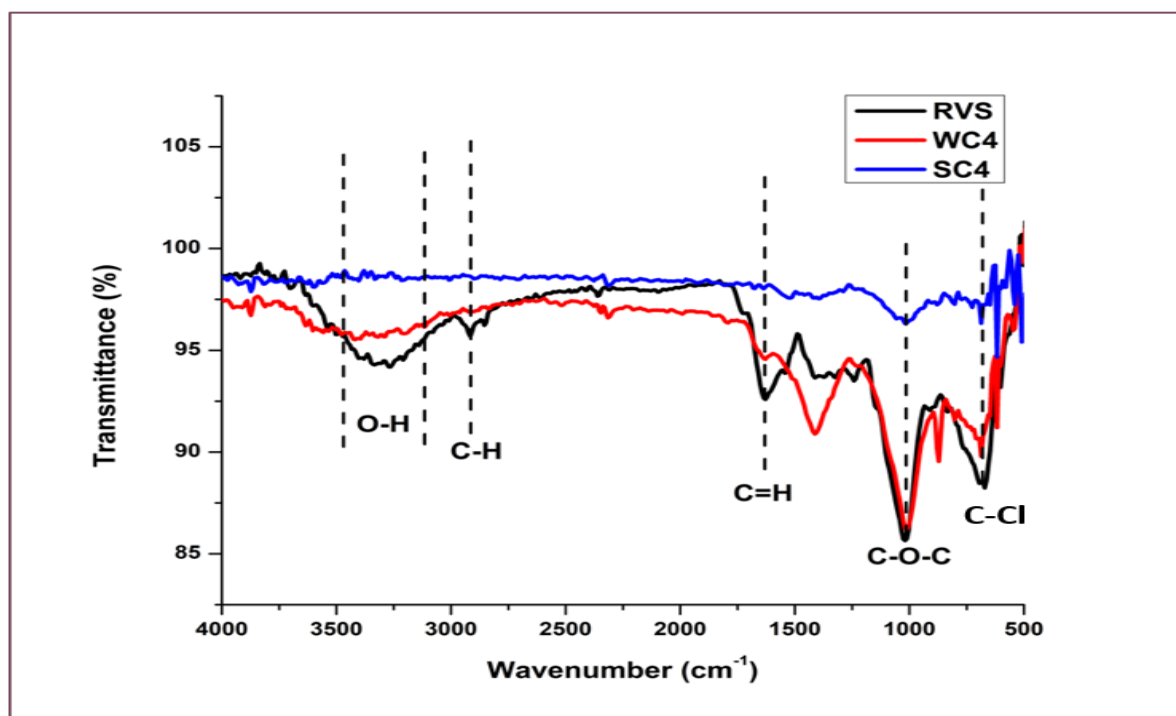
RVW- Raw Vegetable Waste

WC4- Vegetable waste composted in winter with consortium of fungus

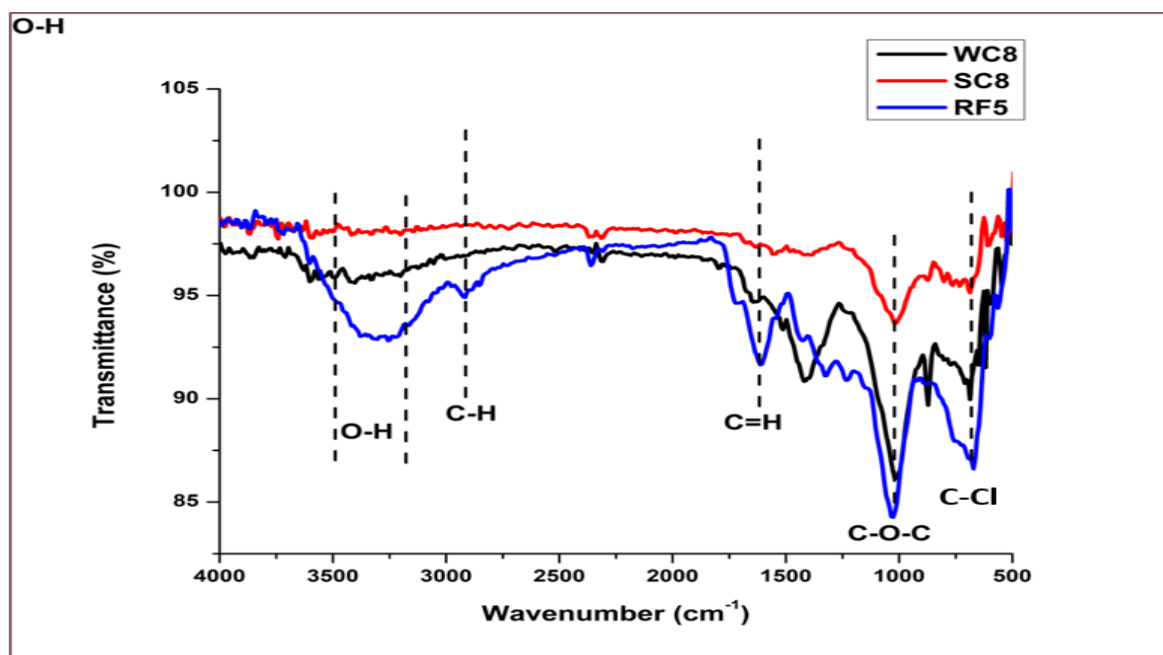
SC4- Vegetable waste composted in summer with consortium of fungus

Figure - VII

## FT-IR peak of raw and composted Vegetable waste



**Figure -VIII**  
**FT-IR peak of raw and composted Fruit waste**



The raw vegetable and fruit waste and Best treatment i.e. Compost 8 and Compost 4 of both the season were subjected for FT-IR studies. The FT-IR peak obtained for raw vegetable and fruit waste, Compost 8 as well as Compost 4 are shown in Table – 3, Figure – VII & VIII.

All the samples RVW, WC4, SC4, WC8, SC8 and RFW showed a OH, CH, C=C, C-O and C-C groups in FT-IR analysis. The characteristic IR band at 3500-3000 cm<sup>-1</sup> confirm the presence of O-H (stretching) with abundant amino or amines group. This O-H (stretching) indicates alcohol molecules and phenol. Further, the C-H (stretching) groups due to organic stabilization were confirmed by IR absorption range from 3000-2500 cm<sup>-1</sup> which depict the aliphatic compound and presence of alkyne or alkene molecules in the samples. Followed by the 1750-1500 cm<sup>-1</sup> absorption indicate the presence of C-O (stretching) is the aromatic ester and amides. The distinct peak at 1500-1000 cm<sup>-1</sup> consist of C=O stretching of polysaccharides, C-O-C of carbohydrate and confirm the presence of aliphatic amides. The halo compounds of the samples were confirmed at 750-500 cm<sup>-1</sup> for C-Cl (Stretching).

Similar result was obtained by Arumugam *et al.*, (2018) who stated that FT-IR spectra comparison of cellulose, paper cup, Vermicompost and Vermicompost with bacterial consortium were studied and the presence of hydrogen bonded (O-H) stretch is indicated by

the stretch of vibration in the range between 3100 and 3600  $\text{cm}^{-1}$ , while the peak intensity at 3423  $\text{cm}^{-1}$  decreases in VC cowdung + paper cup waste + earthworm (*Eudrilus eugeniae*) and VCB- cowdung + paper cup waste + earthworm (*Eudrilus eugeniae*) + microbial consortia when compared to paper cup (PC).

During vermicomposting process, the FT-IR spectroscopy is used to confirm the decomposition of polypeptides, polysaccharides, aliphatic, aromatic, carboxylic, phenolic groups and lignin (Bhat *et al.*, 2017).

The increase in pH, EC and available NPK levels were probably due to the production of  $\text{NH}_4$  during proteolysis by microbes and also due to progressive increase in mineral constituents of vegetable and fruit waste compost incorporation into the soil. A decrease in C: N ratio indicate an increase in the degree of humification of organic waste and also due to the losses of carbon mainly as carbon dioxide due to respiratory activities of earthworms and associated microflora and simultaneously adding of nitrogen in substrate material by inoculated earthworms lowers the C: N ratio. It might also due to composted treatment which contained efficient decomposing organisms and it enhanced carbon oxidation and mineralization. The low C: N ratio indicated stabilization, maturity and the value of the decomposed vegetable and fruit waste biocompost.

## PHASE II

### 4.4 Pot culture experiments

A pot culture was conducted with black gram [*Vigna mungo* (L.) Hepper] Var Co 6 and Lablab [*Lablab purpureus* (L.) Sweet] Var Co (Gb) 14 grown in winter and summer season compost as test crops to estimate the effect of different biocompost prepared from vegetable and fruit waste. The treatments were named as  $T_1$  to  $T_8$  and were compared against Control (only soil).

Biometric parameters, biochemical analysis, yield parameter, leghaemoglobin content of Black gram and Lablab grown in winter and summer season compost were recorded at different time interval of 15 DAS, 35 DAS, 55 DAS and 75 DAS (Day After Sowing).

#### 4.4.1 BIOMETRIC CHARACTERS

##### 4.4.1.1 Influence of Vegetable and Fruit waste composted in winter on the vegetative parameters of test crops (Table-4, 5, 6 & 7, Plate-7, 8, 9 & 10)

###### 4.4.1.1a Shoot length

###### **Black gram [*Vigna mungo* (L.) Hepper]**

A gradual increase in shoot length was noted in all the treatments (Table-4, Plate- 7 & 8). Among all the treatment a maximum shoot length was obtained in T<sub>8</sub> (Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha), T<sub>4</sub> (Vegetable waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) and T<sub>7</sub> (Fruit waste composted by using *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) on 15 DAS (56.50 cm, 49.60 cm and 39. 80 cm) when compared to Control (20.08 cm). On 35 and 55 DAS, significant increase in shoot length was noted in T<sub>8</sub> treatment (58.13 cm and 65.60 cm) and T<sub>4</sub> treatment (55.00 cm and 59.80 cm) followed by other treatment and Control (24.03 cm and 32.70 cm) respectively.

###### **Lablab [*Lablab purpureus* (L.) Sweet]**

An increase in shoot length was observed from 15 to 55 DAS in all the treatments when compared to Control (Table- 5, Plate- 9 & 10). Among all the treatments, a significant increase in shoot length was obtained in T<sub>8</sub> (Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha), T<sub>4</sub> (Vegetable waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha), T<sub>7</sub> (Fruit waste composted by using *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) and T<sub>3</sub> (Vegetable waste composted by using *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) on 15 DAS (113.70 cm, 86.80 cm, 77.50 cm and 74.05 cm), 35 DAS (124.50 cm, 98.03 cm, 88.72 cm and 81.10 cm) and 55 DAS (135.03 cm, 109.02 cm, 96.08 cm and 92.05 cm) respectively. The shortest shoot length was noted in Control treatment (41.20 cm, 63.55 cm and 76.50 cm) on 15, 35 and 55 Days after sowing respectively.

The results are in line with Kamble *et al.*, (2016) who found that treatment T<sub>3</sub>- 100% NPK+ PM at 5 t ha<sup>-1</sup> resulted in maximum plant height value of 37.30 cm and yield attributing value of 12.83 cm for pod length and 0.93 cm for pod diameter

(42.18). Treatment T<sub>16</sub> - FYM @ 25 t ha<sup>-1</sup> had the lowest growth character in French bean. According to Coulibaly *et al.*, (2019) the compost made from pig waste obtained the tallest plant height (70.19 cm) that was followed by the compost made from chicken waste (51.4 cm) and the shortest plant (22.45 cm) was observed in Control on 45 days.

Senevirathne *et al.*, (2019) reported that T<sub>4</sub> treatment (6th week after planting) showed the highest plant height of 33.63 cm, whereas the lowest plant height was noted in T<sub>6</sub> treatment of 32.57 cm in *Glycine max*.

#### **4.4.1.1a Root length**

##### **Black gram [*Vigna mungo* (L.) Hepper]**

A gradual increase in the root length was noted in all the treatments (T<sub>1</sub>-T<sub>8</sub>) when compared to Control from 15 DAS to 55 DAS as shown in Table -4.

A significant increase in root length was obtained in T<sub>8</sub>- Fruit waste + *Pleurotus eous* + *Trichoderma asperelloides* + cow dung + *Eudrilus eugeniae* (5 t/ha) (12.20 cm, 15.20 cm and 17.10 cm) and T<sub>4</sub>- Vegetable waste + *Pleurotus eous* + *Trichoderma asperelloides* + cow dung + *Eudrilus eugeniae* (5 t/ha) (11.98 cm, 14.02 cm and 14.52 cm) followed by other treatments and Control (4.20 cm, 4.83 cm and 5.10 cm) on 15, 35 and 55 DAS.

##### **Lablab [*Lablab purpureus* (L.) Sweet]**

As presented in Table- 5, Plate- 9 & 10, gradual increased in root length was observed in all the treatments. On 15 DAS and 35 DAS, the root length of lablab was highest in T<sub>8</sub> treatment (13.20 cm and 19.30 cm), T<sub>4</sub> treatment (10.09 cm and 18.55 cm) followed by T<sub>7</sub> treatment (9.40 cm and 11.08 cm) and Control (5.70 cm and 6.30 cm). On 55 DAS, maximum root length was obtained in treatment T<sub>8</sub> treatment (27.02 cm) followed by T<sub>4</sub> treatment (23.56 cm) when compared to Control (7.02 cm) respectively.

The current study agrees with Silpa and Vijayalakshmi, (2020) finding that application of T<sub>4</sub> treatment (cocoa shell compost) improved cowpea shoot and root length as compared to control.

TABLE - 4

Effect of winter composted Vegetable and Fruit waste on vegetative parameter of Black gram [*Vigna mungo* (L.) Hepper]

Treatment	Shoot length (cm)			Root length (cm)			Number of Leaves		
	15 DAS	35 DAS	55 DAS	15 DAS	35 DAS	55 DAS	15 DAS	35 DAS	55 DAS
C	20.08	24.03	32.70	4.20	4.83	5.10	5.03	6.10	10.04
T <sub>1</sub>	28.50	27.00	42.20	5.90	5.60	5.20	7.00	10.08	11.12
T <sub>2</sub>	29.00	30.80	47.20	6.50	11.00	7.10	12.20	12.02	14.32
T <sub>3</sub>	39.30	35.20	45.00	7.50	8.40	12.50	10.01	11.41	17.16
T <sub>4</sub>	49.60	55.00	59.80	11.98	14.02	14.52	13.10	15.19	19.00
T <sub>5</sub>	27.82	29.00	40.40	7.15	7.50	9.58	9.04	9.20	11.27
T <sub>6</sub>	29.40	32.50	53.40	7.90	5.36	13.30	11.20	11.04	15.08
T <sub>7</sub>	39.80	46.90	61.50	9.93	13.00	12.80	12.33	14.22	18.41
T <sub>8</sub>	56.50	58.13	65.60	12.20	15.20	17.10	14.12	18.15	20.09
SEd	1.26250			1.07634			1.61207		
CD (P<0.05)	2.53117			2.15795			3.23201		
CD (P<0.01)	3.37325**			2.87586**			4.30725**		

\*\* - significant at 1% (P<0.01), DAS- Days After Sowing

C- Control

T<sub>1</sub>- V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub>- V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub>- V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub>- V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub>- F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub>- F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub>- F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

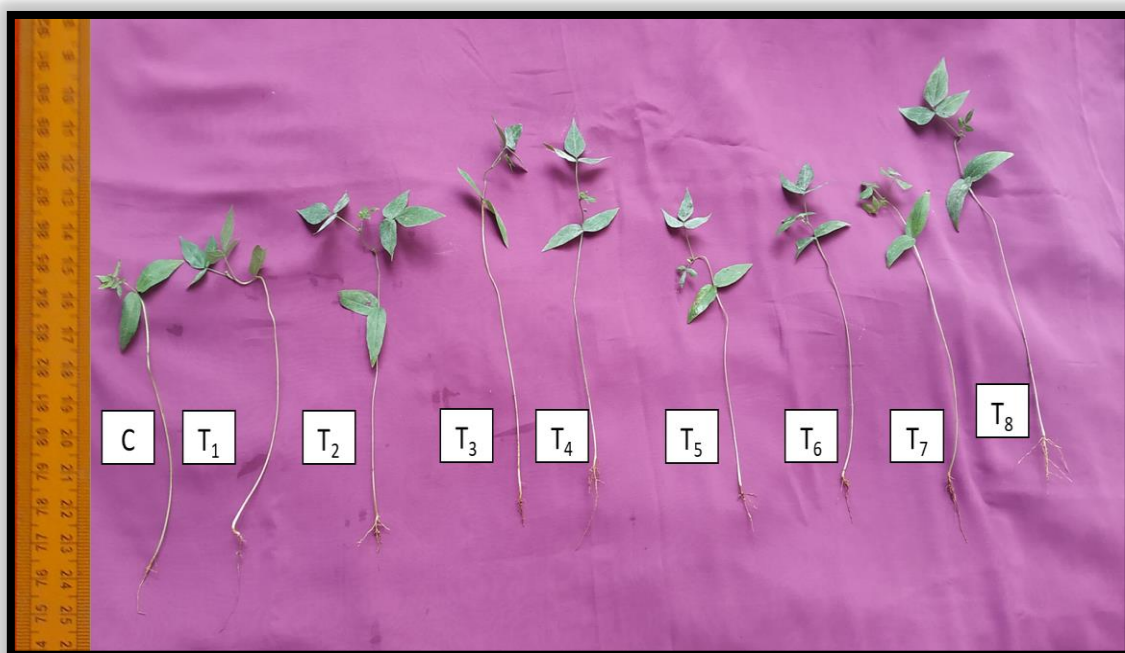
T<sub>8</sub>- F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

PLATE – 7

Effect of winter composted Vegetable and Fruit waste on vegetative parameter of Black gram [*Vigna mungo* (L.) Hepper] on 15 DAS



15 DAS



**PLATE – 8**  
**Effect of winter composted Vegetable and Fruit waste on vegetative parameter of**  
**Black gram [*Vigna mungo* (L.) Hepper] on 35 and 55 DAS**  
**35 DAS**



**55 DAS**



C – Control,

T<sub>1</sub>- V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub>- V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub>- V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub>- V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub>- F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub>- F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub>- F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub>- F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

The results was positively compared with Vijayalakshmi, (2011) observation that pressmud 5 mg + 1% IAA application increased plant root length (27.50 cm) in *Lablab purpureus*.

#### **4.4.1.1c Number of leaves**

##### **Black gram [*Vigna mungo* (L.) Hepper]**

As shown in Table- 4, Plate- 7 & 8, among all the treatment, maximum number of leaves/ plant was recorded in T<sub>8</sub> (Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) followed by T<sub>4</sub> (Vegetable waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) on 15 DAS (14.12, 13.10), 35 DAS (18.15, 15.19) and 55 DAS (20.09, 19.00) respectively. Least number of leaves/ plant was noted in Control (5.03, 6.10 and 10.04) on 15, 35 and 55 DAS respectively.

##### **Lablab [*Lablab purpureus* (L.) Sweet]**

As presented in Table- 5, Plate- 9 & 10, highest number of leaves obtained in T<sub>8</sub>- Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) of 22.00, 39.00 and 48.00), T<sub>4</sub>- Vegetable waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) of 21.00, 35.00 and 44.00) followed by T<sub>7</sub> - Fruit waste composted by using *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) of 20.00, 32.00 and 40.00 on 15, 35 and 55 DAS respectively. Lowest number of leaves/ plant was noted in Control (9.00, 18.00 and 26.00) on 15, 35 and 55 DAS.

The findings of the study are consistent with those of Naik *et al.*, (2018) who showed that the ornamental sunflower treatment M1 (with mulch) + S1 (60 cm x 40 cm) + F1 (40:60:40 NPK kg ha<sup>-1</sup>) produced the maximum leaves (26.93).

Singh *et al.*, (2018) observed a similar outcome, noting that T8 (75 percent RDF plus 12.5% FYM and 12.5% VC) had the most leaves per plant (97.80, 94.00, and 93.20), followed by T3 (RDF plus 10 tones VC) and T9 (50 percent RDF plus 25% FYM and 25% VC).

The current finding is consistent with that of Rekha *et al.*, (2018) who found that a 50% vermicompost treatment increased the number of leaves on the chilli plant (8.3, 13.0, 16.7, 17.9, and 25) from the 1<sup>st</sup> to the 5<sup>th</sup> week.

#### 4.4.1.1d Number of flowers/ plant

##### **Black gram [*Vigna mungo* (L.) Hepper]**

Number of flowers/ plant in black gram was obtained highest in T<sub>8</sub>- Fruit waste + *Pleurotus eous* + *Trichoderma asperelloides* + cow dung + *Eudrilus eugeniae* (5 t/ha) (13.00) followed by T<sub>4</sub> - Vegetable waste + *Pleurotus eous* + *Trichoderma asperelloides*, + cow dung + *Eudrilus eugeniae* (5 t/ha) (11.00) as compared to Control (2.66) on 55 Day After Sowing respectively (Table -6).

##### **Lablab [*Lablab purpureus* (L.) Sweet]**

As shown in Table - 7, number of flowers/ plant was maximum in application of treatment T<sub>8</sub>- (Fruit waste composted by using consortium of fungus, cow dung and *Eudrilus eugeniae* (5 t/ha) followed by T<sub>4</sub> treatment (Vegetable waste + combination of *Pleurotus eous* and *Trichoderma asperelloides* + cow dung + *Eudrilus eugeniae* (5 t/ha) on 55 DAS (21.00 and 19.00) as compared to Control (9.00) respectively.

A similar work was done by Saraswathy and Prabhakaran, (2014) who obtained the maximum number of flowers / plant (43.45), number of fruits / plant (36.57) and fruit weight (71.65 g) with the application of vermicompost (10.5 t / ha) + Recommend Dose of Fertilizer (20%) treatment over control in tomato plant.

The results are in line with those of Sakthivigneswari and Vijayalakshmi, (2016) who found that pre-digested coirpith together with earthworms and *Pleurotus sajor-caju* compost (T<sub>6</sub>) application significantly increased the number of flowers (28.67) per plant when compared to the control (6.33) in black nightshade.

Similar result was observed by Chaudhary and Mishra, (2019) who noted highest number of flowers with KWC 60% + 40% soil (T<sub>3</sub>) followed by T<sub>1</sub>- KWC 20% + 80% soil, T<sub>2</sub>- KWC 40% + 60% soil and C<sub>1</sub> (Control)- 100% soil on 50, 75 and 110 days in tomato.

The results is in par with El-Goud and Amal, (2020) who reported that the highest number of flowers/ plant (4.67) in T<sub>1</sub> (vermicast 6.5 t/fed. + vermitea 4 times) followed by T<sub>2</sub> (vermicast 6.5 t/fed. + vermitea 3 times) of 4.33 and least was noted in C<sub>7</sub>- Control (0.67) in black eggplant (*Solanum melongena*, L.)

TABLE - 5

Effect of winter composted Vegetable and Fruit waste on vegetative parameter of Lablab [*Lablab purpureus* (L.) Sweet]

Treatment	Shoot length (cm)			Root length (cm)			Number of Leaves		
	15 DAS	35 DAS	55 DAS	15 DAS	35 DAS	55 DAS	15 DAS	35 DAS	55 DAS
C	41.20	63.55	76.50	5.70	6.30	7.02	9.00	18.00	26.00
T <sub>1</sub>	64.31	66.20	78.01	6.02	7.40	9.00	14.00	22.00	28.00
T <sub>2</sub>	65.50	72.00	85.06	7.50	8.20	10.52	17.00	24.00	29.00
T <sub>3</sub>	74.05	81.10	92.05	7.30	9.03	11.80	18.00	26.00	35.00
T <sub>4</sub>	86.80	98.03	109.02	10.09	18.55	23.56	21.00	35.00	44.00
T <sub>5</sub>	66.25	79.08	90.08	7.00	7.60	10.01	16.00	21.00	27.00
T <sub>6</sub>	69.00	75.70	78.10	8.25	9.54	12.35	19.00	28.00	34.00
T <sub>7</sub>	77.50	88.72	96.08	9.40	11.08	14.00	20.00	32.00	40.00
T <sub>8</sub>	113.70	124.50	135.03	13.20	19.30	27.02	22.00	39.00	48.00
SEd	0.51334			0.43876			0.53672		
CD (P<0.05)	1.02919			0.87966			1.07606		
CD (P<0.01)	1.37159**			1.17231**			1.43404**		

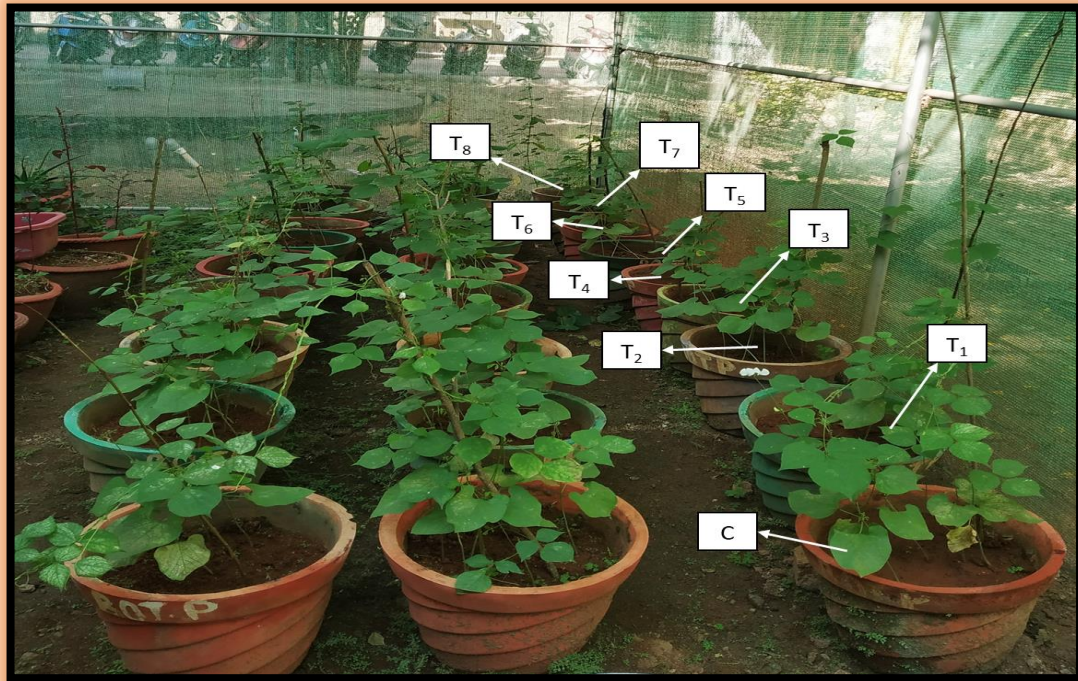
\*\* - significant at 1% (P&lt;0.01), DAS - Days After Sowing

C - Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

PLATE – 9

Effect of winter composted Vegetable and Fruit waste on vegetative parameter of Lablab [*Lablab purpureus* (L.) Sweet] on 15 DAS



15 DAS



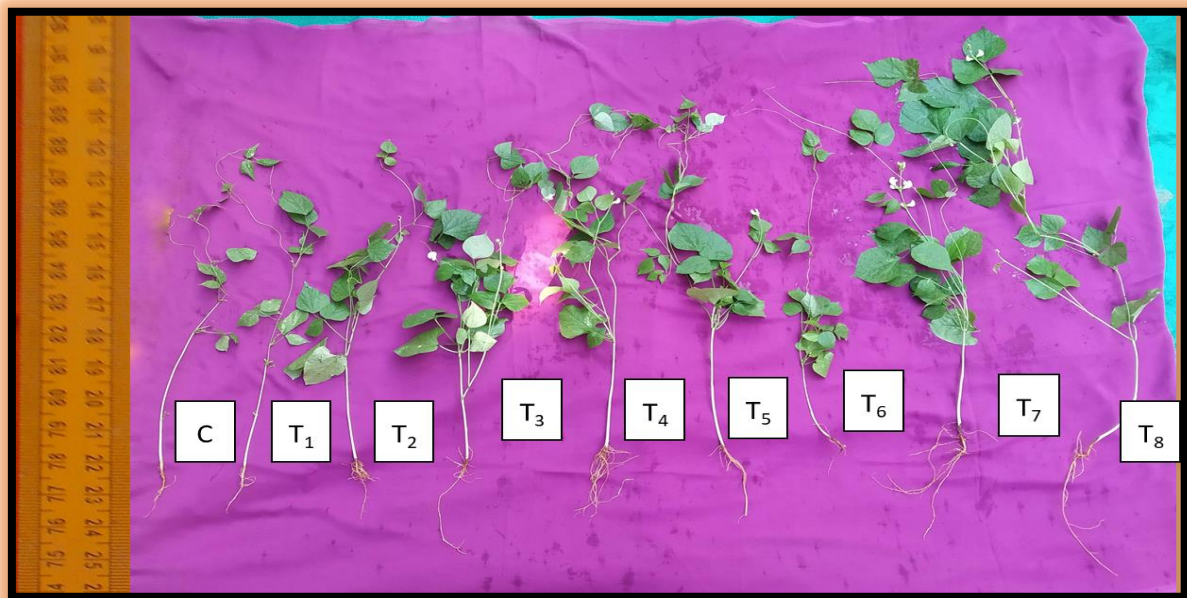
PLATE – 10

Effect of winter composted Vegetable and Fruit waste on vegetative parameter of Lablab [*Lablab purpureus* (L.) Sweet] on 35 and 55 DAS

35 DAS



55 DAS



C – Control,

T<sub>1</sub>- V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub>- V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub>- V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub>- V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub>- F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub>- F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub>- F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub>- F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

#### 4.4.1.1e Number of nodules

##### Black gram [*Vigna mungo* (L.) Hepper]

Gradual increase in number of nodules from 25 to 50 DAS was noted as depicted in Table-6. Maximum number of nodules was observed in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) and T<sub>6</sub>- (Fruit waste + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha) on 25 DAS (15.00, 12.00 and 10.00) and 50 DAS (20.00, 18.00 and 16.00) respectively. The least number of nodules was noticed in Control (4.00 and 7.00) on 25 DAS and 50 DAS respectively.

##### Lablab [*Lablab purpureus* (L.) Sweet]

As presented in Table-7, a significant increase in number of nodules from 25 DAS to 50 DAS was obtained in T<sub>8</sub>- Fruit waste composted by using consortium of fungus, cow dung and *Eudrilus eugeniae* (5 t/ha) (24.07 to 30.00) followed by T<sub>4</sub>- Vegetable waste composted by using consortium of fungus, cow dung and *Eudrilus eugeniae* (5 t/ha) (19.10 to 26.00) and T<sub>7</sub>- Fruit waste composted by using *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) (14.00 to 23.16) respectively.

The present findings agreed with the study of Chaudhari *et al.*, (2013) who found that combination of vermicompost and panchagavya (4%) as a soil supplement significantly enhanced the number of nodules in summer green gram on 30 DAS.

The study is in par with Meena *et al.*, (2016) who stated that number of nodules per plant were recorded in 125% recommended dose of fertilizer (5.1 and 7.2) as compared to 100% recommended dose of fertilizer (5.1 and 6.1) at 60 and 90 DAS.

This result was supported by the work of Premalatha *et al.*, (2017) who confirmed significantly higher number of nodule (12 plant<sup>-1</sup>) registered in the treatment of 100% leaf litter compost with 75% leaf litter compost.

#### 4.4.1.1f Fresh weight and Dry weight

##### Black gram [*Vigna mungo* (L.) Hepper]

As shown in Table- 6, increasing trend in fresh weight and dry weight from 15 DAS to 55 DAS was observed in all the treatment. A significant increase in fresh weight was noted in combined application of fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) (T<sub>8</sub>), T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus*

*eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) followed by fruit waste + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) (T<sub>7</sub>) on 15 DAS (1.863g, 1.176g, 0.931g), on 35 DAS (1.885g, 1.490g, 1.364g) and 55 DAS (1.938g, 1.763g, 0.1750g) as compared to Control (0.350g, 0.355g, 0.573g) respectively.

The highest dry weight was obtained in T<sub>8</sub>- Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 0.420g, 0.512g and 0.625g followed by treatment T<sub>4</sub>- Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 0.286g, 0.384g and 0.518g and T<sub>7</sub>- Fruit waste + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 0.230g, 0.324g and 0.449g over Control (0.072g, 0.078g and 0.119g) on 15, 35 and 55 DAS respectively.

#### **Lablab [*Lablab purpureus* (L.) Sweet]**

The plant fresh weight increase significantly in T<sub>8</sub>- Fruit waste composted by using consortium of fungus, cow dung and *Eudrilus eugeniae* (5 t/ha) (4.911g, 15.693g and 21.244g) followed by T<sub>4</sub>- Fruit waste composted by using consortium of fungus, cow dung and *Eudrilus eugeniae* (5 t/ha) (4.044g, 8.523g and 13.048g) and other treatments when compared to Control (1.117g, 1.520g and 2.714g) on 15, 35 and 55 Day after sowing respectively (Table-7).

A maximum dry weight was registered in T<sub>8</sub> treatment followed by T<sub>4</sub> treatment and T<sub>7</sub> treatment on 15 DAS (0.652g, 0.554g and 0.456g), 35 DAS (2.156g, 1.526g and 1.523g) and 55 DAS (3.234g, 2.309g and 2.021g) whereas lowest dry weight was noted in Control (0.124g, 0.260g and 0.375g) respectively

The results are consistent with Sharma *et al.*, (2019) who reported that highest fresh and dry weight of plants (3.44 and 1.40g) was noted in T<sub>7</sub> treatment followed by T<sub>6</sub> (2.43 and 0.35g) and T<sub>1</sub> (1.76 and 0.15g) in *Spinacia oleracea*.

The study reported by Al-Sabbagh *et al.*, (2020) the maximum fresh weight of Chinese kale was recorded in Market compost (0.276 gms) grown plants followed by Ecodrum (0.271 gms), when compared to control (0.133 gms) respectively. Similar findings were reported by Silpa and Vijayalakshmi, (2020) who found that T<sub>4</sub> significantly increased the fresh weight of 7.195 g, 8.186 g and 12.555 g and dry weight of 1.277 g, 1.465 g and 2.254 g when compared to control (1.053 g, 1.077 g and 1.856 g) and (0.494 g, 0.604 g and 0.819 g) on 25, 35 and 45 DAS in cowpea.

TABLE - 6

Influence of winter composted Vegetable and Fruit waste on vegetative parameter of Black gram [*Vigna mungo* (L.) Hepper]

Treatments	No. of flowers	No. of Nodules		Fresh weight (g)			Dry weight (g)		
	55 DAS	25 DAS	50 DAS	15 DAS	35 DAS	55 DAS	15 DAS	35 DAS	55 DAS
C	2.66	4.00	7.00	0.350	0.355	0.573	0.072	0.078	0.119
T <sub>1</sub>	5.00	6.00	9.00	0.403	0.518	0.951	0.104	0.140	0.221
T <sub>2</sub>	4.00	7.00	12.00	0.508	0.958	1.311	0.135	0.235	0.318
T <sub>3</sub>	7.00	5.00	14.00	0.866	1.039	1.481	0.214	0.254	0.382
T <sub>4</sub>	11.00	12.00	18.00	1.176	1.490	1.763	0.286	0.384	0.518
T <sub>5</sub>	3.00	8.24	13.00	0.723	0.920	1.033	0.144	0.226	0.252
T <sub>6</sub>	9.00	10.00	16.00	0.901	1.125	1.562	0.220	0.279	0.430
T <sub>7</sub>	10.00	9.00	15.00	0.931	1.364	1.750	0.230	0.324	0.449
T <sub>8</sub>	13.00	15.00	20.00	1.863	1.885	1.938	0.420	0.512	0.625
SEd	1.2191	0.92741		0.02580			0.00174		
CD (P<0.05)	2.5612	1.88108		0.05172			0.00349		
CD (P<0.01)	3.5096**	2.52229**		0.06893**			0.00466**		

\*\* - significant at 1% (P&lt;0.01), DAS - Days After Sowing

C - Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

TABLE - 7

Influence of winter composted Vegetable and Fruit waste on vegetative parameter of Lablab [*Lablab purpureus* (L.) Sweet]

Treatments	No. of flowers	No. of Nodules		Fresh weight (g)			Dry weight (g)		
	55 DAS	25 DAS	50 DAS	15 DAS	35 DAS	55 DAS	15 DAS	35 DAS	55 DAS
C	9.00	6.00	9.00	1.117	1.520	2.714	0.124	0.260	0.375
T <sub>1</sub>	10.00	8.02	12.30	2.236	2.345	3.238	0.238	0.352	0.463
T <sub>2</sub>	13.00	7.00	15.00	2.764	4.523	7.501	0.217	0.685	1.433
T <sub>3</sub>	14.00	10.20	19.22	3.417	6.952	12.352	0.291	0.586	1.983
T <sub>4</sub>	19.00	19.10	26.00	4.044	8.523	13.048	0.554	1.526	2.309
T <sub>5</sub>	12.00	11.32	18.10	3.340	4.655	9.191	0.302	0.865	1.434
T <sub>6</sub>	15.00	8.06	14.05	3.216	3.765	8.569	0.330	0.452	0.525
T <sub>7</sub>	17.00	14.00	23.16	4.032	5.635	11.761	0.456	1.523	2.021
T <sub>8</sub>	21.00	24.07	30.00	4.911	15.693	21.244	0.652	2.156	3.234
SEd	1.6555	1.03040		0.12905			0.04728		
CD (P<0.05)	3.4782	2.08999		0.25873			0.09480		
CD (P<0.01)	4.7661**	2.80241**		0.34481**			0.12633**		

\*\* - significant at 1% (P&lt;0.01), DAS - Days After Sowing

C - Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

#### 4.4.1.2 Influence of Vegetable and Fruit waste composted in summer on the vegetative parameters of test crops (Table- 8, 9, 10 & 11, Plate- 11, 12, 13 & 14)

##### 4.4.1.2a Shoot length

###### Black gram [*Vigna mungo* (L.) Hepper]

A significant increase in shoot length was obtained in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + and *Eudrilus eugeniae* (5 t/ha) as shown in Table- 8, Plate –11 & 12, which is followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) and T<sub>7</sub> (Fruit waste + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) on 15 DAS (56.90 cm, 44.12 cm, 40.25 cm), 35 DAS (62.10 cm, 56.20 cm, 48.05 cm) and 55 (71.50 cm, 64.20 cm, 62.55 cm) Days after sowing whereas lowest shoot length was observed in Control on 15 DAS (21.80 cm), 35 DAS (29.70 cm) and 55 DAS (38.50 cm) respectively.

###### Lablab [*Lablab purpureus* (L.) Sweet]

As inferred in Table- 9, Plate- 13 & 14, highest shoot length (118.20 cm, 129.20 cm and 140.45 cm) was recorded in T<sub>8</sub> (Fruit waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) and T<sub>4</sub> (Vegetable waste composted by using *Pleurotus eous*, *Trichoderma asperelloides*, cow dung and *Eudrilus eugeniae* (5 t/ha) (89.24 cm, 98.72 cm and 111.25 cm) followed by T<sub>7</sub> (78.91 cm, 85.57 cm and 98.32 cm) when compared to Control (42.20 cm, 65.42 cm and 79.80 cm) on 15, 35 and 55 DAS respectively

The results coincide with Dey *et al.*, (2019) the highest shoot length (cm) was observed in treatments S4 (86.6) which is followed by other treatment when compared to control (49.6) and root length had a significant increase in S4 (41) over control (21.3) respectively. Using kitchen waste compost, the plant height of treated plants (T1, T2, and T3) reported significant on 25th day and 50th day, but only T3 remained high till 135th Day in tomato plant (Chaudhary and Mishra, 2019).

The findings are consistent with those of Sutar *et al.*, (2019) who found that cowpea plants treated with jeevamrutha at 1000 per hectare grew taller, had more branches, and had more leaves than controls.

##### 4.4.1.2b Root length

###### Black gram [*Vigna mungo* (L.) Hepper]

A gradual increase in root length from 15 to 55 DAS was noted in all the treatments as shown in Table- 8, Plate- 11 & 12. The treatment T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus*

*eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) showed the highest root length on 15 DAS (14.50 cm), 35 DAS (17.20 cm) and 55 DAS (18.52 cm) whereas shortest root length was observed in Control (4.60 cm, 6.20 cm and 6.92 cm) respectively.

#### **Lablab [*Lablab purpureus* (L.) Sweet]**

Maximum root length in the plant was obtained in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) and T<sub>7</sub> (Fruit waste + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) on 15 DAS (15.48 cm, 12.62 cm, 10.29 cm), 35 DAS (22.80 cm, 20.20 cm, 11.70 cm) and 55 DAS (28.50 cm, 24.45 cm, 15.27 cm) while the lowest root length was registered in Control (5.90 cm, 6.80 cm, 7.22 cm) as compared to other treatments respectively (Table- 9, Plate- 13 & 14).

The results are comparable to Dhanalakshmi *et al.*, (2014) who reported that okra (7.07, 9.13, 13.03 cm) and chilli (5.80, 7.60, 10.90 cm) both had significant increases in root length on 30, 60, and 90 Days after planting when treated with 50% vermicompost + soil. Vermicompost had a significant impact on the number of branches and leaves when compared to control.

The results is consistent with the finding of Gayathri *et al.*, (2016) who investigated on plant growth parameters such as shoot length, root length and leaf diameter after 15 and 25 days and observed that growth rate increases when treated with vegetable compost than control plants of Tomato, French bean, and Lady's finger.

Similar findings were reported by Gayathri and Sowntharya, (2019) who observed that on 60<sup>th</sup>, 75<sup>th</sup> and 90<sup>th</sup> days, plants treated with VAM fungus showed higher roots length in chilli plant.

#### **4.4.1.2c Number of leaves**

##### **Black gram [*Vigna mungo* (L.) Hepper]**

Number of leaves/ plant was more in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha), T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) followed by T<sub>6</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha) on 15 DAS (16.24, 15.20, 13.05) and 35 DAS (20.09, 17.10, 15.21) respectively whereas on 55 DAS (21.09, 20.24) and T<sub>7</sub> (18.32) as presented in Table- 8.

TABLE - 8

Effect of summer composted Vegetable and Fruit waste on vegetative parameter of Black gram [*Vigna mungo* (L.) Hepper]

Treatment	Shoot length (cm)			Root length (cm)			Number of Leaves		
	15 DAS	35 DAS	55 DAS	15 DAS	35 DAS	55 DAS	15 DAS	35 DAS	55 DAS
C	21.80	29.70	38.50	4.60	6.20	6.92	7.12	8.10	11.16
T <sub>1</sub>	28.91	30.03	43.28	6.53	6.71	7.34	8.05	10.15	12.20
T <sub>2</sub>	30.24	32.14	50.33	7.56	10.34	12.31	10.16	11.03	14.07
T <sub>3</sub>	36.93	44.52	48.02	9.39	14.53	14.96	10.23	13.12	15.12
T <sub>4</sub>	44.12	56.20	64.20	14.10	16.30	16.83	15.20	17.10	20.24
T <sub>5</sub>	31.50	34.25	46.23	8.08	9.25	9.87	11.08	12.34	15.10
T <sub>6</sub>	31.82	46.46	55.41	8.25	10.51	14.28	13.05	15.21	17.14
T <sub>7</sub>	40.25	48.05	62.55	11.22	15.27	16.35	12.11	14.17	18.32
T <sub>8</sub>	56.90	62.10	71.50	14.50	17.20	18.52	16.24	20.09	22.19
SEd	2.96265			0.32923			0.53672		
CD (P<0.05)	5.93977			0.66008			1.07606		
CD (P<0.01)	7.91584**			0.87967**			1.43404**		

\*\* - significant at 1% (P&lt;0.01), DAS - Days After Sowing

C - Control

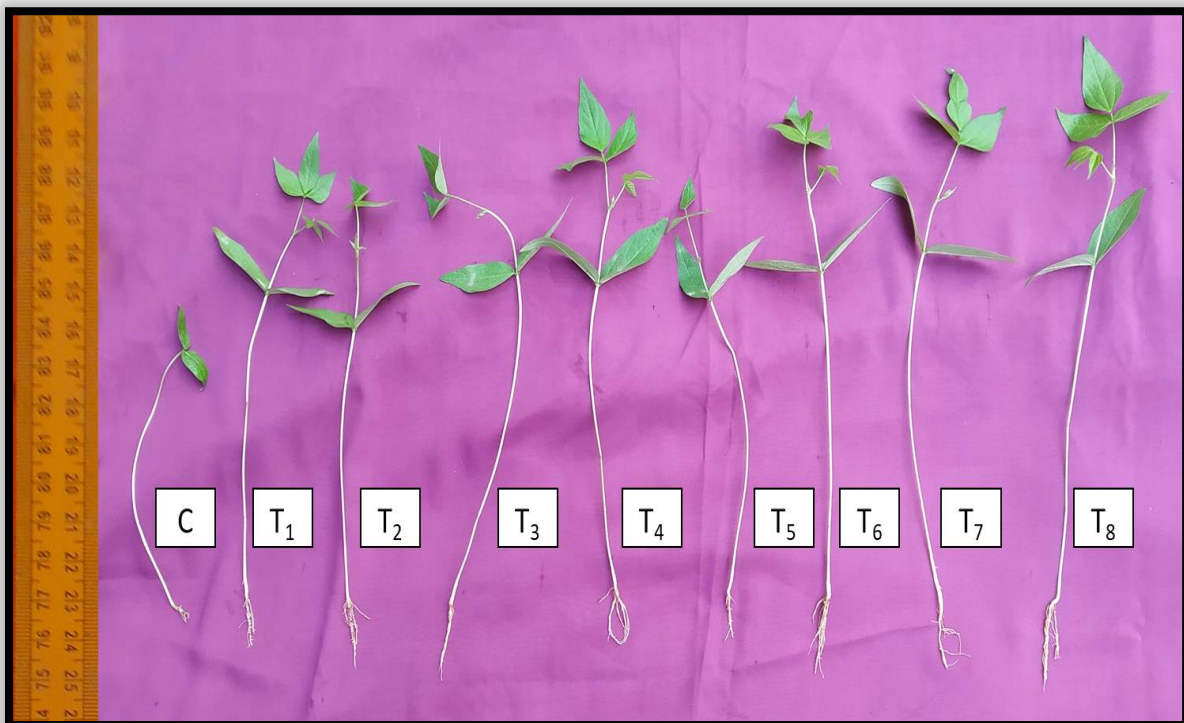
T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

PLATE – 11

Effect of summer composted Vegetable and Fruit waste on vegetative parameter of Black gram [*Vigna mungo* (L.) Hepper] on 15 DAS



15 DAS



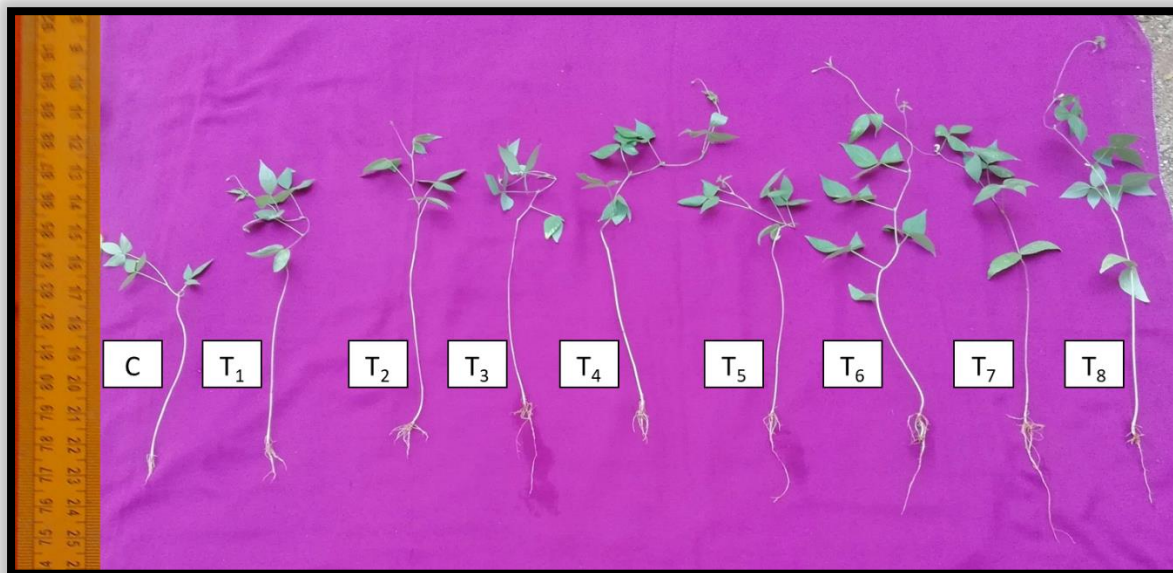
## PLATE – 12

Effect of summer composted Vegetable and Fruit waste on vegetative parameter of Black gram [*Vigna mungo* (L.) Hepper] on 35 and 55 DAS

35 DAS



55 DAS



C – Control,

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

**Lablab [*Lablab purpureus* (L.) Sweet]**

A substantial increase in number of leaves/ plant was reported in combination of fruit waste composted by using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) (T<sub>8</sub>), vegetable waste composted by using cow dung, *Pleurotus eous*, *Trichoderma asperelloides*, and *Eudrilus eugeniae* (5 t/ha) (T<sub>4</sub>) followed by fruit waste composted by using cow dung, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) (T<sub>7</sub>) on 15 (25.00, 23.25, 21.55), 35 (42.20, 38.50, 34.39) and 55 (50.24, 46.13, 41.15) Days after sowing as compared to Control (10.02, 20.32, 28.05) respectively (Table-9).

The present finding was correlates with Gupta *et al.*, (2018) who confirmed that the treatment of vermicompost + soil + recommended dose of NPK (T<sub>3</sub>) significantly increase the number of leaves of Okra plants when comparing between treatment T<sub>1</sub> and T<sub>3</sub>. The findings are consistent with those reported by Coulibaly *et al.*, (2019) who observed that leaves under the ear (6.43) for pig compost, chicken compost (7.25) and control (6.23).

According to Al-Sabbagh *et al.*, (2020) 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.

**4.4.1.2d Number of flowers/ plant****Black gram [*Vigna mungo* (L.) Hepper]**

The number of flowers/ plant reported maximum in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) and T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) followed by T<sub>6</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha) on 55 DAS (18.00, 16.00, 14.00) when compared to Control (5.00) respectively as presented in Table- 10.

**Lablab [*Lablab purpureus* (L.) Sweet]**

As depicted in Table- 11, combined application of Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) (T<sub>8</sub>) showed highest number of flowers/ plant (23.00) followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) (21.00) when compared to Control (10.00) on 55 DAS respectively.

TABLE - 9

Effect of summer composted Vegetable and Fruit waste on vegetative parameter of Lablab [*Lablab purpureus* (L.) Sweet]

Treatment	Shoot length (cm)			Root length (cm)			Number of Leaves		
	15 DAS	35 DAS	55 DAS	15 DAS	35 DAS	55 DAS	15 DAS	35 DAS	55 DAS
C	42.20	65.42	79.80	5.90	6.80	7.22	10.02	20.32	28.05
T <sub>1</sub>	65.11	69.33	82.43	6.51	7.93	9.72	15.09	24.00	30.02
T <sub>2</sub>	66.94	74.41	86.75	8.04	8.80	10.91	18.00	26.22	31.10
T <sub>3</sub>	75.67	89.57	92.82	7.95	9.56	12.24	19.20	27.12	37.30
T <sub>4</sub>	89.24	98.72	111.25	12.62	20.20	24.45	23.25	38.50	46.13
T <sub>5</sub>	68.16	81.93	93.52	7.83	8.24	11.96	17.29	22.10	29.52
T <sub>6</sub>	74.87	83.64	89.28	8.76	10.22	13.83	20.14	30.21	35.19
T <sub>7</sub>	78.91	85.57	98.32	10.29	11.70	15.27	21.55	34.39	41.15
T <sub>8</sub>	118.20	129.20	140.45	15.48	22.80	28.50	25.00	42.20	50.24
SEd	1.01928			0.97188			1.01027		
CD (P<0.05)	2.04354			1.94851			2.02548		
CD (P<0.01)	2.72339**			2.59675**			2.69932**		

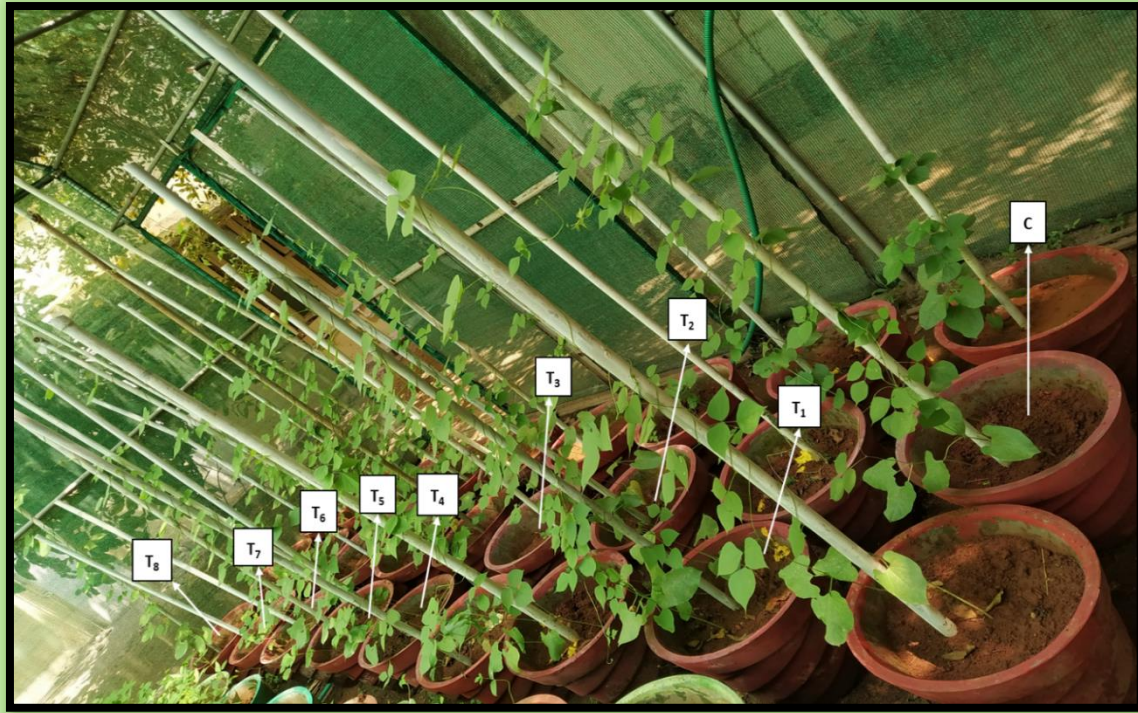
\*\*- significant at 1% (P&lt;0.01), DAS- Days After Sowing

C- Control

T<sub>1</sub>- V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>2</sub>- V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>3</sub>- V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>4</sub>- V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>5</sub>- F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>6</sub>- F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>7</sub>- F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>8</sub>- F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

PLATE – 13

Effect of summer composted Vegetable and Fruit waste on vegetative parameter of Lablab [*Lablab purpureus* (L.) Sweet] on 15 DAS



15 DAS



PLATE – 14

Effect of summer composted Vegetable and Fruit waste on vegetative parameter of Lablab [*Lablab purpureus* (L.) Sweet] on 35 and 55 DAS

35 DAS



55 DAS



C – Control,

T<sub>1</sub>- V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub>- V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub>- V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub>- V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub>- F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub>- F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub>- F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub>- F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

The results positively coincide with the study of Prakash and Hemalatha, (2013) who noted an increase in black gram flowers after applying vermicomposted pressmud on 90 days.

Similar finding was reported by Sandeepani *et al.*, (2021) that highest number of flowers per plant at 6 and 8 weeks after planting were recorded in *Vigna radiata* L. planted in Maxicrop™ foliar application with soil application of Jeewamirtha and it was followed by the plants on Maxicrop™ foliar application with the soil application of DOA fertilizer.

The results are consistent with Silpa and Vijayalakshmi, (2022) finding who noted that T8 - Raw JFP + *Pleurotus eous* + *Pleurotus florida* + *Eudrilus eugeniae* 5t/ha<sup>-1</sup> showed maximum number of flowers/plant (12) followed by T4 treatment (10) while minimum number of flowers were found in control (4) on 45 DAS.

#### **4.4.1.2e Number of nodules**

##### **Black gram [*Vigna mungo* (L.) Hepper]**

Number of nodules showed significant increase from 25 to 50 DAS as shown in Table- 10. A substantial increased in number of nodules was noted in T<sub>8</sub>- Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) and T<sub>4</sub>- Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) followed by other treatments on 25 DAS (20.21 and 16.20) and 50 DAS (27.00 and 24.32) when compared to Control (6.00 and 9.02) respectively.

##### **Lablab [*Lablab purpureus* (L.) Sweet]**

As presented in Table- 11, maximum number of nodules was obtained in T<sub>8</sub> treatment (24.00 and 32.06) followed by T<sub>4</sub> treatment (21.02 and 27.14) and T<sub>7</sub> treatment (19.06 and 25.88) on 25 and 50 Day after sowing. The lowest number of nodules was noted in control (8.03 and 10.15) respectively.

The results were consistent with Birla *et al.*, (2018) findings that crops fertilized with the combination of 50% N through castor cake and 50% vermicompost + PSB (T<sub>9</sub>) had a significantly higher number of root nodules (23.5) on par with treatments T<sub>7</sub> (23.3), T<sub>8</sub> (23.1) and 100% N (Vermicompost) + PSB (T<sub>3</sub>) noted lowest root nodules (20.5) per plant.

According to Anjali *et al.*, (2021) liquid biofertilizer treated LGR33+RB1+0.1% CMC recorded maximum number of nodules and dry weight of nodules over uninoculated control in chickpea.

TABLE - 10

Influence of summer composted Vegetable and Fruit waste on vegetative parameter of Black gram [*Vigna mungo* (L.) Hepper]

Treatments	No. of flowers	No. of Nodules		Fresh weight (g)			Dry weight (g)		
	55 DAS	25 DAS	50 DAS	15 DAS	35 DAS	55 DAS	15 DAS	35 DAS	55 DAS
C	5.00	6.00	9.02	0.405	0.700	0.821	0.075	0.092	0.117
T <sub>1</sub>	7.00	7.00	11.00	0.496	0.736	0.974	0.106	0.146	0.286
T <sub>2</sub>	9.00	9.05	17.03	0.643	1.144	1.341	0.139	0.270	0.390
T <sub>3</sub>	12.00	11.12	15.00	0.955	1.224	1.580	0.287	0.314	0.456
T <sub>4</sub>	16.00	16.20	24.32	1.241	1.694	1.885	0.390	0.406	0.629
T <sub>5</sub>	11.00	8.00	19.00	0.736	1.049	1.168	0.164	0.230	0.295
T <sub>6</sub>	14.00	12.06	12.08	0.964	1.332	1.653	0.235	0.315	0.436
T <sub>7</sub>	13.00	10.00	20.10	0.972	1.569	1.792	0.287	0.394	0.467
T <sub>8</sub>	18.00	20.21	27.00	1.910	1.967	2.063	0.465	0.492	0.665
SEd	1.8257	0.93697		0.03366			0.03285		
CD (P<0.05)	3.8358	1.90048		0.06749			0.06585		
CD (P<0.01)	5.2561**	2.54931**		0.08994**			0.08776**		

\*\*- significant at 1% (P&lt;0.01), DAS- Days After Sowing

C- Control

T<sub>1</sub>- V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>2</sub>- V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>3</sub>- V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>4</sub>- V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>5</sub>- F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>6</sub>- F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>7</sub>- F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>8</sub>- F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

TABLE - 11

Influence of summer composted Vegetable and Fruit waste on vegetative parameter of lablab [*Lablab purpureus* (L.) Sweet]

Treatments	No. of flowers	No. of Nodules		Fresh weight (g)			Dry weight (g)		
	55 DAS	25 DAS	50 DAS	15 DAS	35 DAS	55 DAS	15 DAS	35 DAS	55 DAS
C	10.00	8.03	10.15	1.250	1.942	2.978	0.220	0.305	0.432
T <sub>1</sub>	12.00	10.05	13.08	2.769	2.998	3.635	0.298	0.429	0.520
T <sub>2</sub>	14.00	11.25	17.22	2.920	4.824	7.954	0.251	0.607	1.622
T <sub>3</sub>	16.00	13.00	20.07	3.832	7.129	12.726	0.310	0.712	2.029
T <sub>4</sub>	21.00	21.02	27.14	4.529	9.520	15.148	0.624	1.742	2.943
T <sub>5</sub>	13.00	15.09	21.02	3.524	4.925	9.520	0.352	0.911	1.798
T <sub>6</sub>	16.00	12.01	15.00	3.741	4.228	8.821	0.401	0.628	0.824
T <sub>7</sub>	19.00	19.06	25.88	4.215	6.122	12.552	0.498	1.613	2.440
T <sub>8</sub>	23.00	24.00	32.06	5.120	16.328	23.204	0.725	2.435	3.751
SEd	3.4534	0.97710		0.00836			0.00706		
CD (P<0.05)	7.2554	1.98188		0.01676			0.01415		
CD (P<0.01)	9.9420**	2.65746**		0.02234**			0.01886**		

\*\*- significant at 1% (P&lt;0.01), DAS- Days After Sowing

C- Control

T<sub>1</sub>- V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>2</sub>- V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>3</sub>- V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>4</sub>- V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>5</sub>- F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>6</sub>- F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>7</sub>- F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>8</sub>- F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

The highest number of nodules and number of effective nodules were recorded where *Vigna unguiculata* L. planted in loose soil with the application of Amuthakaraisal and it was followed by the plants on loose soil with the application of compost and DOA recommended fertilizer. The lowest number of nodules and active nodules were recorded in plants where compact soil with compost and department of agriculture recommended fertilizer application dosage was given (Senarath *et al.*, 2022).

#### **4.4.1.2f Fresh weight and Dry weight**

##### **Black gram [*Vigna mungo* (L.) Hepper]**

A remarkable increase in fresh weight was registered in T<sub>8</sub>- compost prepared from fruit waste by using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) (1.910g, 1.967g and 2.063g) and T<sub>4</sub>- compost prepared from vegetable waste by using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) (1.241g, 1.694g and 1.885g) followed by other treatments and Control (0.405g, 0.700g and 0.821g) on 15 DAS, 35 DAS and 55 DAS.

A gradual increase in dry weight was observed from 15 DAS to 55 DAS with maximum dry weight in T<sub>8</sub> (Fruit waste composted by using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha), T<sub>4</sub> (Vegetable waste composted by using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) followed by T<sub>7</sub> on 15 DAS (0.465g, 0.390g and 0.287g), 35 DAS (0.492g, 0.406g and 0.394g) and 55 DAS (0.665g, 0.629g and 0.467g). The lowest dry weight was noted in Control (0.075g, 0.092g and 0.117g) respectively (Table-10).

##### **Lablab [*Lablab purpureus* (L.) Sweet]**

As presented in Table - 11, the plant fresh weight was noted in T<sub>8</sub> (Fruit waste composted by using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha), T<sub>4</sub> (Vegetable waste composted by using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) followed by other treatment on 15 DAS (5.120g, 4.529g), 35 DAS (16.328g, 9.520g) and 55 DAS (23.204g, 15.148g) when compared to Control (1.250g, 1.942g and 2.978g) respectively.

Maximum dry weight was obtained in T<sub>8</sub> treatment (0.725g, 2.435g and 3.751g) and T<sub>4</sub> treatment (0.624g, 1.742g and 2.943g) followed by T<sub>7</sub> treatment (0.498g, 1.613g and 2.440g) on 15 DAS, 35 DAS and 55 DAS respectively. The lowest dry weight of the plant was recorded in Control on 15 DAS (0.220g), 35 DAS (0.305g) and 55 DAS (0.432g) as shown in Table - 11.

According to Khan *et al.*, (2020) T6 (seed inoculation with *B. subtilis*, *B. thuringiensis* and *B. megaterium* and 2 PGRs) and T5 (seed inoculation with *B. subtilis*, *B. thuringiensis* and *B. megaterium*) observed highest shoot fresh weight (81% and 75%) in sensitive and tolerant types. For the sensitive variety, T6 (seed inoculation with *B. subtilis*, *B. thuringiensis* and *B. megaterium* and 2 PGRs) reported highest shoot dry weight (77%) whereas in tolerant variety T2 (*Bacillus subtilis* + 2 PGRs) noted maximum shoot dry weight (71%). According to Afriyie and Amoabeng, (2017) the fresh weight and dry weight of radish showed maximum in S<sub>M</sub> (50% of compost) 8.14 gm, 0.78 gm which is followed by S<sub>H</sub> (100% of compost) 7.91 gm, 0.73 gm and S (control) 4.87 gm and 0.41 gm.

The results are in line with Sahu *et al.*, (2017) who found that kitchen waste compost T1 (13.00g) noted the highest fresh weight followed by T4 (12.88g), T7 (12.83g) and T9 (10.00g) whereas the highest dry weight was observed in T1 (5.55g) followed by T4 (5.50g) and T9 (4.14) in crops.

#### **4.5 YIELD CHARACTERS**

##### **4.5.1 Effect of Vegetable and Fruit waste composted in winter on yield parameters of test crops**

###### **4.5.1a Black gram [*Vigna mungo* (L.) Hepper]**

The data presented in Table-12, Plate-15, reported that highest number of pods/ plant, (34.00 and 27.00), pod length (4.20 cm and 3.90 cm), number of seeds/ pod (8.00 and 7.00), weight of seeds/ pod (0.330g and 0.320g), pod fresh weight (0.728g and 0.724g) and pod dry weight (0.452g and 0.440g) in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) over other treatments and Control (5.00, 2.00 cm, 3.00, 0.130g, 0.404g and 0.210g) on 75 DAS respectively.

###### **4.5.1b Lablab [*Lablab purpureus* (L.) Sweet]**

The data presented in Table-13, Plate- 15, revealed that number of pods/plant, pod length, number of seeds/pod, weight of seeds/ pod, pod fresh weight and pod dry weight were higher in T<sub>8</sub> treatment when compared to Control on 75 DAS. Maximum number of pods/plant (40.00), pod length (13.00 cm), number of seeds/pod (6.00), weight of seeds/ pod (4.060g), pod fresh weight (7.425g) and pod dry weight (1.382g) was obtained in T<sub>8</sub> treatment (Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) when compared to Control (16.00, 9.00, 3.00, 1.771g, 4.408g and 0.530g) respectively.

TABLE - 12

Influence of winter composted Vegetable and Fruit waste on yield parameters of Black gram [*Vigna mungo* (L.) Hepper] on 75 DAS

Treatments	Number of pods/ plant	Pod length (cm)	No. of seeds/pod	Weight of seed/ pod (g)	Pod Fresh weight (g)	Pod Dry weight (g)
C	5.00	2.00	3.00	0.130	0.404	0.210
T <sub>1</sub>	9.00	3.20	6.00	0.136	0.478	0.250
T <sub>2</sub>	7.00	3.50	4.00	0.231	0.606	0.390
T <sub>3</sub>	15.00	3.70	5.00	0.177	0.521	0.320
T <sub>4</sub>	27.00	3.90	7.00	0.320	0.724	0.440
T <sub>5</sub>	6.00	3.40	5.00	0.185	0.537	0.379
T <sub>6</sub>	21.00	3.60	4.00	0.209	0.609	0.394
T <sub>7</sub>	24.00	3.80	6.00	0.260	0.612	0.372
T <sub>8</sub>	34.00	4.20	8.00	0.330	0.728	0.452
SEd	1.1601	0.8014	1.6387	0.0163	0.0016	0.0163
CD (p<0.05)	2.4374	1.6837	3.4427	0.0342	0.0034	0.0342
CD (p<0.01)	3.3399**	2.3071**	4.7175**	0.0468**	0.0047**	0.0468**

\*\*- significant at 1% (P&lt;0.01), DAS- Days After Sowing

C- Control

T<sub>1</sub>- V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>2</sub>- V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>3</sub>- V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>4</sub>- V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>5</sub>- F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>6</sub>- F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>7</sub>- F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>8</sub>- F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

TABLE - 13

Influence of winter composted Vegetable and Fruit waste on yield parameters of Lablab [*Lablab purpureus* (L.) Sweet] on 75 DAS

Treatments	Number of pods/ plant	Pod length (cm)	No. of seeds/pod	Weight of seed (g)	Pod Fresh weight (g)	Pod Dry weight (g)
C	16.00	9.00	3.00	1.771	4.408	0.530
T <sub>1</sub>	20.00	9.30	3.20	1.993	4.740	0.800
T <sub>2</sub>	23.00	10.40	4.00	2.172	6.220	0.886
T <sub>3</sub>	26.00	11.10	4.00	2.150	5.911	0.980
T <sub>4</sub>	35.00	12.30	5.20	2.813	7.003	1.122
T <sub>5</sub>	24.00	11.30	4.40	2.065	5.962	0.865
T <sub>6</sub>	32.00	11.60	4.00	2.089	6.233	1.070
T <sub>7</sub>	30.00	10.50	5.00	2.769	6.298	0.946
T <sub>8</sub>	40.00	13.00	6.00	4.060	7.425	1.382
SEd	1.5870	1.2511	0.9463	0.1451	0.6722	0.1099
CD (p<0.05)	3.3342	2.6284	1.9882	0.3049	1.4123	0.2309
CD (p<0.01)	4.5688**	3.6017**	2.7244**	0.4177**	1.9352**	0.3163**

\*\* - significant at 1% (P&lt;0.01), DAS - Days After Sowing

C - Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

The results is in par with Ananth and Kumar, (2018) the highest number of pods / plant, pod length, single pod weight, yield / plant and seeds / pod were recorded with 5t vermicompost ha<sup>-1</sup> + 75 % RDF + CBF (O3I1B1) in dolichos bean.

The result coincides with Haghghi *et al.*, (2016) who reported that combination of vermicompost and 25% municipal soil waste compost significantly enhanced the number of fruits at the harvest period over control in *Lycopersicum esculentum*.

The results coincide with Promoda *et al.*, (2020) who noted significant increase in seed yield such as number of pods per plant (117.19), number of seeds per pod (4.25) and pod length (5.66 cm) in *rabi* season crop in dolichos bean (*Lablab purpureus* L. (Sweet)). The results coincide with Joshi *et al.*, (2016) who revealed that T<sub>2</sub>- RDF (20-40-0 NPK kg ha<sup>-1</sup>) treatment recorded highest number of pods plant<sup>-1</sup> (79.60) and number of seeds/ pod<sup>-1</sup>(13.45) in Cowpea.

The results coincide with Meena and Ram, (2016) who recorded tallest plant height (44.5 cm), pods/plant (36) and seeds/pod (6.2) with the application of N<sub>20</sub> : P<sub>17.2</sub> Kg/ha as RDF + 16.6 Kg K + 20 Kg S + 3 Kg Zn/ha along seed inoculation with Rhizobium + PSB + 5t FYM/ha in black gram (*Vigna mungo* L.).

The results correlate with Silpa and Vijayalakshmi, (2022) observations who found that T<sub>8</sub> treatment - composted RJF peel using *Pleurotus eous*, *Pleurotus florida*, cowdung and *Eudrilus eugeniae* 5t/ha<sup>-1</sup> noted higher number of pods/ plant (21), pod length (16.50 cm), number of seeds/ pod (20), seed weight/pod (1.68g) over control in cowpea.

#### **4.5.2 Effect of Vegetable and Fruit waste composted in summer on yield parameters of test crops**

##### **4.5.2a Black gram [*Vigna mungo* (L.) Hepper]**

A significant increase in number of pods/plant (28.00, 24.00), pod length (4.30 cm, 4.00 cm), number of seeds/pod (7.00, 6.00), weight of seeds/ pod (0.372g, 0.357g), pod fresh weight (0.795g, 0.754g) and pod dry weight (0.502g, 0.498g) was obtained in T<sub>8</sub> treatment (Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) on 75 DAS as shown in Table – 14, Plate- 16. Minimum results was obtained in Control (8.00, 2.10, 3.00, 0.139g, 0.410g and 0.215g) respectively.

TABLE - 14

Effect of summer composted Vegetable and Fruit waste on yield parameters of Black gram [*Vigna mungo* (L.) Hepper] on 75 DAS

Treatments	Number of pods/ plant	Pod length (cm)	No. of seeds/pod	Weight of seed /pod (g)	Pod Fresh weight (g)	Pod Dry weight (g)
C	8.00	2.10	3.00	0.139	0.410	0.215
T <sub>1</sub>	12.00	3.40	5.00	0.142	0.509	0.237
T <sub>2</sub>	15.00	2.90	4.00	0.190	0.527	0.350
T <sub>3</sub>	18.00	3.70	4.20	0.245	0.618	0.407
T <sub>4</sub>	24.00	4.00	6.00	0.357	0.754	0.498
T <sub>5</sub>	20.00	3.00	4.00	0.207	0.549	0.392
T <sub>6</sub>	22.00	3.80	4.60	0.229	0.621	0.412
T <sub>7</sub>	19.00	3.50	5.00	0.280	0.677	0.420
T <sub>8</sub>	28.00	4.30	7.00	0.372	0.795	0.502
SEd	1.6851	0.9541	1.1879	0.0867	0.0725	0.1057
CD (p<0.05)	3.5403	2.0046	2.4957	0.1822	0.1524	0.2221
CD (p<0.01)	4.8512**	2.7469**	3.4199**	0.2497**	0.2088**	0.3043**

\*\* - significant at 1% (P&lt;0.01), DAS- Days After Sowing

C- Control

T<sub>1</sub>- V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>2</sub>- V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>3</sub>- V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>4</sub>- V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>5</sub>- F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),T<sub>6</sub>- F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),T<sub>7</sub>- F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),T<sub>8</sub>- F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

TABLE - 15

Effect of summer composted Vegetable and Fruit waste on yield parameters of Lablab [*Lablab purpureus* (L.) Sweet] on 75 DAS

Treatments	Number of pods/ plant	Pod length (cm)	No. of seeds/pod	Weight of seed /pod (g)	Pod Fresh weight (g)	Pod Dry weight (g)
C	18.00	11.00	3.00	1.825	4.628	0.628
T <sub>1</sub>	21.00	11.70	3.52	2.120	4.925	0.872
T <sub>2</sub>	25.00	12.80	4.00	2.326	6.497	1.054
T <sub>3</sub>	27.00	12.50	4.29	2.451	6.121	0.998
T <sub>4</sub>	38.00	13.50	6.00	3.402	7.421	1.325
T <sub>5</sub>	26.00	13.00	4.62	2.224	6.236	0.982
T <sub>6</sub>	34.00	13.20	4.00	2.528	6.525	1.261
T <sub>7</sub>	32.00	14.40	5.00	3.124	6.654	1.107
T <sub>8</sub>	43.00	14.70	6.32	4.157	7.862	1.822
SEd	3.1505	3.0110	2.0962	0.0088	0.0809	0.1050
CD (p<0.05)	6.6191	6.3259	4.4041	0.0185	0.1699	0.2205
CD (p<0.01)	9.0701**	8.6683**	6.0349**	0.0254**	0.2329**	0.3022**

\*\* - significant at 1% (P<0.01), DAS- Days After Sowing

C- Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

#### 4.5.2 Lablab [*Lablab purpureus* (L.) Sweet]

As presented in Table- 15, Plate- 16, on 75 DAS, the highest number of pods/ plant and pod length was obtained in T<sub>8</sub> treatment (43.00 and 14.70 cm) treatment followed by T<sub>4</sub> treatment (38.00 and 13.50 cm) when compared to Control (18.00 and 11.00 cm). The maximum number of seeds/ pod, weight of seeds/ pod, pod fresh weight and pod dry weight was recorded in T<sub>8</sub> treatment (6.32, 4.157g, 7.862g and 1.822g) and T<sub>4</sub> treatment (6.00, 3.402g, 7.421g and 1.325g) followed by other treatment as compared to Control (3.00, 1.825g, 4.628g and 0.628g) respectively.

Similar results were reported by Kamble *et al.*, (2016) who stated that the treatment of T<sub>3</sub>- 100% NPK+ poultry manure at 5 t ha<sup>-1</sup> resulted in highest plant height measurements of 37.30 cm and yield-attributing measurements of 12.83 cm for pod length and 0.93 cm for pod diameter (42.18). Treatment T<sub>16</sub> - FYM @ 25 t ha<sup>-1</sup> had the lowest growth character value in French bean.

The current finding is consistent with Sakthivigneswari and Vijayalakshmi, (2016c) who observed that treatment T<sub>6</sub>- Raw coirpith + *Pleurotus sajor-caju* + *Eudrilus eugeniae* (5t ha<sup>-1</sup>) significantly increased the vegetative and yield parameters followed by T<sub>3</sub>- Raw corncob + *Pleurotus sajor-caju* + *Eudrilus eugeniae* (5t ha<sup>-1</sup>) in black nightshade (*Solanum nigrum*).

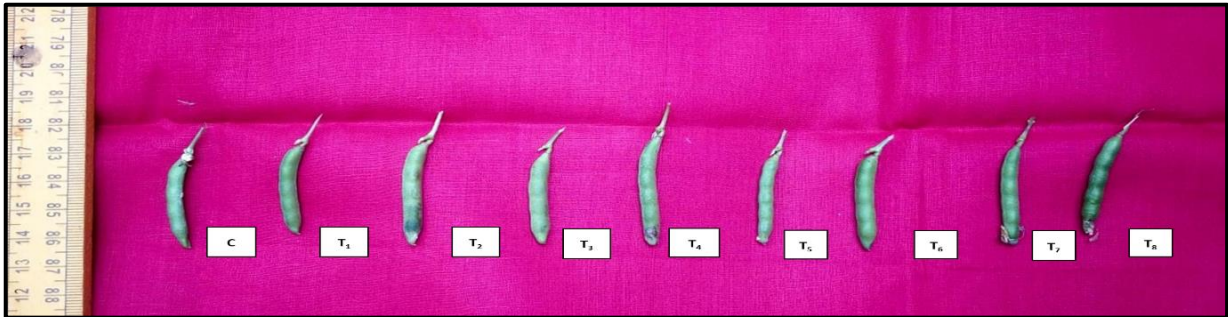
The finding is comparable to Dhanraj *et al.*, (2018) who noted that T<sub>4</sub> treatment showed highest number of pods per plant (46.43), pod length (9.76 cm), test weight (4.11g), seed yield (13.53 Qha<sup>-1</sup>) and crude protein content (7.47%) in Shankapushpi.

The result coincides with Sutar *et al.*, (2019) who reported that application of jeevamrutha @ 1000 l ha<sup>-1</sup> has highest no. of pods/ plant (20.57), pod length (19.8cm), no. of seeds/ pod (15.58), seed weight/ plant (9.53g) and 100 seed weight (11.82g) when compared to control in cowpea.

The increase in yield characters of the crop might be due to the positive role of the organic manures that supply nitrogen throughout the life cycle of the crop and was able to furnish the increased assimilate demand of plant resulted in higher yield. The improvement in the shoot length, root length, number of leaves, fresh weight and dry weight may be due to the incorporation of composted vegetable and fruit waste where the major nutrients readily available are favourable to soil condition which in return enhance the plant growth.

PLATE – 15

Yield parameters influence by winter composted Vegetable and Fruit waste on 75 DAS  
*Vigna mungo* (L.) Hepper

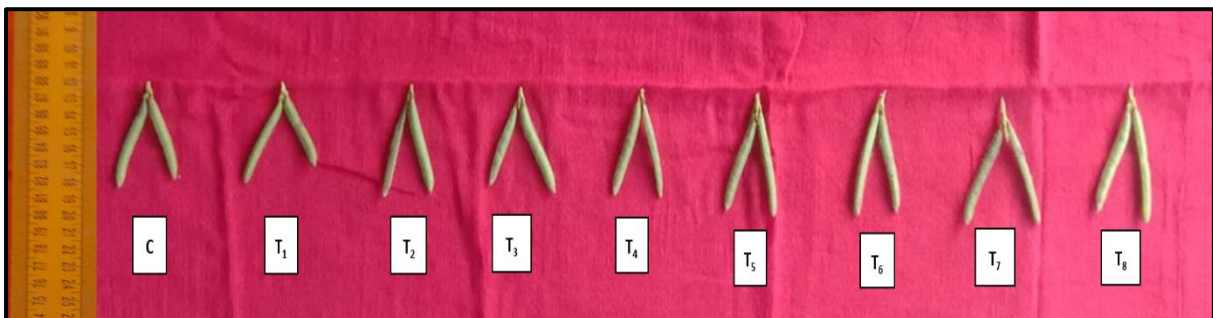


*Lablab purpureus* (L.) Sweet



PLATE – 16

Yield parameters influence by summer composted Vegetable and Fruit waste on 75 DAS  
*Vigna mungo* (L.) Hepper



*Lablab purpureus* (L.) Sweet



The increase in plant growth may be due to the presence of nitrogen which is an active constituent of protoplasm and enzyme that act as catalyst in speeding up the cell division and photosynthetic activity and nutrient found in the compost. The soil biological properties improved after the application of composted vegetable and fruit waste and increase beneficial micro-organism activities which resulted in enhancement of root nodules.

### PHASE III

#### 4.6 BIOCHEMICAL CHARACTERS

##### 4.6.1 Effect of Vegetable and Fruit waste composted in winter on protein content on leaves of test crops

###### 4.6.1a Black gram [*Vigna mungo* (L.) Hepper]

An increasing trend in protein content was observed from 15 DAS to 35 DAS and after that decrease in its content on 55 DAS (Table- 16).

Among all the treatment, T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) obtained the highest protein content in leaves of 61.08 mg/g tissue and 69.08 mg/g tissue followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 57.26 mg/g tissue and 68.53 mg/g tissue on 15 DAS and 35 DAS. The protein content gradually declined in T<sub>8</sub> treatment of 63.44 mg/g tissue and T<sub>4</sub> treatment of 59.08 mg/g tissue on 55 DAS when compared to control (31.99 mg/g tissue, 42.26 mg/g tissue and 33.95 mg/g tissue) respectively.

###### 4.6.1b Lablab [*Lablab purpureus* (L.) Sweet]

As depicted in Table- 17, the protein content in leaves shown an increasing trend from 15 to 35 DAS and after that gradually declined in its content on 55 DAS was noted.

The protein content in leaves was maximum in T<sub>8</sub> (Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) and T<sub>4</sub> (Vegetable waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) followed by T<sub>7</sub> (Fruit waste composted using cow dung, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) on 15 DAS (56.81 mg/g tissue, 51.17 mg/g tissue, 44.73 mg/g tissue) and 35 DAS (74.53 mg/g tissue, 65.44 mg/g tissue, 56.35 mg/g tissue). Decrease in protein content was noted in T<sub>8</sub> treatment (63.81 mg/g tissue), T<sub>4</sub> treatment (56.30 mg/g tissue when compared to Control (30.17 mg/g tissue, 40.90 mg/g tissue, 32.90 mg/g tissue) respectively.

**TABLE - 16**  
**Effect of winter composted Vegetable and Fruit waste on protein content**  
**in leaves of Black gram**

Protein (mg/g tissue)			
Treatments	15 DAS	35 DAS	55 DAS
C	31.99	42.26	33.95
T <sub>1</sub>	33.72	48.30	39.45
T <sub>2</sub>	41.81	59.44	42.90
T <sub>3</sub>	47.26	60.08	51.44
T <sub>4</sub>	57.26	68.53	59.08
T <sub>5</sub>	38.17	51.99	42.81
T <sub>6</sub>	46.35	56.35	48.54
T <sub>7</sub>	54.72	63.99	56.99
T <sub>8</sub>	61.08	69.08	63.44
SEd	0.01100		
CD (p<0.05)	0.02205		
CD (p<0.01)	0.02939**		

\*\* - significant at 1% (P<0.01), DAS- Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae*  
(5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae*  
(5 t/ha).

**TABLE - 17**  
**Effect of winter composted Vegetable and Fruit waste on protein content in**  
**leaves of Lablab**

Protein (mg/g tissue)			
Treatments	15 DAS	35 DAS	55 DAS
C	30.17	40.90	32.90
T <sub>1</sub>	32.36	42.08	36.63
T <sub>2</sub>	33.45	44.10	36.99
T <sub>3</sub>	35.26	44.45	38.08
T <sub>4</sub>	51.17	65.44	56.30
T <sub>5</sub>	35.08	46.54	41.08
T <sub>6</sub>	41.63	51.35	45.63
T <sub>7</sub>	44.73	56.35	47.54
T <sub>8</sub>	56.81	74.53	63.81
SEd	0.01298		
CD (p<0.05)	0.02603		
CD (p<0.01)	0.03469**		

\*\* - significant at 1% (P<0.01), DAS- Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae*  
(5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae*  
(5 t/ha).

#### 4.6.2 Effect of Vegetable and Fruit waste composted in winter on carbohydrate content on leaves of test crops

##### 4.6.2a Black gram [*Vigna mungo* (L.) Hepper]

As presented in Table-18, the total carbohydrate content in black gram showed increasing trend upto 35 DAS and after that it declined gradually in all the treatments.

Carbohydrate content increase significantly from 15 to 35 DAS in T<sub>8</sub> treatment (Fruit waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) which ranged from 72.46 mg/g tissue to 79.04 mg/g tissue followed by T<sub>4</sub> treatment (Vegetable waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) ranged from 65.90 mg/g tissue to 76.41 mg/g tissue when compared to Control (38.31 mg/g tissue and 39.19 mg/g tissue) respectively. Gradual decline in carbohydrate content was noted in T<sub>8</sub> treatment (76.41 mg/g tissue) followed by T<sub>4</sub> treatment (72.14 mg/g tissue) against Control (40.50 mg/g tissue) on 55 DAS.

##### 4.6.2b Lablab [*Lablab purpureus* (L.) Sweet]

An increasing trend in carbohydrate content in leaves was recorded in all the treatment from 15 to 35 DAS and after that there was decrease in its content on 55 DAS (Table- 19).

Among all the treatments, carbohydrate content in leaf was increased significantly in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 76.85 mg/g tissue and 81.45 mg/g tissue and T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 69.19 mg/g tissue and 74.66 mg/g tissue followed by T<sub>7</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha) of 57.03 mg/g tissue and 59.66 mg/g tissue when compared to Control (32.62 mg/g tissue and 39.63 mg/g tissue) on 15 and 35 Day after sowing and declined to 78.82 mg/g tissue, 71.59 mg/g tissue, 57.91 mg/g tissue over control (36.34 mg/g tissue) on 55 DAS respectively.

TABLE - 18

Effect of winter composted Vegetable and Fruit waste on carbohydrate content in leaves of Black gram

Carbohydrate (mg/g tissue)			
Treatments	15 DAS	35 DAS	55 DAS
C	38.31	39.19	40.50
T <sub>1</sub>	40.39	57.36	46.96
T <sub>2</sub>	50.25	68.97	54.52
T <sub>3</sub>	56.38	70.83	58.68
T <sub>4</sub>	65.90	76.41	72.14
T <sub>5</sub>	45.76	58.46	55.61
T <sub>6</sub>	55.39	66.12	62.62
T <sub>7</sub>	65.46	73.24	67.98
T <sub>8</sub>	72.46	79.04	76.41
SEd	0.01059		
CD (p<0.05)	0.02124		
CD (p<0.01)	0.02830**		

\*\* - significant at 1% (P<0.01), DAS- Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

TABLE - 19

Effect of winter composted Vegetable and Fruit waste on carbohydrate content in leaves of Lablab

Carbohydrate (mg/g tissue)			
Treatments	15 DAS	35 DAS	55 DAS
C	32.62	39.63	36.34
T <sub>1</sub>	35.79	46.41	39.41
T <sub>2</sub>	43.16	50.25	46.85
T <sub>3</sub>	44.34	52.76	56.49
T <sub>4</sub>	69.19	74.66	71.59
T <sub>5</sub>	47.84	54.19	49.48
T <sub>6</sub>	48.39	56.05	51.34
T <sub>7</sub>	57.03	59.66	57.91
T <sub>8</sub>	76.85	81.45	78.82
SEd	0.01033		
CD (p<0.05)	0.02071		
CD (p<0.01)	0.02760**		

\*\* - significant at 1% (P<0.01), DAS- Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

### 4.6.3 Influence of Vegetable and Fruit waste composted in summer on protein content on leaves of test crops

#### 4.6.3a Black gram [*Vigna mungo* (L.) Hepper]

An increasing trend in protein content was observed in leaves of all the treatment from 15 to 35 DAS and after that decrease in its content was noted on 55 DAS (Table- 20).

Among all the treatment, T<sub>8</sub> treatment registered the highest protein content (62.72 mg/g tissue and 70.90 mg/g tissue and T<sub>4</sub> treatment (57.43 mg/g tissue and 69.53 mg/g tissue) followed by T<sub>7</sub> treatment (55.63 mg/g tissue and 65.44 mg/g tissue) on 15 DAS and 34 DAS and after that gradual decrease in its content on 55 DAS in T<sub>8</sub> treatment (64.53 mg/g tissue), T<sub>4</sub> treatment (60.44 mg/g tissue) when compared to Control (33.17 mg/g tissue, 43.15 mg/g tissue and 35.45 mg/g tissue).

#### 4.6.3b Lablab [*Lablab purpureus* (L.) Sweet]

An increasing trend in protein content in leaves was noticed from 15 to 35 DAS and declined in its content on 55 DAS (Table- 21).

Among all the treatment, T<sub>8</sub> (Fruit waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) obtained maximum protein content of 61.81 mg/g tissue and 81.08 mg/g tissue followed by T<sub>4</sub> (Vegetable waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) of 57.72 mg/g tissue and 68.35 mg/g tissue on 15 and 35 DAS. After that decrease in protein content to 70.90 mg/g tissue and 60.35 mg/g tissue on 55 DAS. The least protein content was noted in Control (31.81 mg/g tissue, 36.36 mg/g tissue and 34.36 mg/g tissue) respectively.

The application of T<sub>3</sub>- vermicompost (15gm) + azospirillum increased the protein content when compared to other treatment in *Solanum nigrum* L. and *Trigonella foenum-graecum* L. (Vijayalakshmi and Karthiyayini, 2018).

The study was in accordance with Vijayalakshmi and Gayathri, (2017) who reported that the application of vermicompost increased the carbohydrate (37.80 mg/g) and protein (3.25 mg/g) on 30 DAS in chilli plant.

TABLE - 20

Effect of summer composted Vegetable and Fruit waste on protein content in leaves of Black gram

Protein (mg/g tissue)			
Treatments	15 DAS	35 DAS	55 DAS
C	33.17	43.15	35.45
T <sub>1</sub>	34.90	50.15	40.35
T <sub>2</sub>	42.85	59.99	45.35
T <sub>3</sub>	49.99	60.81	53.0
T <sub>4</sub>	57.43	69.53	60.44
T <sub>5</sub>	38.81	53.44	44.63
T <sub>6</sub>	46.90	57.35	54.26
T <sub>7</sub>	55.63	65.44	59.08
T <sub>8</sub>	62.72	70.90	64.53
SEd	0.00990		
CD (p<0.05)	0.01984		
CD (p<0.01)	0.02644**		

\*\* - significant at 1% (P<0.01), DAS- Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

TABLE - 21

Effect of summer composted Vegetable and Fruit waste on protein content in leaves of Lablab

Protein (mg/g tissue)			
Treatments	15 DAS	35 DAS	55 DAS
C	31.81	36.36	34.36
T <sub>1</sub>	37.45	45.26	40.99
T <sub>2</sub>	43.72	52.90	45.63
T <sub>3</sub>	47.63	58.63	53.44
T <sub>4</sub>	57.72	68.35	60.35
T <sub>5</sub>	45.90	59.26	48.08
T <sub>6</sub>	54.35	62.63	57.17
T <sub>7</sub>	54.63	63.81	59.44
T <sub>8</sub>	61.81	81.08	70.90
SEd	0.01150		
CD (p<0.05)	0.02306		
CD (p<0.01)	0.03074**		

\*\* - significant at 1% (P<0.01), DAS- Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

#### 4.6.4 Influence of Vegetable and Fruit waste composted in summer on carbohydrate content on leaves of test crops

##### 4.6.4a Black gram [*Vigna mungo* (L.) Hepper]

As depicted in Table- 22, the total carbohydrate content in leaves was noted highest from 15 to 35 DAS in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) which ranged from 75.54 mg/ g tissue and 81.43 mg/g tissue followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) ranged from 69.19 mg/g tissue and 76.85 mg/g tissue over Control of 39.96 mg/g tissue and 52.00 mg/g tissue and after that it was declined to 77.73 mg/g tissue, 72.80 mg/g tissue when compared to Control of 42.70 mg/g tissue on 55 DAS respectively.

##### 4.6.4b Lablab [*Lablab purpureus* (L.) Sweet]

The total carbohydrate content in leaves of lablab was recorded gradual increase upto 35 DAS and decrease in its content on 55 DAS (Table- 23).

Among the treatment, treatment T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) obtained maximum carbohydrate content of 78.82 mg/g tissue and 86.05 mg/g tissue followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 65.46 mg/g tissue and 79.81 mg/g tissue when compared to other treatment and Control (33.06 mg/g tissue and 42.58 mg/g tissue) on 15 DAS and 35 DAS. On 55 DAS, gradual decrease in carbohydrate content was noted in T<sub>8</sub> treatment (82.11 mg/g tissue) followed by T<sub>4</sub> treatment (76.74 mg/g tissue) over Control (37.33 mg/g tissue) respectively.

The study showed that T<sub>5</sub> (Combined treatment of *B. subtilis*, *B. thuringiensis* and *B. megaterium*) had significantly (33% and 37%) increased the leaf protein content over uninoculated plants grown in sandy soil (T<sub>10</sub>), followed by T<sub>1</sub> (inoculation with *Bacillus subtilis*) in both the sensitive and tolerant varieties (Khan *et al.*, 2020).

The results coincide with Sarwar *et al.*, (2018) who recorded that treatment comprising of 120 kg ha<sup>-1</sup> NPK showed the maximum protein contents (28.89 mg g<sup>-1</sup> dry weight), whereas controls noted the lowest protein levels (19.77 mg g<sup>-1</sup> dry weight) in *Moringa oleifera* plants. Similar result was obtained by Nishi *et al.*, (2019) who noted the highest protein content (29.87%) in N<sub>60</sub>P<sub>20</sub>K<sub>50</sub> kg/ha treatments in *Oryza sativa* while the lowest protein content (7.06%) was found in Control.

TABLE - 22

Effect of summer composted Vegetable and Fruit waste on carbohydrate content in leaves of Black gram

Carbohydrate (mg/g tissue)			
Treatments	15 DAS	35 DAS	55 DAS
C	39.96	52.00	42.7
T <sub>1</sub>	42.04	60.43	47.62
T <sub>2</sub>	51.67	72.26	54.63
T <sub>3</sub>	60.21	73.24	63.94
T <sub>4</sub>	69.19	76.85	72.80
T <sub>5</sub>	46.75	64.37	53.75
T <sub>6</sub>	56.49	69.08	65.35
T <sub>7</sub>	67.00	74.67	71.16
T <sub>8</sub>	75.54	81.43	77.73
SEd	0.01116		
CD (p<0.05)	0.02238		
CD (p<0.01)	0.02982**		

\*\* - significant at 1% (P<0.01), DAS - Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

The present study is consistent with the findings of Badar *et al.*, (2015b), who reported that composted tea trash combined with coal ash produced better results than other treatments. All treatments enhanced biochemical components like total chlorophyll, protein, and carbohydrate content increased non-significantly, though the treatment with composted tea waste with bottom ash considerably raised total chlorophyll content of cow pea plants.

**TABLE - 23**  
**Effect of summer composted Vegetable and Fruit waste on carbohydrate content in leaves of Lablab**

Carbohydrate (mg/g tissue)			
Treatments	15 DAS	35 DAS	55 DAS
C	33.06	42.58	37.33
T <sub>1</sub>	37.11	53.86	45.10
T <sub>2</sub>	45.10	56.16	48.71
T <sub>3</sub>	50.47	64.70	56.05
T <sub>4</sub>	65.46	79.81	76.74
T <sub>5</sub>	54.63	67.32	62.18
T <sub>6</sub>	55.61	71.38	65.90
T <sub>7</sub>	61.30	76.41	65.57
T <sub>8</sub>	78.82	86.05	82.11
SEd	0.01013		
CD (p<0.05)	0.02031		
CD (p<0.01)	0.02706**		

\*\* - significant at 1% (P<0.01), DAS - Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

The findings are consistent with those of Biswas and Dutta, (2020) who investigated the protein content of potato tubers and discovered that applying of 100% RDF + vermicompost @ 2 t/ha (T5) resulted in the highest protein content (1.23%), closely followed by 100% RDF + yeast vinasse @ 2 t/ha (T2) (1.22%), and 100% RDF (T1) (1.21%) whereas highest carbohydrate content of potato was noted with the application of 100% RDF + yeast

vinasse @ 2 t/ha (T2) (74.9%), followed by 100% RDF + vermicompost @ 2 t/ha (T5) (74.7%) and 100% RDF (T1) (74.6%) respectively..

The highest protein content was obtained with NPK fertilizer treatment (14.92% DM) as compared to control (12.62% Dry Matter) and other fertilizers. The highest total carbohydrates were obtained in chicken manure (72.57% Dry Matter) and compost (72.49% Dry Matter) respectively when compared to control in New Kuroda variety (Merlin *et al.*, 2020).

The increasing density of microbes present in compost promoted faster decomposition of organic matter hence permitting increased availability of nutrients including nitrogen, amino acids, enzymes, and vitamins, which may account for the increase in the protein and carbohydrate content up to 35 DAS. The decrease in protein content at 55 DAS might be attributed to its utilization for flower and fruit formation.

#### **4.6.5 Effect of Vegetable and Fruit waste composted in winter on chlorophyll content on leaves of test crops**

##### **4.6.5a Black gram [*Vigna mungo* (L.) Hepper]**

Chlorophyll 'a', chlorophyll 'b' and total chlorophyll content of black gram increased significantly from 15 to 35 DAS and then gradually decrease after that in all the treatment as presented in Figure- IX.

Treatment T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) recorded the highest chlorophyll content from 15 to 35 DAS which ranged from 1.313 mg/g tissue to 2.662 mg/g tissue (chlorophyll 'a'), 1.734 mg/g tissue to 2.260 mg/ g tissue (chlorophyll 'b'), 3.154 mg/ g tissue to 4.922 mg/g tissue (total chlorophyll) which is followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) ranging from 1.182 to 2.482 mg/g tissue (chlorophyll 'a'), 1.229 to 2.139 mg/g tissue (chlorophyll 'b'), 2.410 to 4.620 mg/g tissue (total chlorophyll) when compared to Control of 0.587 to 0.904 mg/g tissue (chlorophyll 'a'), 0.213 to 1.095 mg/g tissue (chlorophyll 'b'), 0.800 to 2.053 mg/g tissue (total chlorophyll) respectively. On 55 DAS, decline in chlorophyll content was noted in T<sub>8</sub> of 1.354 mg/g tissue (chlorophyll 'a'), 1.882 mg/g tissue (chlorophyll 'b') and 3.206 mg/g tissue (total chlorophyll) over control respectively.

Figure - IX

Effect of winter composted Vegetable and Fruit waste on chlorophyll content in leaves of Black gram [*Vigna mungo* (L.) Hepper]

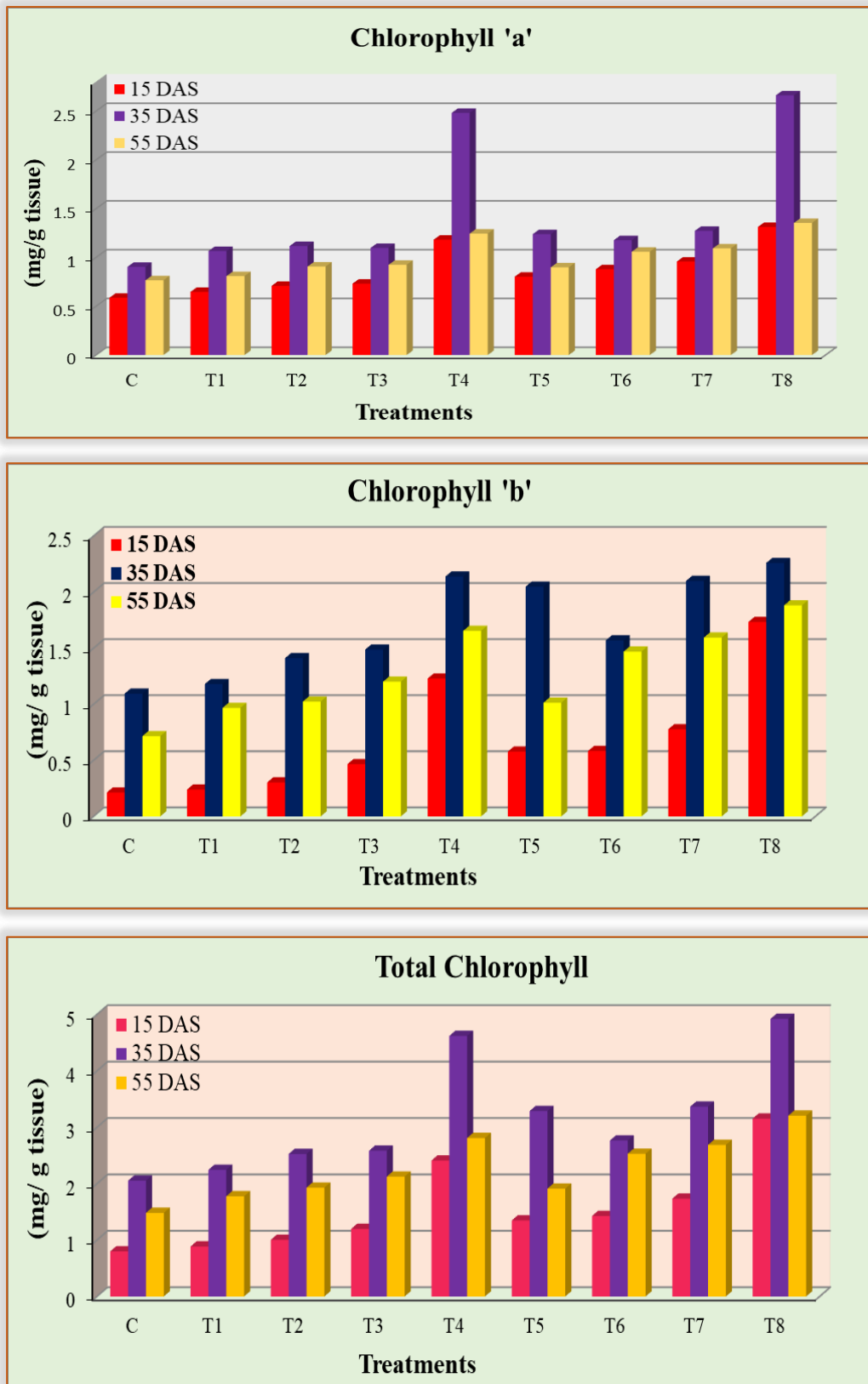
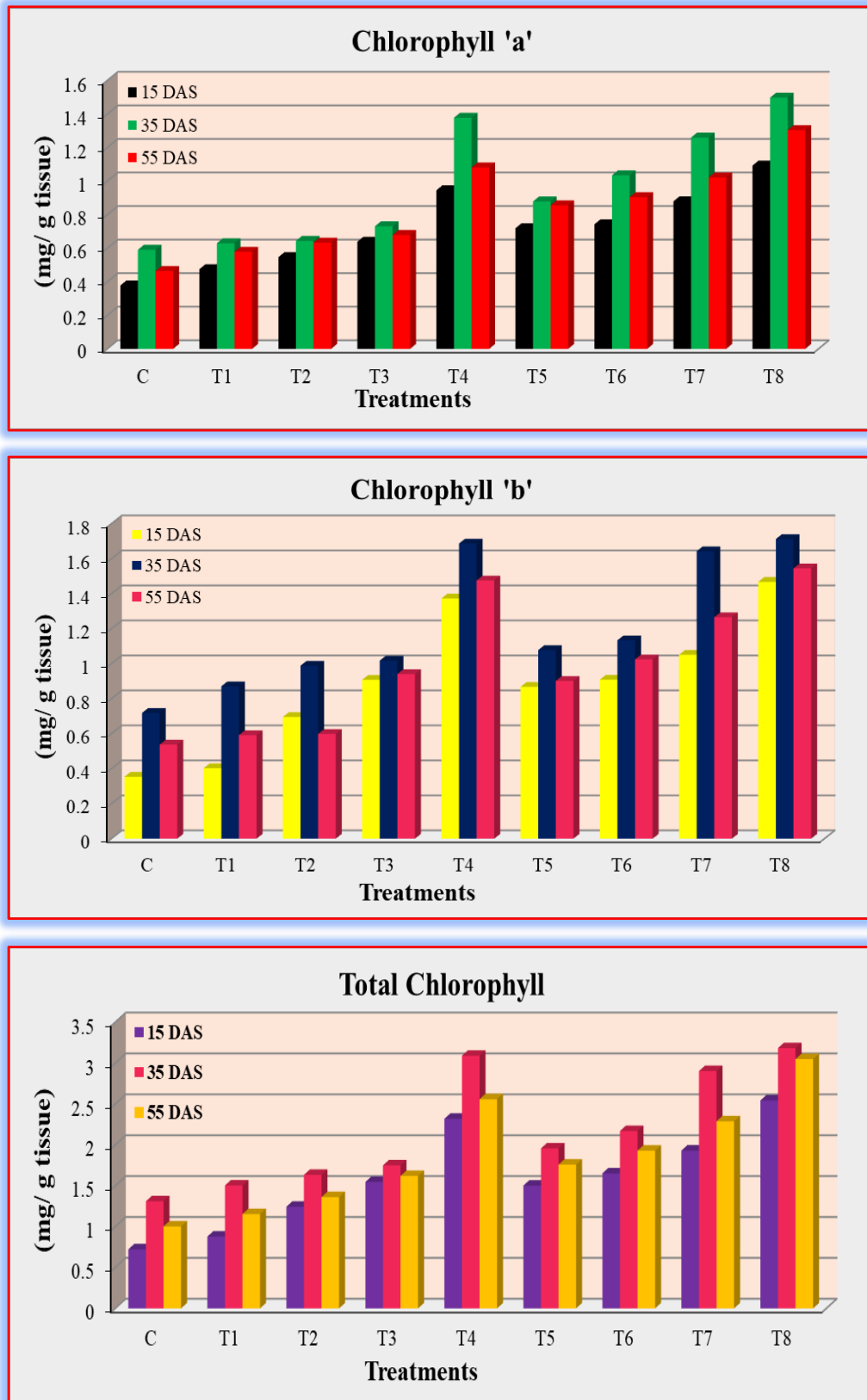


Figure - X

Effect of winter composted Vegetable and Fruit waste on chlorophyll content in leaves of Lablab [*Lablab purpureus* (L.) Sweet]



#### 4.6.5b Lablab [*Lablab purpureus* (L.) Sweet]

Chlorophyll 'a', chlorophyll 'b' and total chlorophyll content of lablab increased significantly upto 35 DAS and after that gradually declined in its content in all the treatment as presented in Figure- X.

Among the treatment, T<sub>8</sub> (Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) significantly increased chlorophyll content from 15 to 35 DAS which ranged from 1.093 to 1.498 mg/g tissue followed by T<sub>4</sub> (Vegetable waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) ranging from 0.946 to 1.378 mg/g tissue (chlorophyll 'a'), 1.468 to 1.713 mg/g tissue followed by 1.373 to 1.687 mg/g tissue (chlorophyll 'b'), 2.543 to 3.183 mg/g tissue followed by 2.319 to 3.090 mg/g tissue (total chlorophyll) and it decreased gradually to 1.304 mg/g tissue followed by 1.082 mg/g tissue (chlorophyll 'a'), 1.545 mg/g tissue followed by 1.476 mg/g tissue (chlorophyll 'b'), 3.048 mg/g tissue followed by 2.558 mg/g tissue (total chlorophyll) on 55 DAS and least amount of chlorophyll was recorded in Control treatment of 0.378, 0.591 and 0.464 mg/g tissue (chlorophyll 'a'), 0.354, 0.719 and 0.538 mg/g tissue (chlorophyll 'b') and 0.723, 1.310 and 1.002 mg/g tissue (total chlorophyll) respectively.

#### 4.6.6 Effect of Vegetable and Fruit waste composted in summer on chlorophyll content on leaves of test crops

##### 4.6.6a Black gram [*Vigna mungo* (L.) Hepper]

Chlorophyll 'a', chlorophyll 'b' and total chlorophyll content of black gram leaves increased upto 35 DAS and then gradually declined after that in all the treatment when compared to Control (Figure- XI).

The chlorophyll content increase significantly in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) which ranged from 1.431 mg/g tissue to 2.762 mg/g tissue followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) ranging from 1.349 mg/g tissue to 2.580 mg/g tissue (chlorophyll 'a'), 1.976 mg/g tissue to 2.426 mg/g tissue followed by 1.360 mg/g tissue to 2.347 mg/g tissue (chlorophyll 'b'), 3.500 mg/g tissue to 5.186 mg/g tissue followed by 2.708 mg/g tissue to 4.816 mg/g tissue (total chlorophyll) from 15 to 35 DAS and after that it gradually declined to 2.018 mg/g tissue followed by 1.854 mg/g tissue (chlorophyll 'a'), 2.073 mg/g tissue followed by 1.671 mg/g tissue

(chlorophyll 'b'), 3.983 mg/g tissue followed by 3.466 mg/g tissue (total chlorophyll) at 55 DAS. Least chlorophyll content was noted in Control treatment of 0.638, 0.918 and 0.830 mg/g tissue (chlorophyll 'a'), 0.225, 1.260 and 0.729 mg/g tissue (chlorophyll 'b') and 0.893, 2.178 and 1.544 mg/g tissue (total chlorophyll).

#### **4.6.6b Lablab [*Lablab purpureus* (L.) Sweet]**

Chlorophyll content of lablab leaves significantly increased from 15 to 35 DAS and after that it declined in all the treatment when compared to Control (Figure- XII).

Maximum chlorophyll content was obtained in T<sub>8</sub> treatment of 1.103 mg/g tissue to 1.512 mg/g tissue followed by T<sub>4</sub> treatment of 0.956 mg/g tissue to 1.384 mg/g tissue (chlorophyll 'a'), 1.490 mg/g tissue to 1.752 mg/g tissue followed by 1.396 mg/g tissue to 1.687 mg/g tissue (chlorophyll 'b'), 2.592 mg/g tissue to 3.201 mg/g tissue followed by 2.351 mg/g tissue to 3.103 mg/g tissue (total chlorophyll) from 15 to 35 DAS and it gradually decrease to 1.308 mg/g tissue followed by 1.087 mg/g tissue (chlorophyll 'a'), 1.690 mg/g tissue followed by 1.483 mg/g tissue (chlorophyll 'b'), 3.059 mg/g tissue followed by 2.569 mg/g tissue (total chlorophyll) on 55 DAS. The least was recorded in Control of 0.378, 0.597, and 0.468 mg/g tissue (chlorophyll 'a'), 0.377, 0.726 and 0.546 mg/g tissue (chlorophyll 'b') and 0.755, 1.323 and 1.013 mg/g tissue (total chlorophyll) on 15, 35 and 55 DAS respectively.

Similar result was obtained by Mishra and Jain, (2013) who suggested that combined application of biofertilizers (250 g) + NPK (50%) + vermicompost (5t/ha) promoted the chlorophyll (3.8, 4.8, 5.1, 5.9 mg/g) and protein (5.0, 5.9, 6.6, 7.2 mg/g) content on 45 DAS, 75 DAS, 105 DAS and 135 DAS stage of *Andrographis paniculata*. According to Adzmi *et al.*, (2014) the application of 50% NPK+ *Bacillus spaericus* (UPMB 10) + *Pseudomonas* spp. significantly increased the chlorophyll content in rice variety MR 219 in comparison to the control (no fertilizer).

The result is on par with Singh *et al.*, (2014) who stated that combined application of vermicompost (2.5 t/ha) + FYM (12.5 t/ha) + biofertilizer (2.5 kg/ha *Azospirillum* + 2.5 kg/ha phosphate solubilizing bacteria) enhanced chlorophyll 'a' (0.59 mg/g), chlorophyll 'b' (0.92 mg/g) and protein content (0.25 mg/g) of chillies. The present finding is in conformity with that of Jahanshahi *et al.*, (2014) who concluded that the increase in chlorophyll content in dill leaves (0.0083 mg g<sup>-1</sup> tissue) was due to vermicompost (32 t ha<sup>-1</sup>) application.

**Figure - XI**  
**Effect of summer composted Vegetable and Fruit waste on chlorophyll content in leaves of Black gram [*Vigna mungo* (L.) Hepper]**

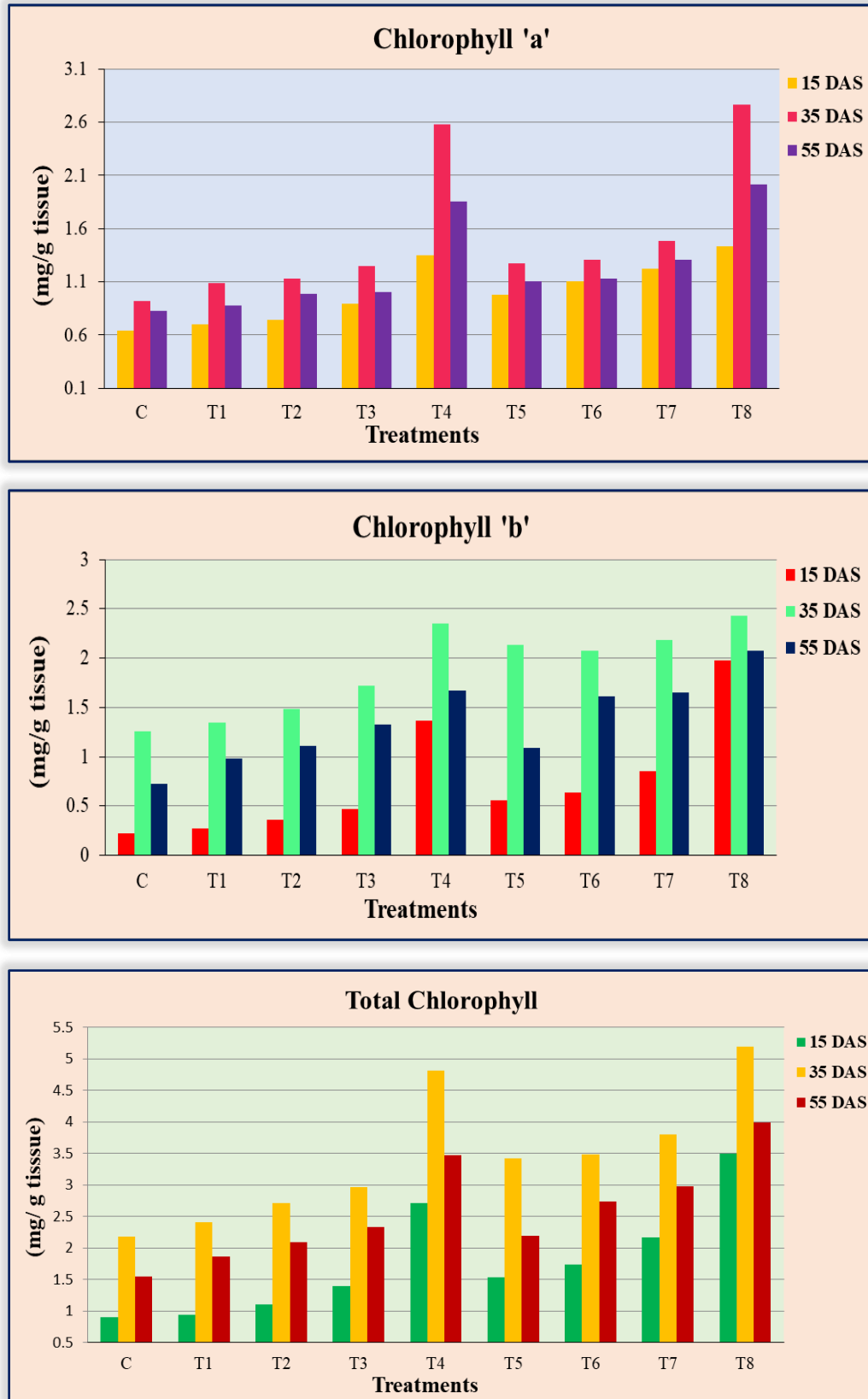
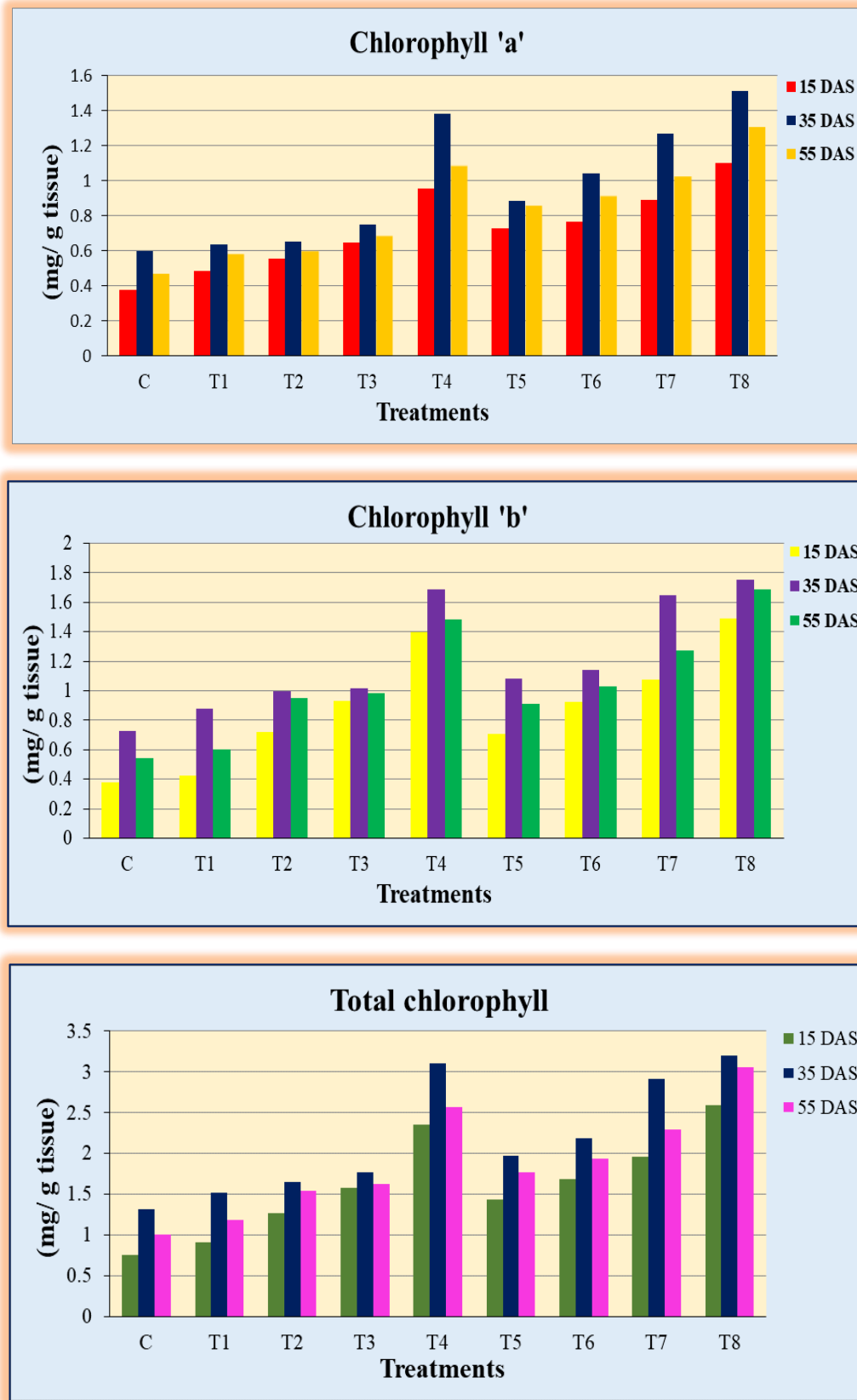


Figure - XII

Effect of summer composted Vegetable and Fruit waste on chlorophyll content in leaves of Lablab [*Lablab purpureus* (L.) Sweet]



The present study was on par with the results of Ravimycin, (2016) who reported that application of vermicompost increased the total chlorophyll content (6.28 mg fresh weight) in *Coriandrum sativum* L.

Maximum chlorophyll content was recorded in Ecodrum compost treatment (30.266) grown plants followed by Coarse compost treatment (29.266) and control (20.500) in leaf lettuce (Al-Sabbagh *et al.*, 2020).

The finding is comparable to that reported by Khan *et al.*, (2020) who found that T6 (*B. subtilis*, *B. thuringiensis*, and *B. megaterium* in combination with PGRs) treatment observed the maximum increase in chlorophyll content (59% and 45%) of S-sensitive variety and the T6 treatment showed higher chlorophyll content than that of irrigated control (T11) for the T-tolerant variety. The results of the present investigation are comparable to those of Silpa and Vijayalakshmi, (2020), who found that adding different combinations of biocomposted agro-industrial wastes (T8 & T4) significantly improved the chlorophyll content in cowpea leaves from 25 to 35 DAS.

Similar findings were reported by Gayathri and Aiswariya, (2020) who revealed that plants treated with a combination of organic fertilisers had higher chlorophyll contents in *Arachis hypogaeae* L. (45.53) and *Sesamum indicum* L. (55.90). Similar study was conducted by Rajashri *et al.*, (2021) who found that treatment T3 consisting of vermicomposted groundnut shell and vegetable waste (75g), significantly increased the chlorophyll content in pigeon pea followed by T1, T2 treatments when compared to the control.

The uptake of N, P, K, Mg, Fe and Cu which are almost often present in compost and have been used in the formation of chlorophyll, which is essential for light harvesting, was attributed to increase in chlorophyll content in leaves up to 55 DAS. The breakdown of proteins, ageing of the leaves, and microbial cell lysis may all contribute to the drop in chlorophyll content after 55 DAS.

#### **4.6.7 Effect of winter composted Vegetable and Fruit on yield protein content and carbohydrate in seeds of test crops**

##### **4.6.7a Black gram [*Vigna mungo* (L.) Hepper]**

The protein content was recorded maximum in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 74.99 mg/g tissue

and T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 69.81 mg/g tissue followed by T<sub>7</sub> (Fruit waste + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 56.35 mg/g tissue as compared to Control (33.17 mg/g tissue) respectively. The carbohydrate content was found to be more in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 78.82 mg/g tissue followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 76.41 mg/g tissue over Control (35.14 mg/g tissue) as depicted in Table- 24.

TABLE -24

**Effect of winter composted Vegetable and Fruit waste on protein and carbohydrate content in seeds of Black gram**

Treatment	Protein (mg/g tissue)	Carbohydrate (mg/g tissue)
C	33.17	35.14
T <sub>1</sub>	34.36	41.05
T <sub>2</sub>	39.26	44.77
T <sub>3</sub>	40.90	56.92
T <sub>4</sub>	69.81	76.41
T <sub>5</sub>	43.26	65.90
T <sub>6</sub>	49.17	66.78
T <sub>7</sub>	56.35	70.06
T <sub>8</sub>	74.99	78.82
SEd	0.0291	0.0282
CD (p<0.05)	0.0611	0.0591
CD (p<0.01)	0.0837**	0.0810**

\*\* - significant at 1% (P<0.01), DAS- Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

#### 4.6.7b Lablab [*Lablab purpureus* (L.) Sweet]

As presented in Table- 25, the protein content in lablab seed was observed highest in T<sub>8</sub> (Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) of 70.89 mg/g tissue followed by T<sub>4</sub> (Vegetable waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) of 71.08 mg/g tissue and T<sub>7</sub> (Fruit waste composted using cow dung, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) of 54.25 mg/g tissue when compared to Control (23.17 mg/g tissue). The carbohydrate content noted maximum in T<sub>8</sub> (Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) of 93.27 mg/g tissue and T<sub>4</sub> (Vegetable waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) of 91.08 mg/g tissue followed by T<sub>7</sub> (Fruit waste composted using cow dung, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) of 82.76 mg/g tissue over Control (35.24 mg/g tissue) respectively.

#### 4.6.8 Effect of summer composted Vegetable and Fruit waste on yield protein and carbohydrate content in seed of test crops

##### 4.6.8a Black gram [*Vigna mungo* (L.) Hepper]

The protein content in black gram seed was found to be highest in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 76.81 mg/g tissue and T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 71.08 mg/g tissue followed by other treatment when compared to Control (39.26 mg/g tissue) respectively. The carbohydrate content in black gram seeds was maximum in T<sub>8</sub> treatment (82.65 mg/g tissue) followed by T<sub>4</sub> treatment (78.98 mg/g tissue) and T<sub>7</sub> treatment (76.85 mg/g tissue) over control (37.44 mg/g tissue) as presented in Table- 26.

Similar results were obtained by Banik and Sengupta, (2014) who observed increase in the seed protein content of mung bean with the application of farm compost at 4-8 t ha<sup>-1</sup> by 6.5-9.0% over the fertilized control treatment.

This result was supported by the work of Sakthivigneswari and Vijayalakshmi, (2018) who noted maximum protein (64.08 mg/g tissue) and carbohydrate (97.55 mg/g tissue) content in T<sub>6</sub> (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5 t/ha) followed by T<sub>3</sub> (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5 t/ha) (58.56 and 92.84 mg/g tissue) as compared to Control.

TABLE - 25

Effect of winter composted Vegetable and Fruit waste on protein and carbohydrate content in seeds of Lablab

Treatment	Protein (mg/g tissue)	Carbohydrate (mg/g tissue)
C	23.17	35.24
T <sub>1</sub>	26.90	41.52
T <sub>2</sub>	33.17	42.70
T <sub>3</sub>	40.90	67.87
T <sub>4</sub>	71.08	91.08
T <sub>5</sub>	41.26	65.90
T <sub>6</sub>	46.07	78.27
T <sub>7</sub>	54.25	82.76
T <sub>8</sub>	70.89	93.27
SEd	1.5420	1.9052
CD (p<0.05)	3.2397	4.0026
CD (p<0.01)	4.4393**	5.4848**

\*\* - significant at 1% (P<0.01), DAS - Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

TABLE - 26

Effect of summer composted Vegetable and Fruit waste on protein and carbohydrate content in seeds of Black gram

Treatment	Protein (mg/g tissue)	Carbohydrate (mg/g tissue)
C	39.26	37.44
T <sub>1</sub>	42.08	42.04
T <sub>2</sub>	47.26	45.43
T <sub>3</sub>	56.17	53.42
T <sub>4</sub>	71.08	78.98
T <sub>5</sub>	59.26	68.75
T <sub>6</sub>	68.72	71.16
T <sub>7</sub>	63.44	76.85
T <sub>8</sub>	76.81	82.65
SEd	0.0360	1.5716
CD (p<0.05)	0.0756	3.3019
CD (p<0.01)	0.1037**	4.5246**

\*\* - significant at 1% (P<0.01), DAS - Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

TABLE - 27

Effect of summer composted Vegetable and Fruit waste on protein and carbohydrate content in seeds of Lablab

Treatment	Protein (mg/g tissue)	Carbohydrate (mg/g tissue)
C	33.54	40.72
T <sub>1</sub>	36.17	43.35
T <sub>2</sub>	40.17	46.41
T <sub>3</sub>	44.72	50.57
T <sub>4</sub>	62.17	72.47
T <sub>5</sub>	46.99	57.69
T <sub>6</sub>	52.08	64.48
T <sub>7</sub>	54.72	67.98
T <sub>8</sub>	65.90	76.96
SEd	0.0377	0.0303
CD (p<0.05)	0.0792	0.0637
CD (p<0.01)	0.1086**	0.0873**

\*\* - significant at 1% (P<0.01), DAS - Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

#### 4.6.8b Lablab [*Lablab purpureus* (L.) Sweet]

As depicted in table- 27, highest protein content in seeds of lablab was found in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 65.90 mg/g tissue followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 62.17 mg/g tissue and T<sub>7</sub> treatment (54.72 mg/g tissue) when compared to Control (33.54 mg/g tissue) respectively. The carbohydrate content in seed was found to be higher in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 76.96 mg/g tissue followed by T<sub>4</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) of 72.47 mg/g tissue followed by other treatments and Control (40.72 mg/g tissue).

Present study was in agreement with the results of Ashwini *et al.*, (2018) who found that seed protein content and protein yield (24.38 % and 480.00 kg ha<sup>-1</sup>) was recorded highest in T<sub>6</sub> when compared to T<sub>8</sub> (21.71 % and 307.62 kg ha<sup>-1</sup>) and T<sub>9</sub> (22.19% and 278.61 kg ha<sup>-1</sup>) respectively.

The result coincides with Lalitha and Santhakumari, (2021) who reported that total carbohydrates and total protein content significantly increased in T<sub>2</sub>- *Pseudomonas fluorescens* Biofertilizer (13.58mg and 0.173mg) followed by T<sub>3</sub>- *Bacillus subtilis* Biofertilizer (15.21 mg and 0.175 mg) when compared to uninoculated T<sub>1</sub> (11.71 and 0.143 mg) in *Vigna mungo* plants.

#### 4.6.9 Influence of winter composted Vegetable and Fruit waste on crude protein content in seeds of Black gram [*Vigna mungo* (L.) Hepper] and Lablab [*Lablab purpureus* (L.) Sweet]

Crude protein content in black gram seeds was significantly influenced by T<sub>8</sub>- Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) of 32.74% followed by T<sub>4</sub>- Vegetable waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperel loides* and *Eudrilus eugeniae* (5 t/ha) of 32.10% and lowest crude protein of 20.25% was noted in Control. T<sub>8</sub> showed the maximum crude protein content in lablab of 26.75 percent which was on par with T<sub>4</sub> treatment of 25.31% and T<sub>7</sub> treatment do 24.85% when compared to Control (20.37%) as presented in Table- 28.

TABLE - 28

**Influence of winter composted Vegetable and Fruit waste on crude protein content in seeds of selected crops**

Crude protein (%)		
Treatments	<i>Vigna mungo</i> (L.) Hepper	<i>Lablab purpureus</i> (L.) Sweet
C	20.25	20.37
T <sub>1</sub>	22.62	20.56
T <sub>2</sub>	24.81	21.18
T <sub>3</sub>	25.37	21.75
T <sub>4</sub>	32.10	25.31
T <sub>5</sub>	27.18	22.81
T <sub>6</sub>	27.93	23.87
T <sub>7</sub>	31.12	24.85
T <sub>8</sub>	32.74	26.75
SEd	2.3522	2.6329
CD (p<0.05)	4.9418	5.5315
CD (p<0.01)	6.7716**	7.5798**

\*\* - significant at 1% (P<0.01), DAS- Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

#### 4.6.10 Influence of summer composted Vegetable and Fruit waste on crude protein content in seeds of Black gram [*Vigna mungo* (L.) Hepper] and Lablab [*Lablab purpureus* (L.) Sweet]

Among all the treatment, T<sub>8</sub> (Fruit waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) recorded higher crude protein content in black gram of 33.18% which was on par with T<sub>4</sub> treatment (Vegetable waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) of 32.50% followed by other treatments and Control (20.56%) respectively. The crude protein content in seed of lablab was noted highest in T<sub>8</sub> treatment of 27.12% and T<sub>4</sub> treatment of 26.00% followed by T<sub>7</sub> treatment of 25.31% when compared to Control (20.62%) as depicted in Table- 29.

A similar result was obtained by Badar and Qureshi, (2014) who reported that the application of Rice husk (5g) composted with *Trichoderma hamatum* (JUF1) improved the crude protein on 30th day (25.46 mg gm<sup>-1</sup>) and *Bradyrhizobium* sp-II (JUR2) on 60th day (9.63 mg g<sup>-1</sup> tissue) in *Helianthus annuus* when compared to control.

The result is on par with Dhanraj *et al.*, (2018) who recorded the maximum test weight (4.11g), seed yield (13.53 Qha<sup>-1</sup>) and crude protein content (7.47 %) in T<sub>4</sub> treatment of Shankapushpi. The present finding is in conformity with Purba *et al.*, (2021) who reported the highest mean percentage of crude protein content is in the N<sub>2</sub> treatment (once every two weeks), which is 8.64 %, while in N<sub>1</sub> treatment (once every four weeks), the average percentage of crude protein was lower (7.86%) because of the right time interval for fertilization that have an incredible impact on the availability of sufficient N for *Clitoria ternatea* plants.

The results coincide with Krishnasree *et al.*, (2022) who noted that crude protein content of the pod was significantly influenced by foliar application of macro and micro nutrients. The highest protein content was recorded in T<sub>7</sub>- RDF + ZnSO<sub>4</sub> + 19:19:19 at 60 DAS (33.5%) and it was on par with treatments T<sub>2</sub>- RDF + 19:19:19 at 45 DAS (31.50%) in cow pea.

According to Kavitha *et al.*, (2013) the highest protein content (61.17 mg/g) was recorded in *Amaranthus triistis* due to the application of *Azospirillum* + chemical fertilizer + vermicompost as compared to the control (29.10 mg/g) on 40 days.

TABLE - 29

**Influence of summer composted Vegetable and Fruit waste on crude protein content in seeds of selected crops**

Crude protein (%)		
Treatments	<i>Vigna mungo</i> (L.) Hepper	<i>Lablab purpureus</i> (L.) Sweet
C	20.56	20.62
T <sub>1</sub>	23.12	21.06
T <sub>2</sub>	25.06	21.75
T <sub>3</sub>	25.75	22.12
T <sub>4</sub>	32.50	26.00
T <sub>5</sub>	27.12	23.18
T <sub>6</sub>	29.06	24.62
T <sub>7</sub>	31.37	25.31
T <sub>8</sub>	33.18	27.12
SEd	2.8021	2.6997
CD (p<0.05)	5.8871	5.6719
CD (p<0.01)	8.0671**	7.7722**

\*\* - significant at 1% (P<0.01), DAS - Days After Sowing

C – Control

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

## 4.7 Leghaemoglobin

### 4.7.1 Influence of Vegetable and Fruit waste composted in winter on leghaemoglobin content on root nodule of test crops

#### 4.7.1a Black gram [*Vigna mungo* (L.) Hepper]

There was a significant increase in leghaemoglobin content in all the treatment upto 50 DAS as mention in Figure-XIII.

The leghaemoglobin content was found to be maximum in T<sub>8</sub> (Fruit waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) which ranged from 0.063 to 0.070 mg/g followed by T<sub>4</sub> (Vegetable waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) ranged from 0.058 to 0.064 mg/g on 25 DAS and 50 DAS when compared to Control (0.012 to 0.017 mg/g) respectively.

#### 4.7.1b Lablab [*Lablab purpureus* (L.) Sweet]

The Figure XIV revealed a significant increase in leghaemoglobin content in all the treatment on 25 DAS and 50 DAS.

The leghaemoglobin content in root nodule of lablab was significantly increased from 25 DAS to 50 DAS in T<sub>8</sub> (Fruit waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) of 0.074 to 0.085 mg/g and T<sub>4</sub> (Vegetable waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) which ranged from 0.064 to 0.081 mg/g followed by other treatments over control (0.022 to 0.028 mg/g) respectively.

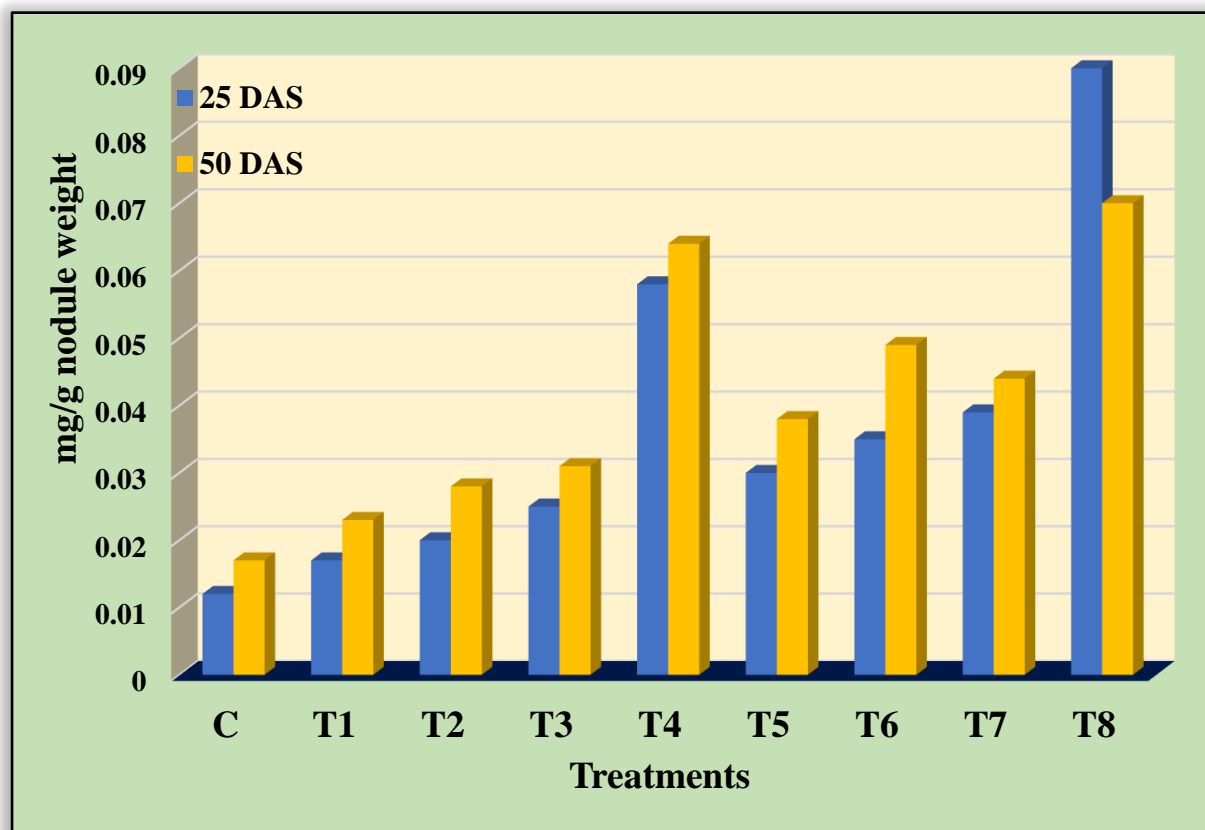
### 4.7.2 Effect of Vegetable and Fruit waste composted in summer on leghaemoglobin content on root nodule of test crops

#### 4.7.2a Black gram [*Vigna mungo* (L.) Hepper]

The leghaemoglobin content was recorded highest in T<sub>8</sub> (Fruit waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) which ranged from 0.068 to 0.073 mg/g followed by T<sub>4</sub> (Fruit waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) ranged from 0.059 to 0.066 mg/g and other treatments when compared to Control (0.024 to 0.030 mg/g) as shown in Figure-XV.

Figure - XIII

Effect of winter composted Vegetable and Fruit waste on Leghaemoglobin content in nodules of Black gram [*Vigna mungo* (L.) Hepper]



C – Control,

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

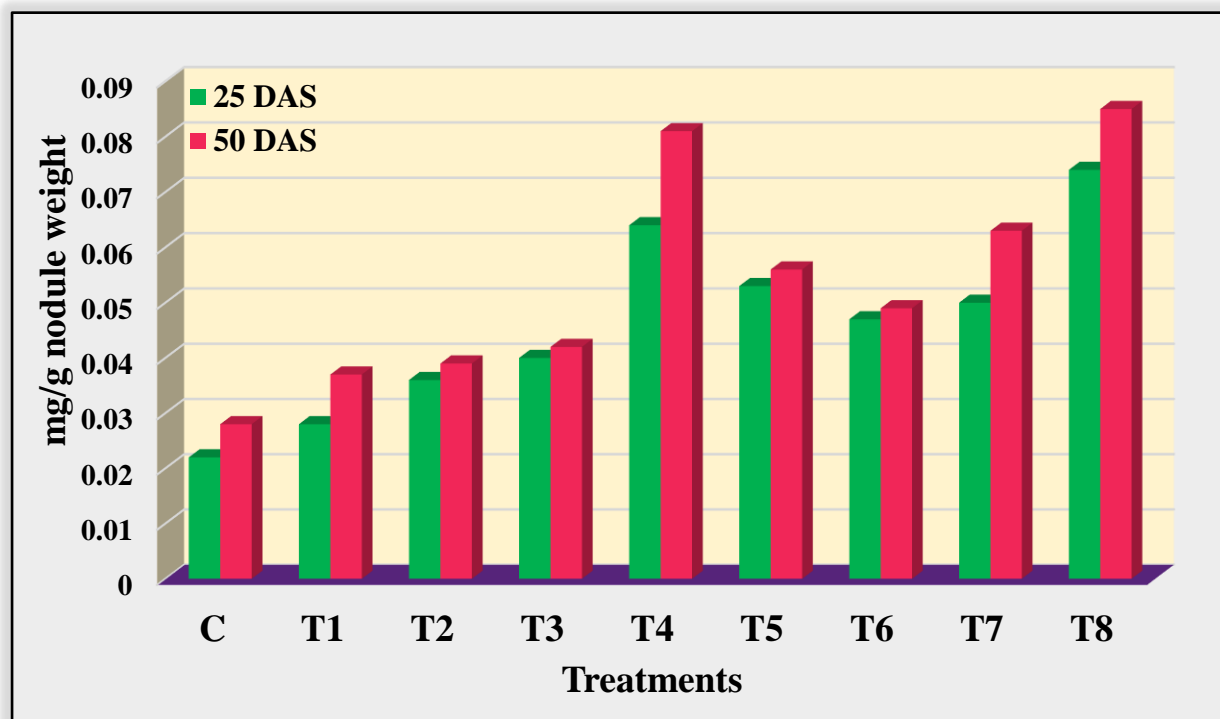
T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

Figure - XIV

Effect of winter composted Vegetable and Fruit waste on Leghaemoglobin content in nodules of Lablab [*Lablab purpureus* (L.) Sweet]



C – Control,

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

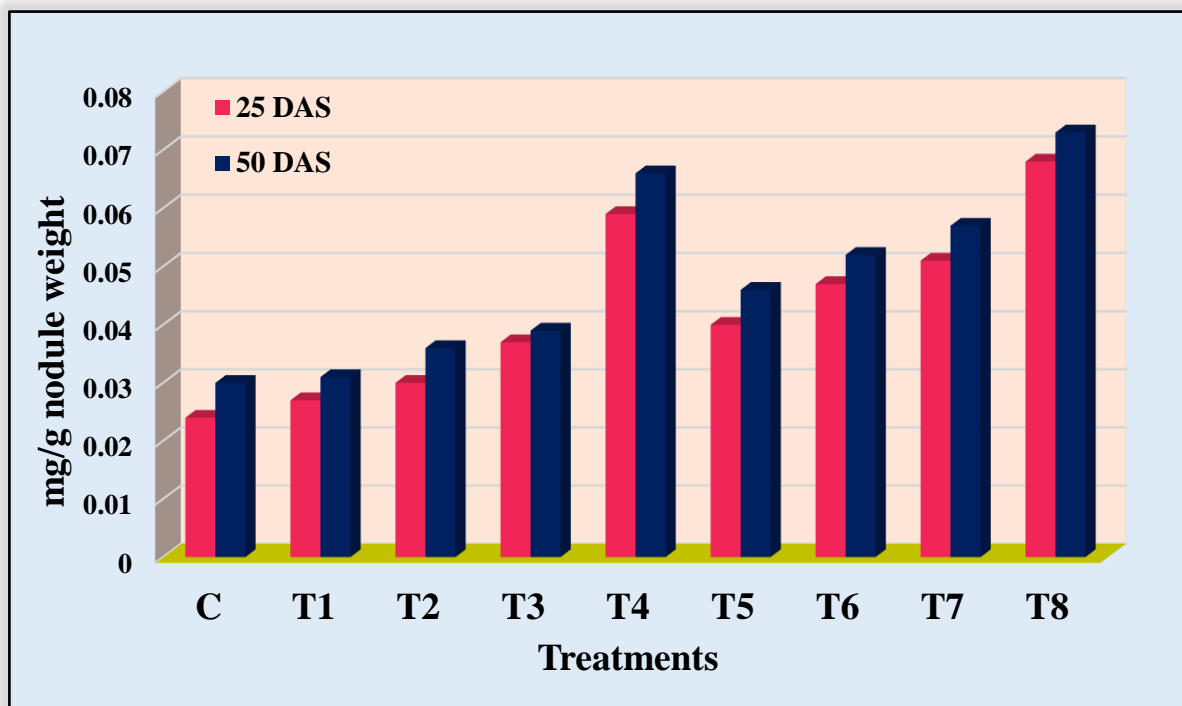
T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

Figure - XV

Effect of summer composted Vegetable and Fruit waste on Leghaemoglobin content in nodules of Black gram [*Vigna mungo* (L.) Hepper]



C – Control,

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

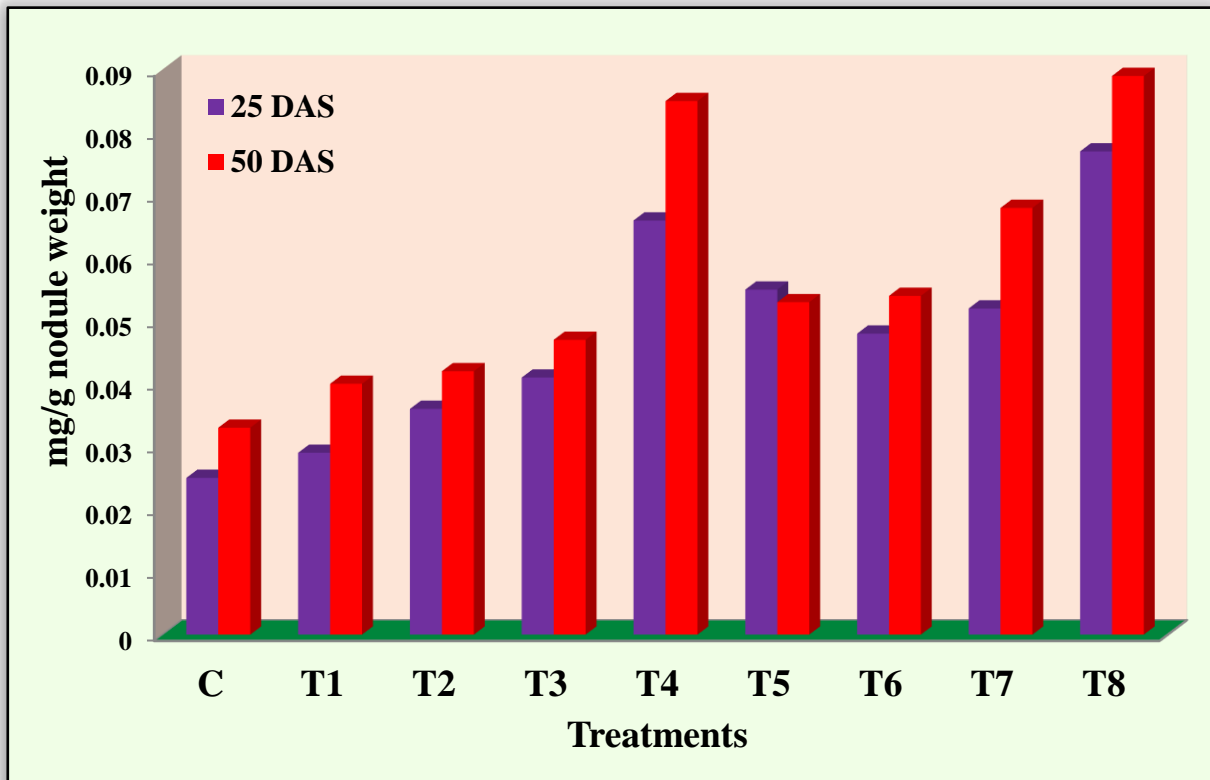
T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

#### 4.7.2b Lablab [*Lablab purpureus* (L.) Sweet]

Maximum leghaemoglobin content was obtained in T<sub>8</sub> treatment (0.077 to 0.089 mg/g) which was on par with T<sub>4</sub> treatment (0.066 to 0.085 mg/g) followed by T<sub>7</sub> treatment (0.055 to 0.068 mg/g) as compared to Control (0.025 to 0.033 mg/g) as depicted in Figure- XVI respectively.

Figure - XVI

Effect of summer composted Vegetable and Fruit waste on Leghaemoglobin content in nodules of Lablab [*Lablab purpureus* (L.) Sweet]



C – Control,

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

Similar work was done by Moinuddin *et al.*, (2014) who revealed that combined inoculation of phosphorus (60/kg) + biological phosphorus fertilizer (*Pseudomonas striata*) increased the leghaemoglobin content (3.37 mg/g) in chickpea nodules.

The result was in agreement with Singh and Vijayalakshmi, (2013) who reported that increase in leghaemoglobin content (0.0560mg/g) in green gram. Patane *et al.*, (2014) reported that application of biofertilizers increases the leghaemoglobin content in black gram.

The finding is comparable to that reported by Verma *et al.*, (2014) that application of vermicompost (6t ha<sup>-1</sup>) increased the leghaemoglobin content of 2.00 mg/g in fenugreek. Due to presence of nitrogen in root nodules leghaemoglobin content increases. Nalini and Kumar, (2016) agreed that 15 per cent concentration of *Mycorrhiza* significantly increased the leghaemoglobin content of 4.59 mM (g.f.m<sup>-1</sup>) in *Vigna mungo* root nodules.

The present study is comparable to Tagore *et al.*, (2013) who found that the leghemoglobin content increases as crop mature with maximum on 55 DAS and then began to decline at 75 DAS in chickpea root nodules. At 35, 55, and 75 DAS, IG- 593 genotypes had the highest nodule leghemoglobin content (2.10, 2.55, and 2.47 mg g<sup>-1</sup> of fresh nodule), while lowest was noted in IG- 370 genotypes (1.07, 1.23, and 1.45 mg g<sup>-1</sup> of fresh nodule). According to Kannan *et al.*, (2015) leghaemoglobin content was tested for root nodules of four tropical legumes. Among them, leghaemoglobin content was noted highest in the nodules of *Arachis hypogaea* GN7 (0.088 µg/ml), *Mymosa putika* TN3 (0.044 µg/ml), *Vigna radiata* GG3 (0.024 µg/ml) and *Vigna mungo* BG2 (0.020 µg/ml).

Similar results was obtained by Singh and Vijayalakshmi, (2016) reported significant increase in leghaemoglobin content in T12 (Composted coirpith (6.5t ha<sup>-1</sup>) + composted pressmud (6.5t ha<sup>-1</sup>) + farmyard manure (6.5t ha<sup>-1</sup>)) followed by T9 (Composted coirpith (12.5t ha<sup>-1</sup>) + 25% NPK) as compared to control of black gram and cluster bean.

The present study correlates with Sakthivigneswari and Vijayalakshmi, (2016b) who reported that leghaemoglobin content was increased from 25 to 50 DAS and it gradually decreases up to 75 DAS. The treatment T<sub>6</sub>- Raw coirpith + *Pleurotus sajor-caju* + *Eudrilus eugeniae* (5t ha<sup>-1</sup>) increases leghaemoglobin content followed by T<sub>3</sub> as compared to the control on 25 to 50 DAS in soyabean root nodules.

Leghaemoglobin content significantly decreased with the increase in salinity levels in both the varieties of fenugreek (cv. NDM-17and Pusa Kasauri) except at 3 EC level whereas the content was higher in the rhizobium inoculated treatment on 90 DAS (Kumari *et al.*, (2017).

According to Pande, (2017) the leghaemoglobin content in the nodules of healthy plants had higher content than those of disease ones on 20, 30, 40 and 50 days after inoculation in cowpea.

The result coincides with Pagare *et al.*, (2019) who reported that T<sub>7</sub> (Liquid consortium + 100 % N) showed higher leghaemoglobin content in soyabean root nodule over rest of the treatments and followed by treatment T<sub>6</sub> (Liquid consortium + 75 % N). The control treatment recorded the least Leghaemoglobin content in root nodule on 45 and 60 days.

Leghaemoglobin content may have increased due to the incorporation of composted vegetable and fruit waste into the soil and high nitrogenase activity by respiring bacteroids. Leghaemoglobin content may have gradually decreased after that due to lower nitrogenase activity by the bacteria and the inactivation or cell lysis of microorganisms.

## PHASE IV

### 4.8 Soil Analysis

#### 4.8.1 Initial Analysis of Experimental Soil

The pot culture was conducted in green house at Avinashilingam Institute for Home Science and Higher Education for women, Coimbatore. Based on textural composition, the soil was sandy clay loam soil. The changes in soil pH, electrical conductivity, available nitrogen, available phosphorus and available potassium of the initial soil in different treatments and combination are depicted in Table- 30.

The result revealed that initial soil pH, electrical conductivity, available nitrogen, phosphorus and potassium were recorded maximum in T<sub>8</sub> (Fruit waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) and T<sub>4</sub> (Vegetable waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) followed by other treatment over the Control.

**TABLE - 30**  
**Initial Analysis of Experimental Soil**

Treatments	pH	EC (Millimhos cm <sup>-1</sup> )	AVAILABLE NITROGEN (Kg/ha)	AVAILABLE PHOSPHORUS (Kg/ha)	AVAILABLE POTASSIUM (Kg/ha)
C	6.07	2.29	159	19.1	115
T <sub>1</sub>	6.34	2.36	164	19.7	121
T <sub>2</sub>	6.38	3.14	172	19.4	127
T <sub>3</sub>	6.40	3.29	178	19.2	130
T <sub>4</sub>	6.71	3.84	198	20.9	152
T <sub>5</sub>	6.42	3.37	182	19.7	137
T <sub>6</sub>	6.39	3.44	187	19.8	141
T <sub>7</sub>	6.56	3.48	190	20.1	146
T <sub>8</sub>	6.80	3.90	212	21.3	163

C – Control,

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae*  
(5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae*  
(5 t/ha).

#### 4.8.2 Post harvest soil Analysis of winter composted test crops

##### 4.8.2a Black gram [*Vigna mungo* (L.) Hepper]

The data presented in Table- 31 showed that significant increase in pH (7.22 and 7.18) electrical conductivity (2.46 and 2.35 millimhos  $\text{cm}^{-1}$ ), available nitrogen (245 kg/ha and 236 kg/ha), available phosphorus (29.5 kg/ha and 27.6 kg/ha) and available potassium (135 kg/ha and 130 kg/ha) was recorded in Fruit waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) (T<sub>8</sub>) and compost of vegetable waste prepared by using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) (T<sub>4</sub>) followed by other treatment as compared to Control (6.12, 1.13 millimhos  $\text{cm}^{-1}$ , 168 kg/ha, 20.7 kg/ha and 94 kg/ha) respectively.

##### 7.8.2b Lablab [*Lablab purpureus* (L.) Sweet]

Among all the treatment, T<sub>8</sub> treatment observed the highest pH (7.27), electrical conductivity (2.52 millimhos  $\text{cm}^{-1}$ ), available nitrogen (254 kg/ha), available phosphorus (30.6 kg/ha) and available potassium (146 kg/ha) followed by T<sub>4</sub> treatment (7.22, 2.39 millimhos  $\text{cm}^{-1}$ , 238 kg/ha, 29.4 kg/ha and 136 kg/ha) and other treatment over Control (6.13, 1.15 millimhos  $\text{cm}^{-1}$ , 172 kg/ha, 20.9 kg/ha and 98 kg/ha) as depicted in Table- 32 respectively.

#### 4.8.3 Post harvest soil Analysis of summer composted test crops

##### 4.8.3a Black gram [*Vigna mungo* (L.) Hepper]

The pH and electrical conductivity increased in all the treatments at harvest with the highest pH and EC recorded in T<sub>8</sub> treatment (Fruit waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) of 7.35 and 2.68 millimhos  $\text{cm}^{-1}$  followed by T<sub>4</sub> treatment (Vegetable waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha) of 7.21 and 2.50 millimhos  $\text{cm}^{-1}$  (Table- 33) as compared to Control of 6.06 and 1.12 millimhos  $\text{cm}^{-1}$  respectively. Available nitrogen, available phosphorus and available potassium was obtained higher in T<sub>8</sub> treatment (288 kg/ha, 34.7 kg/ha and 143 kg/ha) which is in par with T<sub>4</sub> treatment (276 kg/ha, 30.2 kg/ha and 132 kg/ha) followed by other treatments when compared to Control (180 kg/ha, 20.8 kg/ha and 96 kg/ha).

### 7.8.3b Lablab [*Lablab purpureus* (L.) Sweet]

The data from Table- 34 revealed that highest pH (7.30 and 7.28), electrical conductivity (2.39 millimhos  $\text{cm}^{-1}$  and 2.31 millimhos  $\text{cm}^{-1}$ ) in T<sub>8</sub> treatment followed by T<sub>4</sub> treatment as compared to Control (6.10 and 1.12 millimhos  $\text{cm}^{-1}$ ). Maximum available nitrogen of 232 kg/ha and 230 kg/ha, available phosphorus of 27.7 kg/ha and 25.9 kg/ha and available potassium of 132 kg/ha and 129 kg/ha was recorded in T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) followed by T<sub>4</sub> (Vegetable waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) when compared to Control (165 kg/ha, 21.2 kg/ha and 92 kg/ha) respectively.

TABLE - 31

#### Post-harvest soil analysis of *Vigna mungo* (L.) Hepper grown in winter compost

Treatments	pH	EC (Millimhos $\text{cm}^{-1}$ )	AVAILABLE NITROGEN (Kg/ha)	AVAILABLE PHOSPHORUS (Kg/ha)	AVAILABLE POTASSIUM (Kg/ha)
C	6.12	1.13	168	20.7	94
T <sub>1</sub>	6.36	1.20	182	21.4	98
T <sub>2</sub>	6.39	1.54	196	21.9	108
T <sub>3</sub>	6.42	1.66	201	22.3	113
T <sub>4</sub>	7.18	2.35	236	27.6	130
T <sub>5</sub>	6.48	1.62	209	23.8	118
T <sub>6</sub>	6.42	1.68	217	24.7	125
T <sub>7</sub>	6.63	1.70	228	26.5	128
T <sub>8</sub>	7.22	2.46	245	29.5	135

C – Control,

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha).

TABLE - 32

Post-harvest soil analysis of *Lablab purpureus* (L.) Sweet grown in winter compost

Treatments	pH	EC (Millimhos cm <sup>-1</sup> )	AVAILABLE NITROGEN (Kg/ha)	AVAILABLE PHOSPHORUS (Kg/ha)	AVAILABLE POTASSIUM (Kg/ha)
C	6.13	1.15	172	20.9	98
T <sub>1</sub>	6.38	1.22	188	21.8	102
T <sub>2</sub>	6.45	1.59	199	22.3	114
T <sub>3</sub>	6.46	1.68	205	22.9	118
T <sub>4</sub>	7.22	2.39	238	29.4	136
T <sub>5</sub>	6.56	1.67	216	23.8	125
T <sub>6</sub>	6.48	1.70	222	25.5	129
T <sub>7</sub>	6.65	1.75	235	26.8	132
T <sub>8</sub>	7.27	2.52	254	30.6	146

C – Control,

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae*  
(5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae*  
(5 t/ha).

TABLE - 33

Post-harvest soil analysis of *Vigna mungo* (L.) Hepper grown in summer compost

Treatments	pH	EC (Millimhos cm <sup>-1</sup> )	AVAILABLE NITROGEN (Kg/ha)	AVAILABLE PHOSPHORUS (Kg/ha)	AVAILABLE POTASSIUM (Kg/ha)
C	6.06	1.12	180	20.8	96
T <sub>1</sub>	6.20	1.26	194	21.5	110
T <sub>2</sub>	6.24	1.52	197	21.7	115
T <sub>3</sub>	6.38	1.66	200	22.6	119
T <sub>4</sub>	7.21	2.50	276	30.2	132
T <sub>5</sub>	6.44	1.72	204	23.1	124
T <sub>6</sub>	6.59	1.74	210	23.4	127
T <sub>7</sub>	6.78	1.80	215	25.8	128
T <sub>8</sub>	7.35	2.68	288	34.7	143

C – Control,

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae*  
(5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae*  
(5 t/ha).

TABLE - 34

Post-harvest soil analysis of *Lablab purpureus* (L.) Sweet grown in summer compost

Treatments	pH	EC (Millimhos cm <sup>-1</sup> )	AVAILABLE NITROGEN (Kg/ha)	AVAILABLE PHOSPHORUS (Kg/ha)	AVAILABLE POTASSIUM (Kg/ha)
C	6.10	1.12	165	21.2	92
T <sub>1</sub>	6.37	1.24	172	22.6	96
T <sub>2</sub>	6.40	1.52	188	24.4	103
T <sub>3</sub>	6.44	1.59	197	22.2	115
T <sub>4</sub>	7.28	2.31	230	25.9	129
T <sub>5</sub>	6.45	1.65	212	23.5	120
T <sub>6</sub>	6.53	1.72	220	23.8	124
T <sub>7</sub>	6.62	1.78	226	24.9	127
T <sub>8</sub>	7.30	2.39	232	27.7	132

C – Control,

T<sub>1</sub> - V.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>2</sub> - V.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>3</sub> - V.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>4</sub> - V.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae*  
(5 t/ha),

T<sub>5</sub> - F.W + cow dung + *Eudrilus eugeniae* (5 t/ha),

T<sub>6</sub> - F.W + cow dung + *Pleurotus eous* + *Eudrilus eugeniae* (5 t/ha),

T<sub>7</sub> - F.W + cow dung + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha),

T<sub>8</sub> - F.W + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae*  
(5 t/ha).

Similar work was carried out by El-Mohamedy *et al.*, (2015) who found that application of biocompost increased the nitrogen (1.54%), phosphorus (0.37%) and potassium content (2.59%) in potato cultivated soil.

The result is in par with Aswhini *et al.*, (2018) who reported that T6 treatment (FYM at 6 t/ha + RDF + biofertilizers) recorded significant uptake of higher nitrogen, phosphorus and potassium (143.76, 22.68 and 36.17 kg ha<sup>-1</sup>) over other treatments and lowest uptake was

noted with Recommended Dose of Fertilizers (T9) alone at harvest (92.27, 12.31 and 22.49 kg ha<sup>-1</sup>).

Similar findings were attained by Khalil *et al.*, (2019) who revealed that among all treatments, regardless of whether they received organic and inorganic fertilizers individually or together in different ratios had a significant impact on the post-harvest chemical characteristics of maize crop soil, such as pH, EC, total nitrogen and organic matter content.

The results are consistent with those of Senthilvalavan and Ravichandran, (2020), who found that the soil pH and EC of the post-harvest soils of rice and black gram varied within a small range among the treatments. However, when the microbial population (Bacteria, Fungi, Actinomycetes) was counted for two years, the System of Rice Intensification plots were found to be superior by recording higher microbial population and lower microbial count was noticed in conventional method.

The current finding is consistent with Zonayet and Paul, (2020) report that 100% NPK briquettes (267.5 kg ha<sup>-1</sup>) contained higher levels of organic matter (2.86%), organic carbon (1.70%), total nitrogen (0.087%), exchangeable K (0.14 meq 100 g<sup>-1</sup>), and available Zn (0.66 µg g<sup>-1</sup>) in post-harvest soil from fields I and II.

Similar results was observed by Bhuyan *et al.*, (2021) who revealed that combinations of different organic manure significantly influence soil physico-chemical properties. Maximum improvement in terms of soil physico-chemical parameters such as EC, available nitrogen, available phosphorus and available potassium was noticed in application of 100% poultry manure (T<sub>10</sub>).

Post-harvest residues of barley cultivated alone with adequate water supply but undersown with catch crop gathered the same or greater levels of N, P, K, and Mg as residues of barley grown alone under stress (Jastrz ębska *et al.*, 2021).

The increase in the available nitrogen and available potassium might be due to the incorporation of organic manure in soil and microbial activity in biocompost leading to conversion of organic nitrogen into inorganic form. Thus, made it available to the crops. Increase in pH might be due to microbes consuming organic acid and ammonia content during composting process. During decomposition of organic waste, organic acid was produced which solubilised the phosphate and mineralize the organic matter in plant, thereby increasing phosphorus availability in soil.

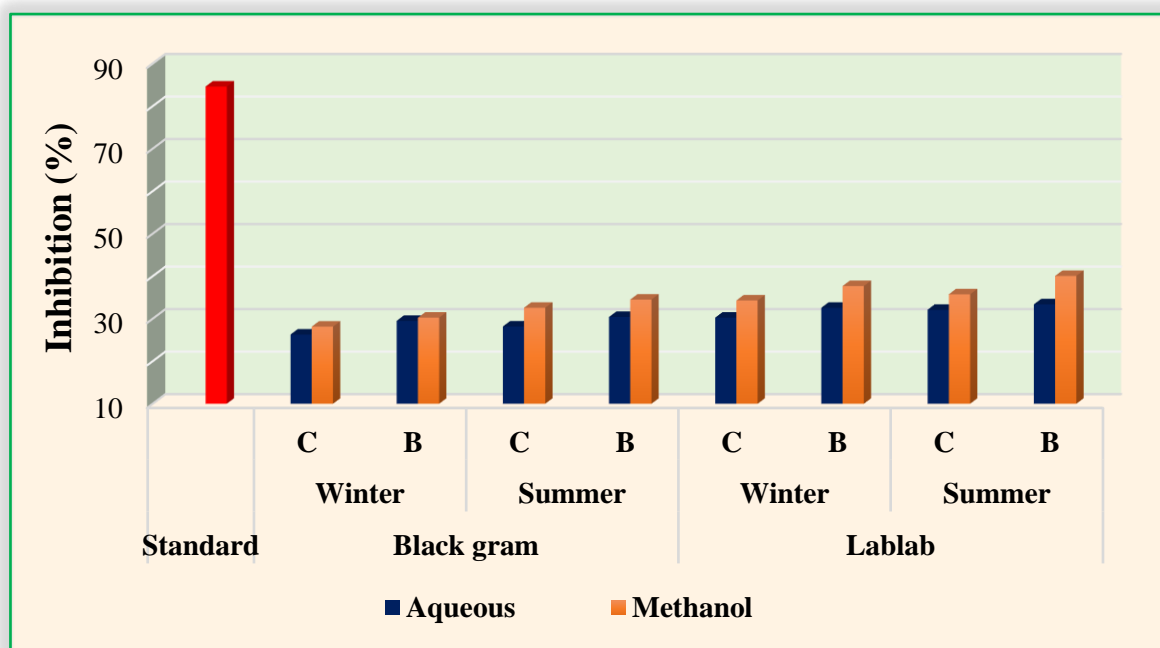
#### 4.9 Effect of aqueous and methanol seeds extract on the antioxidant activity for selected test crops grown in winter and summer compost

The data from the above results were statistically significant in all the compost when compared to Control. Among the eight treatments, T<sub>8</sub> (Fruit waste + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) was recorded as an efficient organic compost as compared to other treatments. The T<sub>8</sub> treatment overall enhanced the microbial flora, biometric, yield and biochemical, leghaemoglobin content and physico-chemical parameters of pre and post-harvest soil of the plant grown in winter and summer compost namely *Vigna mungo* and *Lablab purpureus*.

To strengthen the above results, antioxidant and antibacterial activity was carried out in aqueous and methanol seed extract of selected plants grown under best treatment and control treatment.

Figure - XVII

#### Hydrogen peroxide scavenging activity of Black gram and Lablab grown in winter and summer compost seeds



Standard- Ascorbic acid, C- Control treatment

B- Best treatment [T<sub>8</sub>- Fruit waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha)]

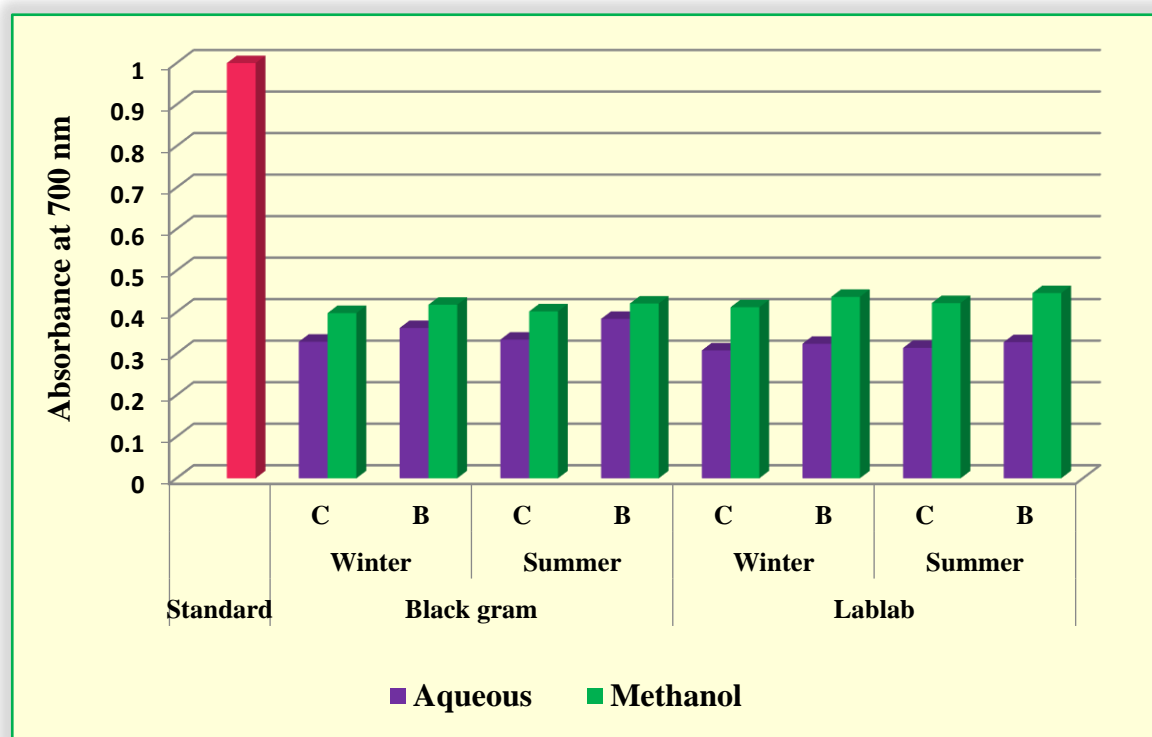
#### 4.9.1a Hydrogen peroxide scavenging activity

The H<sub>2</sub>O<sub>2</sub> scavenging activity of black gram and lablab grown in both winter and summer compost was carried out in aqueous and methanol seed extracts as presented in in Figure- XVII.

Among the selected plant, the hydrogen peroxide scavenging activity was recorded higher in methanol and aqueous seed extract of black gram grown in summer season compost (40.07% and 30.42%) in Best treatment (T<sub>8</sub>) followed by methanol and aqueous seed extracts of lablab grown in summer compost (38.52% and 33.39%) in Best treatment (T<sub>8</sub>) respectively. All the extracts possess hydrogen peroxide scavenging activity in the order of Black gram (summer) > Lablab (summer) > Lablab (winter) > Black gram (winter). The summer composted biocompost treated crops showed better results than winter composted biocompost treated crops.

Figure – XVIII

Reducing power assay for Black gram and Lablab grown in winter and summer compost seeds (absorbance at 700nm)



Standard- Ascorbic acid, C- Control treatment

B- Best treatment [T<sub>8</sub>- Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha)]

#### 4.9.1b Reducing power assay

The reducing power assay was assessed in the Best treatment (T<sub>8</sub>- Fruit waste + cow dung + *Pleurotus eous* + *Tricoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha) and Control treatment in aqueous and methanol seed extracts (Figure- XVIII).

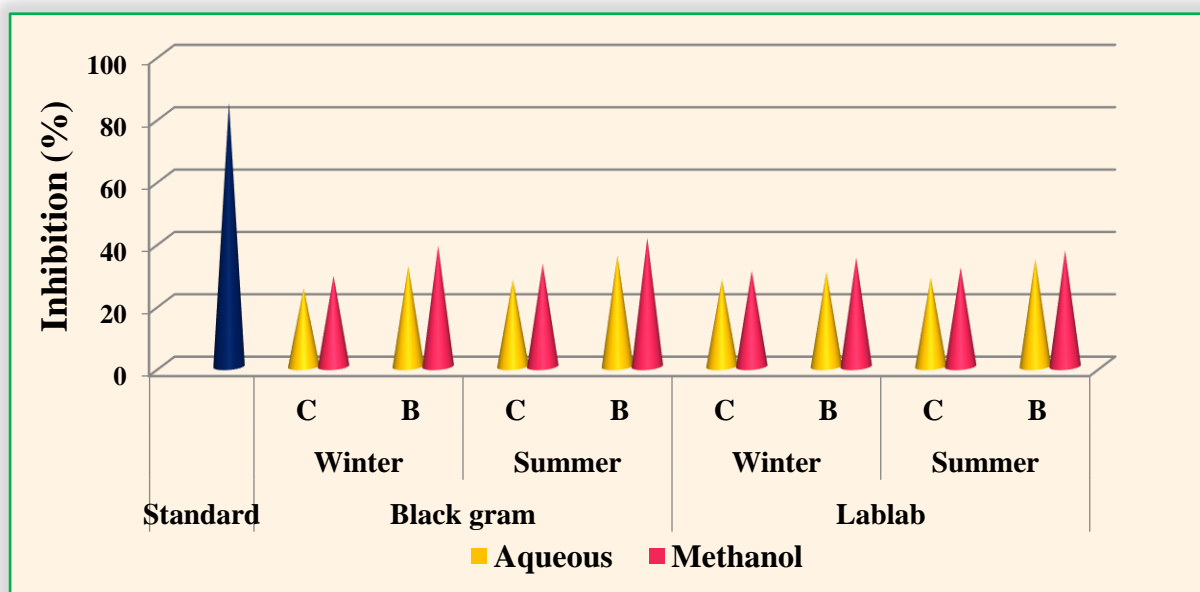
Among the test crops, maximum reducing power was recorded in Best treatment (T<sub>8</sub>) methanol seed extract (0.446) when compared to aqueous seed extract (0.384) of black gram grown in summer compost. Moderate power assay was noted in Control treatment in methanol (0.402) and aqueous (0.334) seed extracts. It has been observed that all the extracts are likely to have reducing power assay in order of *Vigna mungo* (summer) > *Lablab purpureus* (summer) > *Vigna mungo* (winter) > *Lablab purpureus* (winter). This may be due to the ability of an antioxidant to donate an electron which is an important mechanism of phenolic antioxidant action (Nabavi *et al.*, 2009).

#### 4.9.1c Nitric oxide radical scavenging activity

As presented in Figure- XIX, the nitric oxide radical scavenging activity was found in all the selected crops which are grown under Best treatment with moderate activity was observed in Control treated plant seeds.

Figure - XIX

Nitric oxide radical scavenging activity for Black gram and Lablab grown in winter and summer compost seeds



Standard- Ascorbic acid, C- Control treatment

B- Best treatment [T<sub>8</sub>- Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha)]

Among all the selected plants, significant nitric oxide scavenging activity was recorded in Best treatment (T<sub>8</sub>) methanol extract (41.24%) of *Vigna mungo* grown in summer compost followed by aqueous seed extracts (35.71%). The least activity was observed in methanol extracts (29.03%) and aqueous extracts (25.17%) of black gram grown in winter compost Control treatment. It can be concluded that all the plant extract most likely possesses nitric oxide scavenging activity in the order of *Vigna mungo* (summer) > *Lablab purpureus* (summer) > *Vigna mungo* (winter) > *Lablab purpureus* (winter) respectively. All the plants have the property to counteract the harmful effect of nitric oxide and other reactive nitrogen species (RNS) and this could be due to antioxidant potential activity in the extracts.

#### **4.9.1d DPPH activity**

The antioxidant activity was assessed in the selected test crops seed for scavenging free radical using DPPH assay and are indicated in Figure - XX to XXIII.

In DPPH assay, a stable DPPH radical accepts an electron from the antioxidant compound, the violet colour of the DPPH radical was reduced to yellow coloured Diphenyl picrylhydrazine radical (Sasikumar and Kalaisezhien, 2014). The methanol and aqueous seed extracts in different concentration ranging from 20 – 100 µg/ml were tested for antioxidant activity against standard (Ascorbic acid).

#### **Black gram [*Vigna mungo* (L.) Hepper] grown in winter compost**

In Control treatment, the methanolic seed extracts obtained a maximum scavenging activity in 100 µg/ml of 72.85% followed by aqueous seed extracts of 70.32% and highest activity was noted in standard (85.54%) respectively. In the Best treatment, methanolic seed extracts was noted highest in 100 µg/ml (80.69%), 80 µg/ml (70.59%), 60 µg/ml (44.31%), 40 µg/ml (38.49%) and 20 µg/ml (34.56%) concentration followed by aqueous seed extracts of 72.15%, 68.87%, 56.13%, 36.75% and 32.38% respectively.

#### **Lablab [*Lablab purpureus* (L.) Sweet] grown in winter compost**

The methanolic seed extracts of Best treatment (T<sub>8</sub>) noted a higher scavenging activity in 100 µg/ml and 80 µg/ml concentration of 67.93% and 59.87% followed by methanolic seed of extracts of Control treatment (62.22% and 55.98%) and aqueous seed extracts of Best treatment (60.25% and 53.54%) respectively.

Figure – XX

DPPH free radical scavenging activity of aqueous and methanolic seed extracts of Black gram grown in winter compost

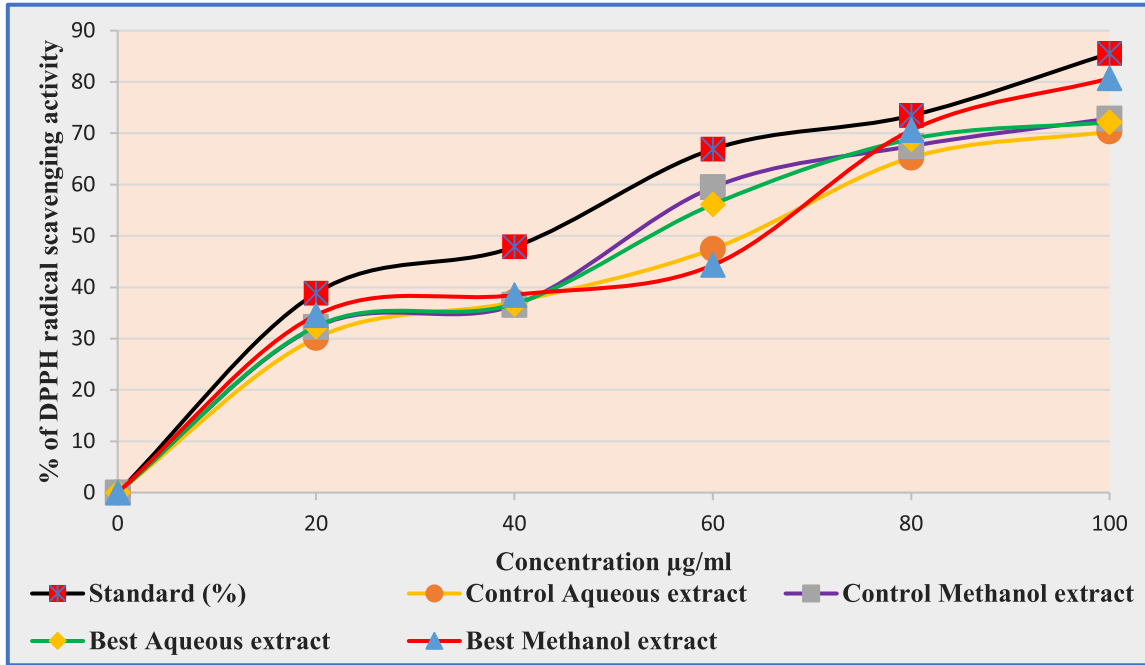
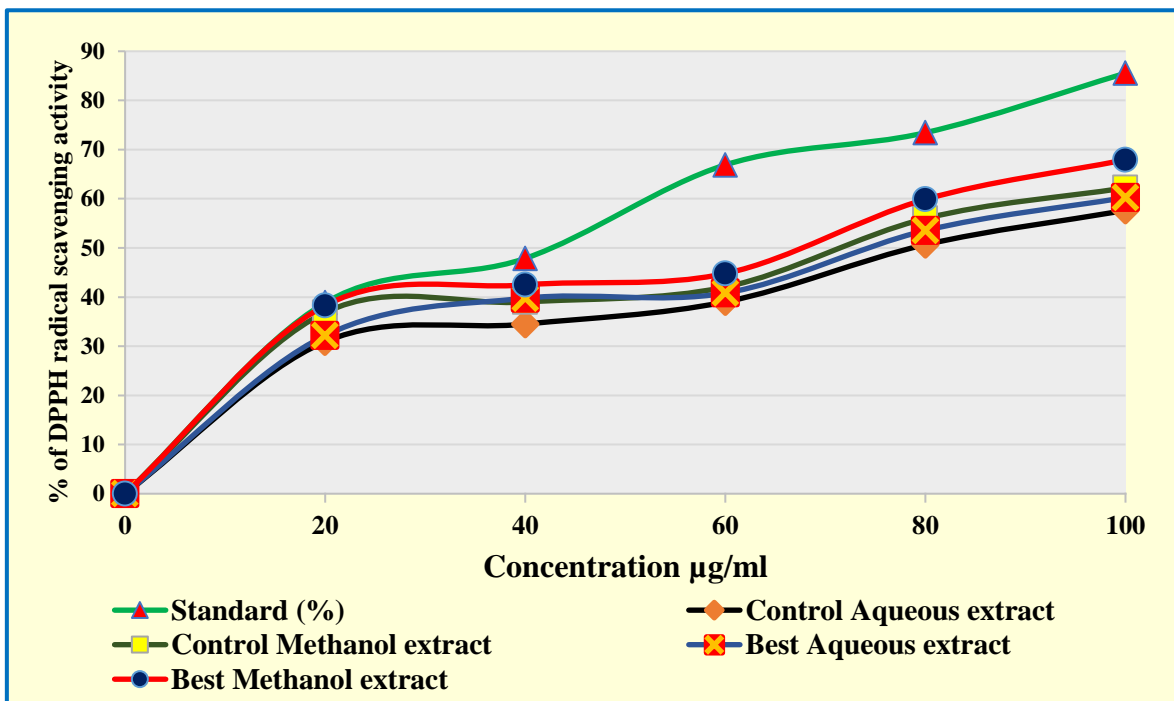


Figure – XXI

DPPH free radical scavenging activity of aqueous and methanolic seed extracts of Lablab grown in winter compost



### **Black gram [*Vigna mungo* (L.) Hepper] grown in summer compost**

The DPPH antioxidant scavenging activity of the test crops noted maximum in Best treatment (T<sub>8</sub>) methanolic seed extracts in different concentration of 100 µg/ml (82.89%) and 80 µg/ml (71.13%) followed by methanolic seed extracts of Control treatment with 100 and 80 µg/ml (75.04% and 70.53%) and aqueous extracts of Best treatment (74.13% and 69.60%) respectively.

### **Lablab [*Lablab purpureus* (L.) Sweet] grown in summer compost**

Methanolic seed extracts of Best treatment showed higher antioxidant scavenging activity in 100 µg/ml concentration of 69.93% followed by aqueous seed extracts (67.67%) and methanolic seed extracts of Control treatment (66.52%) respectively.

The present finding is on par with Prabhu *et al.*, (2011) who concluded that *Eclipta alba* found to be better antioxidant in DPPH radical scavenging activity and significant antimicrobial activity.

The result coincides with Aminifard *et al.*, (2013) who reported that fruit antioxidant activities and quality of pepper was affected by different compost levels and suggest the usage of compost as bio-treatment for improvement of fruit antioxidant activities and quality of pepper.

According to Aires *et al.*, (2013) the percentage of DPPH scavenging radicals from 1 mg mL<sup>-1</sup> antiradical activity was 81.4% in watercress when compared to the positive control (83.3%). The reducing power assay in watercress was 0.437 as compared to positive control (0.487).

The present study coincides with Kazi *et al.*, (2022) who reported highest antioxidant activity in T<sub>1</sub>, T<sub>19</sub> and T<sub>29</sub> (84.95%, 81.41% and 80.53%) respectively and concluded that finger millet is extremely nutritious and needs to be preserved as a possible source of nutrients, antioxidants and nutritional characteristics.

From the above results, it was found that the methanolic extract of selected plant seeds showed maximum activity followed by aqueous seed extracts in the order of *Vigna mungo* (summer) > *Lablab purpureus* (summer) > *Vigna mungo* (winter) > *Lablab purpureus* (winter) respectively.

Figure – XXII

DPPH free radical scavenging activity of aqueous and methanolic seed extracts of Black gram grown in summer compost

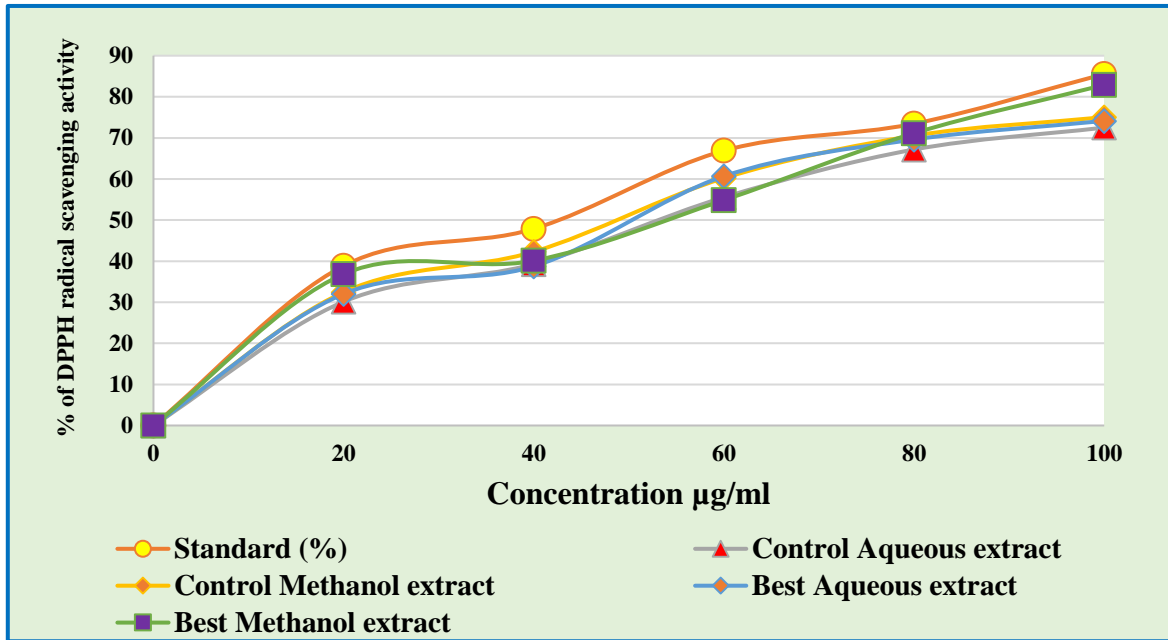
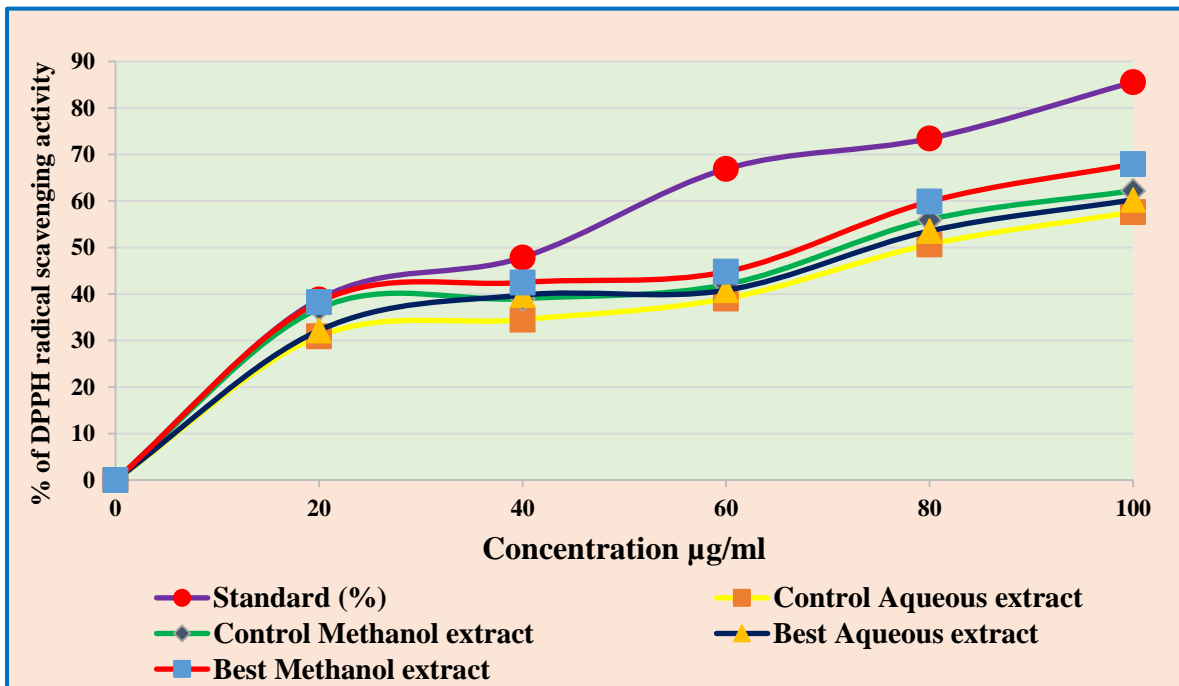


Figure - XXIII

DPPH free radical scavenging activity of aqueous and methanolic seed extracts of Lablab grown in summer compost



From the studies, it was clearly indicated that the black gram grown in summer compost methanolic extract possess significant free radical scavenging activity followed by aqueous extract. Hence, the IC<sub>50</sub> value of DPPH free radical scavenging assay was tested for methanol seed extract of black gram grown in summer compost and presented in Table- 35. The IC<sub>50</sub> value of *Vigna mungo* grown in summer compost Best treatment methanolic seed extracts showed significant antioxidant activity (46.83 µg/ml) when compared to Control treatment respectively.

**TABLE – 35**  
**DPPH free radical scavenging activity of methanolic seed extract of Black gram grown in summer compost**

Samples	Graded concentrations of the samples (µg/ml)					IC <sub>50</sub> Value
	20	40	60	80	100	
Standard	38.85	47.87	66.89	73.44	85.54	38.85
Best sample	36.84	40.11	60.21	78.13	82.89	46.83
Control	32.44	42.29	54.85	70.53	75.04	49.24

Standard- Ascorbic acid, C- Control treatment

B- Best treatment [T<sub>8</sub>- Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha)]

The present result coincides with the results of Kapusta-Duch *et al.*, (2012) who observed maximum antioxidant activity in the methanolic extracts of organically grown red cabbage as compared to the conventional farming.

The results are comparable with Borguini *et al.*, (2013) who found that the alcohol and aqueous extracts of organic tomatoes (25.43 and 14.28%) had stronger DPPH antioxidant activity than those from inorganically produced tomatoes (19.52 and 11.33%).

Similar result was obtained by Deshpande *et al.*, (2011) who concluded that the methanolic extract of the fruit of *Coccinia grandis* showed significant hydrogen peroxide scavenging, reducing power and DPPH activities. The antioxidant activity of the fruit may be attributed to the presence of flavonoids and anthraquinone glycosides.

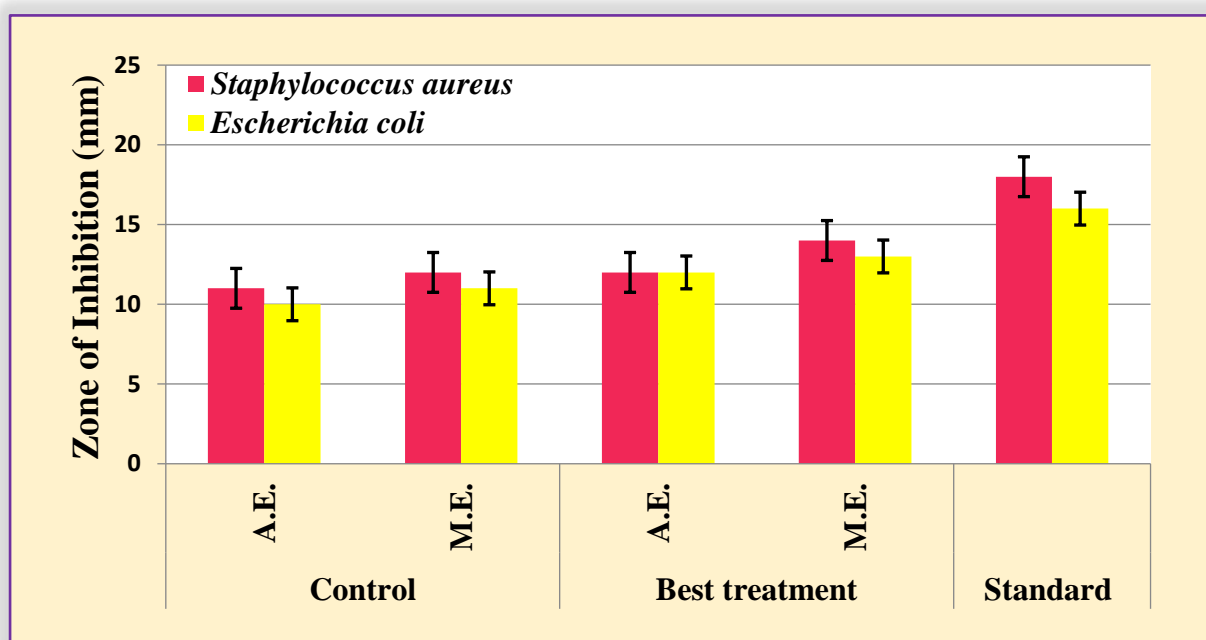
Similarly, Khyade and Jagtap, (2016) also reported that the % DPPH inhibition showed highest antioxidant activity of (40.09 ± 3.63%) in cowpea, followed by (35.68±0.69%) in yellow mustard, (26.21±0.88%) in black gram dry seed whereas least inhibition was noted (25.66±0.48%) in chickpea.

#### 4.10 Effect of aqueous and methanol seeds extract on the antibacterial activity for selected test crops

Antibacterial effect of *Vigna mungo* (L.) Hepper and *Lablab purpureus* (L.) Sweet seeds grown in both winter and summer compost Best treatment (T<sub>8</sub>) and Control treatment aqueous and methanol seed extracts were examined against gram positive and gram-negative bacterial species and also the zone of inhibition with reference to the antibiotics are presented in Figure- XXIV, XXV, XXVI & XXVII, Plate- 17, 18, 19 & 20.

Figure -XXIV

Antibacterial activity against selected microbes in seed extracts of Black gram grown in winter composted Vegetable and Fruit waste at 150 µL concentration



Standard- Ascorbic acid, C- Control treatment

B- Best treatment [T<sub>8</sub>- Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha)] A.E.- Aqueous extract, M.E.- Methanol extract

##### 4.10.1a Black gram grown in winter compost

###### Control treatment

The antibacterial activity of aqueous seed extracts showed inhibition zone of 11mm and 9mm for *Escherichia coli* and *Staphylococcus aureus* respectively. Methanolic seed extracts showed inhibition zone of 12 mm and 10 mm for *Escherichia coli* and *Staphylococcus aureus*. The highest zone of inhibition 12 mm was noted in methanolic seed extracts followed by aqueous extracts.

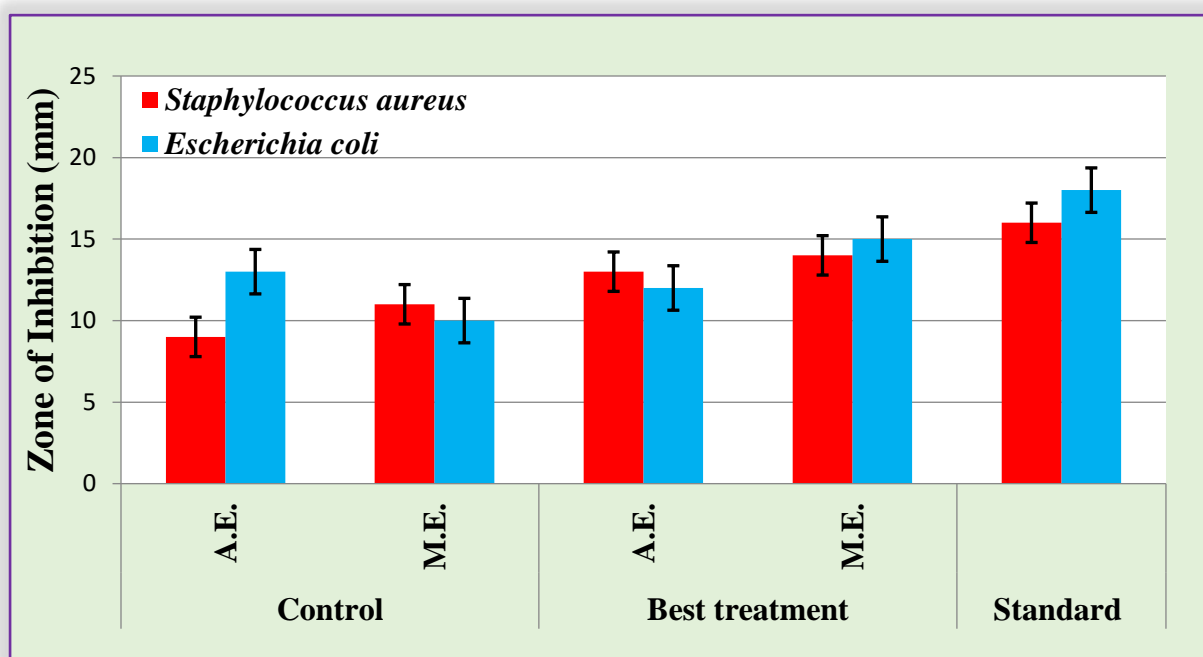
**Best treatment [T<sub>8</sub>- Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha)]**

As per the results, the aqueous seed extracts showed the inhibition zone of 14 mm and 12 mm for *Escherichia coli* and *Staphylococcus aureus*. Methanolic seed extracts showed 16 mm and 14 mm zone of inhibition for *Escherichia coli* and *Staphylococcus aureus*. The highest zone of inhibition 16 mm was found against *Escherichia coli* in methanolic seed extracts. The zone of inhibition differs from each other moderately when compared to standard antibiotics.

The standard antibiotic Kanamycin showed 20 mm and 16 mm for *Escherichia coli* and *Staphylococcus aureus* respectively as depicted in Figure-XXIV, Plate- 17.

**Figure - XXV**

**Antibacterial activity against selected microbes in seed extracts of Lablab grown in winter composted Vegetable and Fruit waste at 150  $\mu$ L concentration**



Standard- Ascorbic acid, C- Control treatment

B- Best treatment [T<sub>8</sub>- Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha)]

A.E- Aqueous extract, M.E.- Methanol extract

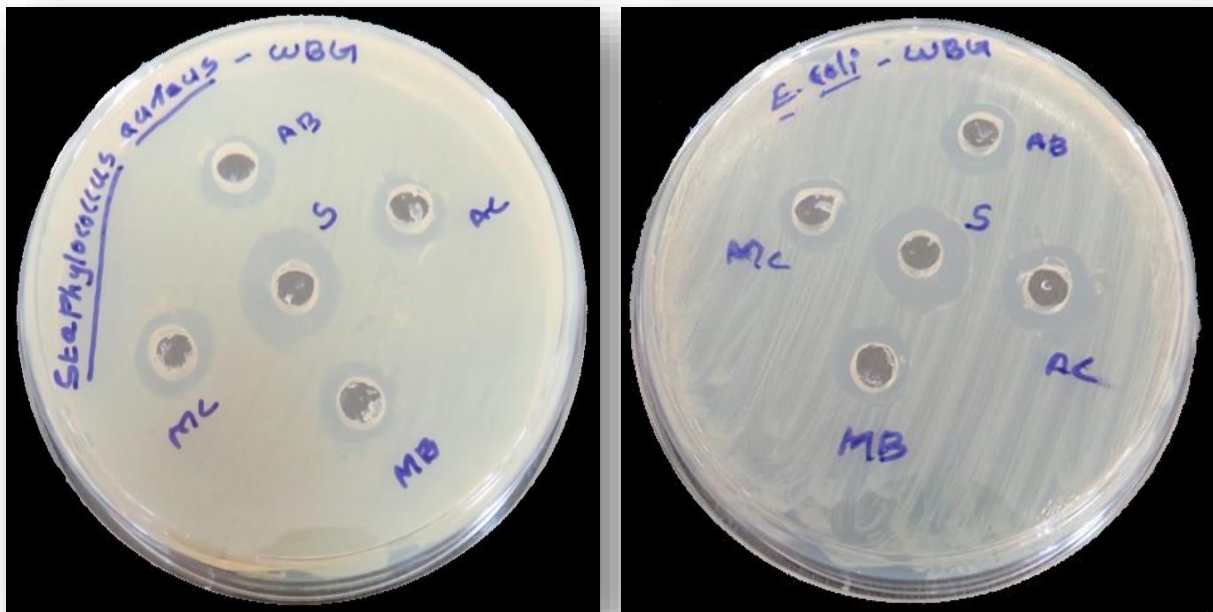
PLATE – 17

Antibacterial activity against different microorganisms in Aqueous and Methanol seeds extracts of Black gram grown in winter compost

Black gram [*Vigna mungo* (L.) Hepper]

*Staphylococcus aureus*

*Escherichia Coli*



S - Standard (Kanamycin)

AC - Aqueous seed extract control treatment

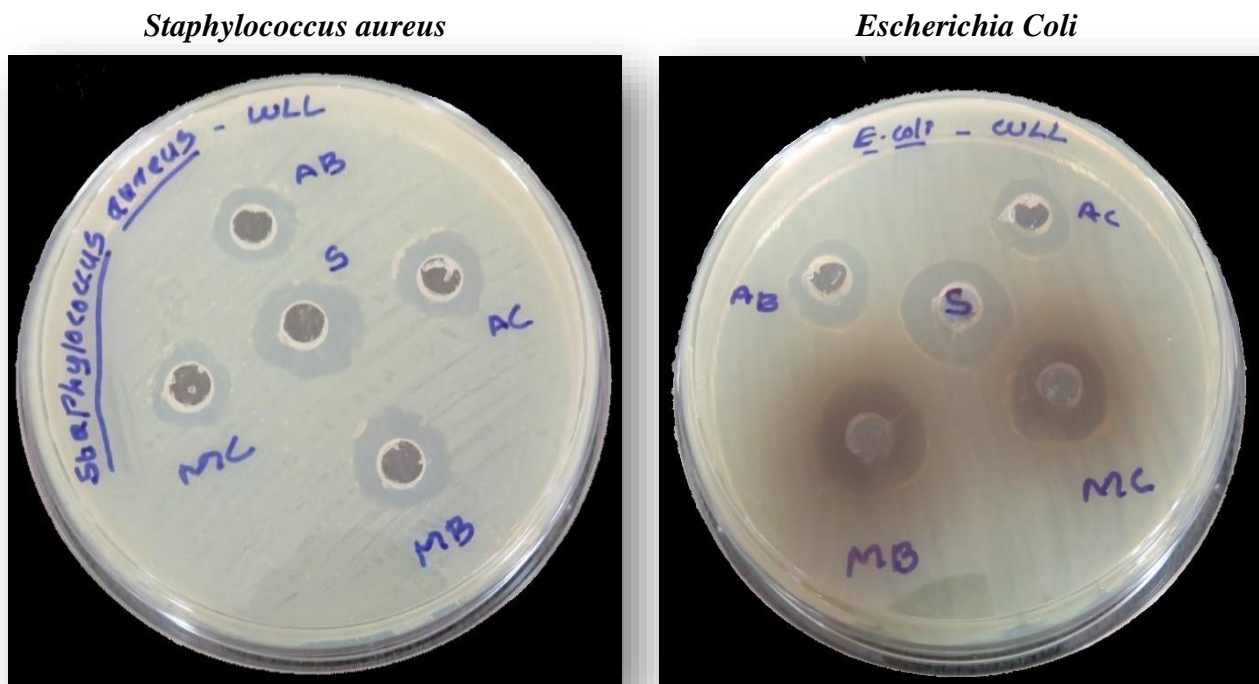
AB - Aqueous seed extract best treatment [ $T_8$  - Fruit wastes (F.W) + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha)]

MC - Methanol seed extract control treatment

MB - Methanol seed extract best treatment [ $T_8$  - Fruit wastes (F.W) + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha)]

## PLATE – 18

## Antibacterial activity against different microorganisms in Aqueous and Methanol seeds extracts of Lablab grown in winter compost

Lablab [*Lablab purpureus* (L.) Sweet]

S - Standard (Kanamycin)

AC - Aqueous seed extract control treatment

AB - Aqueous seed extract best treatment [ $T_8$  - Fruit wastes (F.W) + cow dung + *Pleurotus* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha)]

MC - Methanol seed extract control treatment

MB - Methanol seed extract best treatment [ $T_8$  - Fruit wastes (F.W) + cow dung + *Pleurotus* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha)]

#### 4.10.1b Lablab grown in winter compost

##### Control treatment

The methanolic seed extract showed the inhibition zone of 14 mm and 12 mm for *Escherichia coli* and *Staphylococcus aureus* whereas the aqueous seed extracts noted 11 mm and 10 mm zone of inhibition against *Escherichia coli* and *Staphylococcus aureus* respectively.

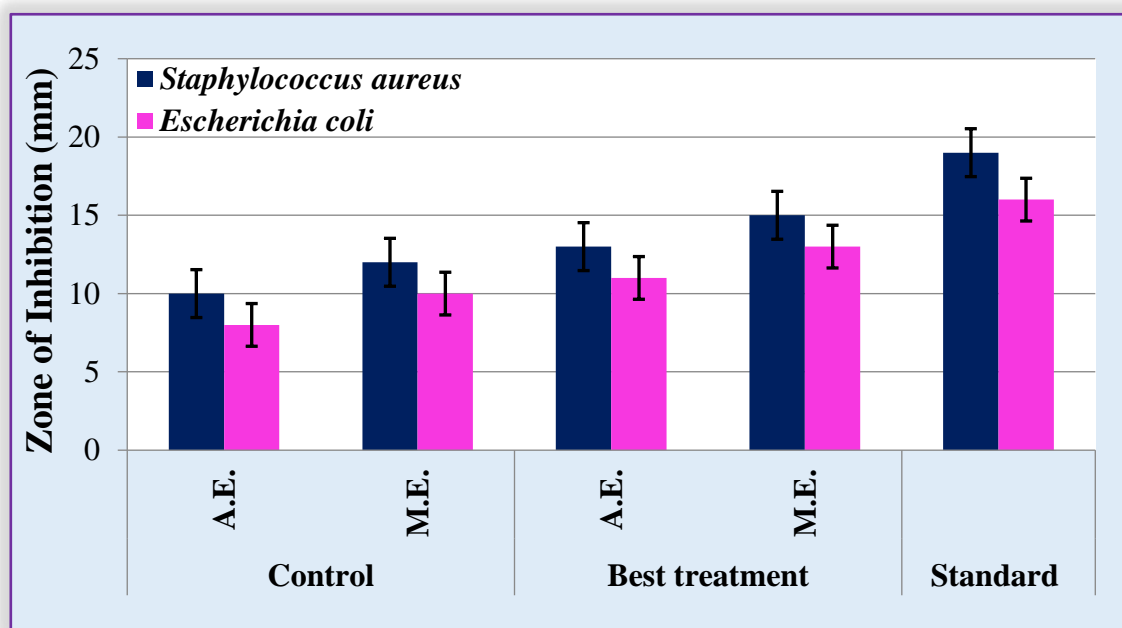
**Best treatment [T<sub>8</sub>- Fruit waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha)]**

As per the results, the aqueous seed extract noted inhibition zone of 12 mm and 11 mm for *Escherichia coli* and *Staphylococcus aureus*. The methanolic seed extracts showed 15 mm and 13 mm zone of inhibition for *Escherichia coli* and *Staphylococcus aureus* respectively. The highest zone of inhibition 15 mm was noted against *Escherichia coli* in methanolic seed extracts.

The standard antibiotic Kanamycin showed 18 mm and 16 mm zone of inhibition for *Escherichia coli* and *Staphylococcus aureus* as presented in Figure XXV, Plate- 18.

**Figure -XXVI**

**Antibacterial activity against selected microbes in seed extracts of Black gram grown in summer composted Vegetable and Fruit waste at 150  $\mu$ L concentration**



Standard- Ascorbic acid, C- Control treatment

B- Best treatment [T<sub>8</sub>- Fruit waste composted using cow dung, *Pleurotus eous*, *Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha)]

A.E- Aqueous extract, M.E.- Methanol extract

#### 4.10.1c Black gram grown in summer compost

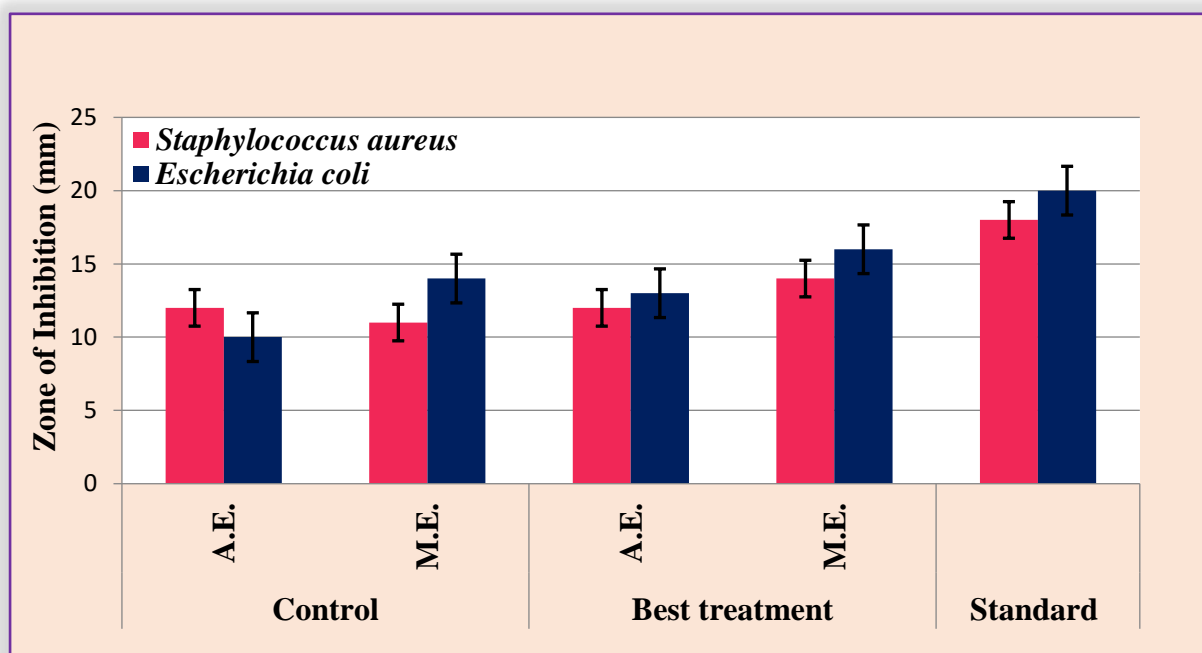
##### Control treatment

As per the results, the aqueous seed extracts showed inhibition zone of 9 mm and 10 mm for *Escherichia coli* and *Staphylococcus aureus* respectively. The methanolic seed extracts showed 12 mm and 11 mm zone of inhibition for *Escherichia coli* and

*Staphylococcus aureus*. The highest zone of inhibition 12 mm was found against *Escherichia coli* in methanolic seed extracts.

**Figure -XXVII**

**Antibacterial activity against selected microbes in seed extracts of Lablab grown in summer composted Vegetable and Fruit waste at 150  $\mu$ L concentration**



Standard- Ascorbic acid, C- Control treatment

B- Best treatment [T<sub>8</sub>- Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha)]

A.E- Aqueous extract, M.E.- Methanol extract

**Best treatment [T<sub>8</sub>- Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha)]**

The aqueous seed extract showed the inhibition zone of 12 mm and 13 mm for *Escherichia coli* and *Staphylococcus aureus* respectively. The methanolic seed extracts noted the zone of inhibition 13 mm and 14 mm for *Escherichia coli* and *Staphylococcus aureus* at 150  $\mu$ l respectively. The highest zone of inhibition 14 mm was found against *Staphylococcus aureus* in methanolic seed extracts. The standard antibiotics Kanamycin showed inhibition zone of 16 mm and 19 mm for *Escherichia coli* and *Staphylococcus aureus* as shown in Figure- XXVI, Plate- 19.

#### 4.10.1d Lablab grown in summer compost

##### Control treatment

The results showed that aqueous seed extracts noted inhibition zone of 11 mm and 10 mm for *Escherichia coli* and *Staphylococcus aureus* whereas methanolic seed extracts showed the inhibition zone of 13 mm and 12 mm for *Escherichia coli* and *Staphylococcus aureus* at 150 µl respectively. The highest zone of inhibition 13 mm was found against *Escherichia coli* in methanolic seed extracts.

##### Best treatment [T<sub>8</sub>- Fruit waste composted using cow dung, *Pleurotus eous*, *Tricoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha)]

The aqueous seed extracts showed the inhibition zone of 14 mm and 12 mm for *Escherichia coli* and *Staphylococcus aureus* respectively. Methanolic seed extracts observed that inhibition zone of 16 mm and 13 mm for *Escherichia coli* and *Staphylococcus aureus* at 150 µl concentration respectively. The highest zone of inhibition 16 mm was noted against *Escherichia coli* in methanolic seed extracts followed by aqueous extracts. The zone of inhibition moderately differs for the extracts when compared to standard antibiotics

The standard antibiotics Kanamycin showed 20 mm and 17 mm zone of inhibition for *Escherichia coli* and *Staphylococcus aureus* respectively. (Figure- XXVII, Plate- 20).

The antibacterial activity was assessed in the selected leguminous (black gram and lablab grown in both winter and summer compost) seed extracts. The selected plants showed significant antibacterial activity in methanol extracts followed by aqueous extracts. This may be due to the solubility of phytochemicals present in the seeds.

Similar results were obtained by Ahmad *et al.*, (2012) who confirmed that ethanolic, methanolic and aqueous extracts showed maximum antibacterial activity against *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Shigella sonnie*, *Salmonella typhi* and *Salmonella paratyphi* with a zone of inhibition ranges from 12-21mm in the *Raphanus sativus* seeds.

The study was supported by Thangaraj *et al.*, (2012) who recorded maximum zone of inhibition (13.3mm) in the hydro alcoholic extracts of *Solanum nigrum* stem against *Staphylococcus aureus*.

PLATE – 19

Antibacterial activity against different microorganisms in Aqueous and Methanol seeds extracts of Black gram grown in summer compost

Black gram [*Vigna mungo* (L.) Hepper]

*Staphylococcus aureus*



*Escherichia Coli*



S – Standard (Kanamycin)

AC - Aqueous seed extract control treatment

AB - Aqueous seed extract best treatment [T<sub>8</sub> - Fruit wastes (F.W) + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha)]

MC - Methanol seed extract control treatment

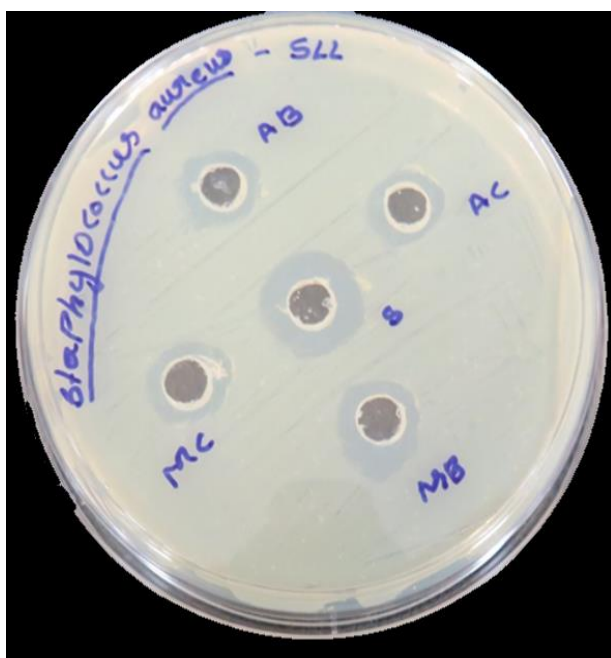
MB - Methanol seed extract best treatment [T<sub>8</sub> - Fruit wastes (F.W) + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha)]

PLATE – 20

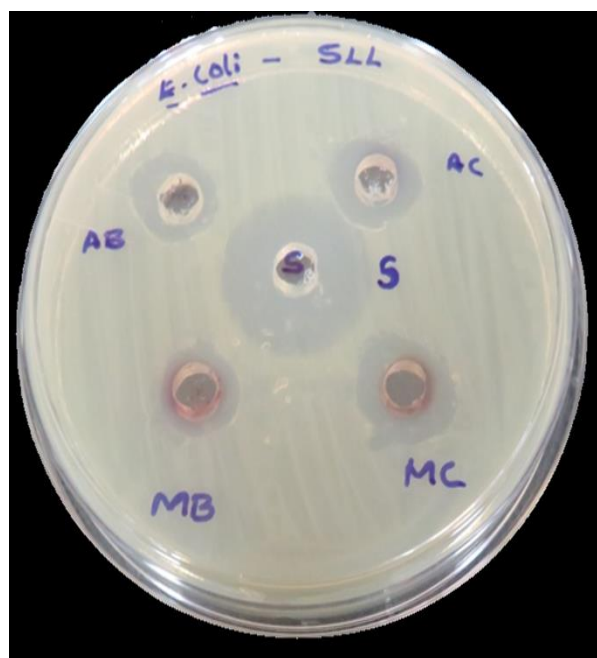
Antibacterial activity against different microorganisms in Aqueous and Methanol seeds extracts of Lablab grown in summer compost

Lablab [*Lablab purpureus* (L.) Sweet]

*Staphylococcus aureus*



*Escherichia Coli*



S – Standard (Kanamycin)

AC - Aqueous seed extract control treatment

AB - Aqueous seed extract best treatment [T<sub>8</sub> - Fruit wastes (F.W) + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha)]

MC - Methanol seed extract control treatment

MB - Methanol seed extract best treatment [T<sub>8</sub> - Fruit wastes (F.W) + cow dung + *Pleurotus eous* + *Trichoderma asperelloides* + *Eudrilus eugeniae* (5 t/ha)]

Similar finding was reported by Moorthy *et al.*, (2014) who revealed that the aqueous extracts of *Adiantum lunulatum* showed significant inhibitory activity against *Salmonella paratyphi* B, *Pseudomonas aeruginosa* and *Vibrio parahaemolyticus*. Ethanolic extract showed inhibitory activity against *Pseudomonas aeruginosa*, *Staphylococcus epidermidis* and *Salmonella paratyphi* B. The petroleum ether extract showed significant inhibitory activity against *Shigella flexneri*, *Salmonella typhimurium* and *Klebsiella pneumoniae*.

Similar result was obtained by Gayathri and Anuradha, (2020) who investigated an antimicrobial activity of acetone mace extract (*Myristica fragrans* Houtt) against *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa*, using agar disc diffusion technique. Acetone mace extract was potentially effective with variable efficiency against the tested bacterial strains. Acetone mace extract can be used as natural alternative antibacterial agent against synthetic antimicrobial drug.

The result is in par with Naik *et al.*, (2021) who studied the antimicrobial activity of both Cinnamon leaf oils and extract using disc diffusion assay and revealed that essential oils and extracts exhibited the highest zone of inhibition against *Staphylococcus aureus* and *Escherichia coli*. Minimum inhibitory concentration (MIC) of both oils and extracts was 0.156 mg/ml to 5mg/ml.

Similar result was observed by Rani *et al.*, (2022) who evaluates the antimicrobial activity of aqueous, chloroform, and ethanol extracts of *Moringa oleifera* and *Citrus maxima* medicinal plants against two Gram-positive bacteria and two Gram-negative bacteria and revealed that ethanolic leaf extract of all the plants showed potential activity against all the microbial cultures of *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Bacillus subtilis*.

Similar finding was reported by Lubiana *et al.*, (2022) on the antibacterial potentiality of ferulic acid isolated from pineapple peel exhibited varied susceptibility against *Escherichia coli*, *Klebsiella pneumoniae*, *Bacillus cereus* and *Staphylococcus aureus*. Ferulic acid showed inhibitory effects against all the four tested bacterial strains. Among the tested pathogens *Bacillus cereus* and *Staphylococcus aureus* were the most resistant species and increased in bactericidal activity was observed in 1000 µg of ferulic acid against *Bacillus cereus* followed by *Staphylococcus aureus*.

The increase in antioxidant activity might be due to the application of vegetable and fruit waste biocompost which can be adopted as an eco-friendly strategy for production of high-quality and healthy edible products. The antibacterial activity in methanol and aqueous extracts may be due to the solubility of phytochemicals such as alkaloids, flavonoids, tannins, phenols, saponin, steroids and aromatic compounds present in the seeds plays a vital role in defence mechanism against many microorganism, insects and other herbivores.