Vermicomposting by *Lampito Mauritii* Cultured in Vegetable Market Wastes and the Effect of Vermicompost on Growth and Yield of Green gram, *Vigna Radiata*

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ABSTRACT: As human population pressure is usually lower in villages than that of the urban communities, wastes are less in quantity and there is less congestions in rural areas. So, impacts and repercussions are less severe there. Wastes pollute and contaminate both surface and underground water. Thus affect vital aquatic resources. To save our environment proper management of these wastes is very essential. Different biodegradable wastes (agricultural wastes, municipal solid wastes, animal wastes etc.) can be converted into useful substances by recycling process in agriculture, because they contain different types of plant nutrients. organic wastes can be converted into valuable wealth by applying vermicomposting technology. Vermicomposting is the process by which earthworms are used to convert organic wastes into humus like material known as vermicompost which is rich with various essential plant nutrients. The present study deals with the production of vermicompost by the earthworm, *Lampito mauritii* kept in 100, 75, 50, 25 and 0 per cent substrate ratios (PSR) prepared from partly decomposed vegetable market wastes with soil was observed for one month. Mean values of stem length, number of leaves, number of flowers, number of pods, pod length and total seeds produced by green gram, *Vigna radiata* cultivated in pots using different per cent substrate ratios (50, 25 and 0) of partly decomposed vegetable market wastes and their vermicompost after using them by earthworm, *Lampito mauritii*. Over all the results of all parameters observed in green gram plants revealed a differential and dose dependent effect with more growth and yield if they were in higher doses and less in lower doses. One important observations noted in the growth study of green gram with vermicompost obtained from vegetable market wastes was that the plants raised in higher PSR (50 PSR) though showed improved growth but are severely affected with insect pest of saprophytic nature due to their tender nature. Of the two compost used, the plants raised in partly decomposed vegetable market wastes showed relatively lesser growth and yield over the plants raised in *L.mauritii* exposed vegetable market wastes.

Keywords: *Vermicompost , Lampito mauritii, Vigna radiata, Vegetable wastes.*

I. INTRODUCTION

In our daily life we create a huge amount of wastes which may be biodegradable or non–biodegradable in nature. Both of them create several problems including health hazards. In India, about 320 million tons of agricultural wastes are generated annually of which vegetable waste alone is in major proportion (Suthar et al., 2005). The waste from the vegetable market is collected and dumped into the municipal landfills, causing a nuisance because of high biodegradability (Bouallagui et al., 2004). When these wastes are improperly dumped, it generally pays a lot of threats to air, water, land, vegetable, wildlife, and human beings. Sickness and disease epidemics often occur due to improper disposal and/or ineffective management of sewage, garbage wastes and unwanted substances. Situation is quite similar in rural surroundings comparing urban areas.

According to Kale, et al. (1982) this composting process can convert all such wastes into wealth. This is an environment-friendly technique entailing no pollution whatsoever. Hence vermicomposting is a more sustainable technique for organic waste disposal and it reduces pollution by providing a valuable substitute for chemical fertilizers. Nutrients in earthworm castings are pre-digested and hence are readily soluble in water for uptake by plants. Vermicompost provides macro and micro nutrients to the plants including biologically active substances such as plant growth regulators (Atiyeh et al., 2002).

The green revolution in India promoted the indiscriminate use of chemical fertilizer and pesticides to obtain a better crop yield. In course of time, the tropical soil after receiving such chemicals turned unproductive due to lack of proper amendments of organic matters (Kale, 1998). The best alternative of the present day's environmental degradation is to make proper use of the available unutilized organic biodegradable wastes in order to convert them into compost within a short period. Vermicompost could be used as an excellent soil amendment for main fields and nursery beds and has been reported to be useful in raising nursery species plants. In nature, some time plants follow altered growth patterns such as negative geotropism of roots, stem elongation and dwarfing, shortening of vegetative phase, enhancement of leaf area, photosynthetic rate, flowering and fruiting by matured plants. Edwards and Burrows (1988) reported that vermicompost could promote early and vigorous growth of seedlings. Vermicompost has found to effectively enhance the root formation, elongation of stem and production of biomass, vegetables, ornamental plants etc. (Grappelli et al., 1985; Kale and Bano, 1986; Kale et al., 1987; Kale, 1998; Bano et al., 1993; Atiyeh et al., 1999).

Ghosh et al. (1999) observed that integration of vermicompost with inorganic fertilizers tended to increase the yield of crops viz- potato, rape seed, mulberry and marigold over other traditional composts. The application of vermicompost rendered better performance in respect of all round growth of mulberry plants in the lateritic soil of South West Bengal (Chakraborty et al., 2008). The nutrient level, especially the (macro or micro-nutrients) were found to be always higher than the compost derived from other methods (Kale, 1998). One of the unique features of vermicompost is that during the process of conversion of various organic wastes by earthworms, many of the nutrients are changed to their available forms in order to make them easily utilizable by plants. Therefore, vermicomposts have higher level of available nutrients like nitrate or ammonium nitrogen, exchangeable phosphorous and soluble potassium, calcium and magnesium derived from the wastes (Buchanan et al., 1988).

Earthworms play an important role in soil. The Greek Philosopher, Aristotle, named them the 'Intestine of Earth'. In India, so far, 509 species, referable to 67 genera and 10 families, have been reported (Kale, 1991). The increase in population has resulted increases demand of wastes. The disposal of wastes now days prime concerned. According to an estimate that India produces about 3000 million tones of wastes annually and more than 60% are of decomposable. With the progressive increase in the size of the world population resulted large volumes of organics wastes produced all over the world. The disposal of bio-degradable solid wastes from domestic agriculture and industrial sources has caused increasing environmental and economic problems. The growth of industries and ever increasing human population has led to an increased accumulation of waste materials (Joshi and Chauhan, 2006).

Vegetable wastes are one of the major sources of municipal wastes. Recycling of wastes through vermitechnology reduces the problem of nonutilization of wastes. Alternative to chemical fertilizers, locally available organic wastes of anthropogenic and natural products were used as biofertilizers after employing earthworm as decomposers, for degradation and recycling toenhance the production of crops which are free from pollution and health hazard (Bakthvathsalam and Ramakrishnan, 2004). Vermicompost has higher economic value compared with compost derived from traditional methods. Vermicompost are finally divided peat like materials with high porosity, aeration, drainage and water holding capacity. Vermicomposts contain in nutrients in forms that are readily taken up by the plants.

The anecic earthworm, i.e. Lampito mauritii (Kinberg), which is commonly found in Indian soils, has appeared as an efficient tool for organic waste reduction (Tripathi and Bharadwaj 2004). The composting efficiency and biology of L. mauritii, is well documented in literature. Several workers have reported the vermicomposting potential of L. mauritii by using a variety of organic wastes (Suthar and Sing 2008; Manivannan 2005).

1.1. MUNG BEAN AND ITS HABITAT

Botanical description Green gram [Vigna radiata] belongs to the family Leguminoseae. It is a small herbaceous annual plant growing to a height of 30 to 120 centimeters with a slight tendency to twining in the upper branches. The central stems are more or less erect while side branches are semi-erect. The leaves are 5-10 cm long trifoliate with long petioles. Both the stems and leaves are covered with short hairs, generally shorter than those in urd (Black gram). The pods are linear, sometimes curved, round and slender with short pubescence. The seeds are small and nearly globular. The colour of seed is usually green, but yellow brown or purple brown seeds also occur. The colour of cotyledons is yellow. The crop is fully self-fertile and self-pollinated.

1.2. CLIMATE AND SOIL

Mung beans are mainly cultivated in China, Thailand, Philippines, Indonesia, Burma, Bangladesh and India, but also in hot and dry regions of South Europe and Southern USA. In India and Bangladesh, they are grown during two seasons. One is the Rabi season (starting November), and the other is the Kharif season (starting June). Mung beans are tropical (or sub-tropical) crops, and require warm temperatures (optimally round 30-35 Deg C). Loamy soil is best for pusap cultivation.

1.3. MUNG BEANS AND ITS USES

Mung beans are commonly used in Chinese cuisine, where they are called lv dou (literally "green bean"), as well as in Southeast Asia. They are generally eaten either whole (with or without skins) or as bean sprouts, or used to make the dessert "green bean soup". The starch of mung beans is also extracted from them to make jellies and "transparent/cellophane" noodles. In Vietnam, the transparent wrapping of Vietnamese spring rolls is made from mung bean flour. In Filipino cuisine, meat is sauteed with garlic, onions, and bay leaves, then mung beans are added and cooked. Mung batter is used to make crepes named Pesarattu in Andhra Pradesh, India, copying other Southeast Asian cooking methods.

With their skins removed, mung beans are light yellow in color. They are made into mung bean paste by de-hulling, cooking, and pulverizing the beans to the consistency of a dry paste. The paste is sweetened and is similar in texture to red bean paste though the smell is slightly more bean-like. In HongKong, de-hulled mung beans and mung bean paste are made into ice creams or frozen ice pops and are very popular Chinesedessert items. In EastChina, mung bean paste is a common filling for Chinesemooncakes. In China, the boiled and shelled beans are used as filling in glutinous rice dumplings eaten during the dragon boat festival.

In India the mung beans are also consumed as a snack, called "Dal moth". The dried mung beans are soaked in water, then partly dried to a dry matter content of about 42%, and then deep-fried in hot oil. The frying time varies between 60 and 90 seconds. The fat content of this snack is around 20%. This snack is traditionally prepared at home and is now also available from industrial producers.

Green gram is one of the important pulse crops in India. It has been reported that Green gram has been cultivated in India since ancient times. It is believed that Green gram is a native of India and Central Asia and grown in these regions since prehistoric times. It is widely cultivated throughout the Asia, including India, Pakistan, Bangladesh, Sri Lanka, Thailand, Laos, Cambodia, Vietnam, Indonesia, Malaysia, south China, and Formosa. In Africa and U.S.A. it is probably recent. Green gram is a protein rich staple food. It contains about 25 percent protein, which is almost three times that of cereals. It supplies protein requirement of vegetarian population of the country. The biological value improves greatly, when wheat or rice is combined with Green gram because of the complementary relationship of the essential amino acids. It is particularly rich in Leucine, Phenylalanine, Lysine, Valine, Isoleucine, etc. In addition to being an important source of human food and animal feed, Green gram also plays an important role in sustaining soil fertility by improving soil physical properties and fixing atmospheric nitrogen. It is a drought resistant crop and suitable for dryland farming and predominantly used as an intercrop with other crops. Higher values of biomass especially of leaves and roots at budding and flowering stages are observed in the variants with foliar feeding (Stancheva et al., 2004).

They are less expensive, highly biodegradable, non-pollutants to both aquatic and terrestrial ecosystems (Mahajan and Gupta, 2009). Using Humic and fulvic acids are considered to be compounds increasing permeability of cellular membranes in plants to vitamins within the cell (Kaya et al., 2005). Several environmental problems originate from municipal solid waste (MSW) as they are not being properly managed. The major part of Indian MSW includes vegetable waste (Sinha and Sinha, 2000). The vegetable waste in MSW is mainly contributed by waste from vegetable markets, restaurants, canteens, juice centers and household kitchens. All cities, towns, districts have vegetable markets producing significant amount of waste.

At present, collection, transportation and disposal of waste are a big problem. The major methods of disposal include dumping, heaping, land filling and burning and the major problems are environmental pollution, lechates, foul smells, greenhouse gases, spread of diseases and other health hazards. We are facing escalating socio-economic and environmental problems in dealing with current and future planning of disposal and management of fruit and vegetable market waste. Though, proper legislative rules and National Disposal Standards have been made, but they are not strictly obeyed and waste stuffs are not properly handled and they often pollute the environment. Hence more sustainable and eco-friendly waste management systems are to be devised and adopted. Vermicomposting has been identified as one of the potential activities in managing MSW, since it is a natural process, cost effective and is accomplished in a shorter duration. Vermicompost in recent years has gained importance because of it contains favorable aerobic bacteria and has higher nutrient value such as nitrogen, phosphorous, potassium etc. (Benitez et al., 2000; Aira et al., 2002).

1.4. OBJECTIVE OF THE STUDY

To produce vermicompost and to check their influence on growth promoting and pest suppressing activity against Vegetable Market wastes on the growth and yield of green gram
(Vigna radiate) raised in pots under controlled conditions.

II. MATERIALS AND METHODS

2.1. COLLECTION OF COW DUNG

The cow dung was collected from nearby cattle sheds in fresh form and allowed to stabilize for one week and used for the study.

2.2. COLLECTION OF SOIL

Dry soil taken from the college campus at Government Arts College (Autonomous), Salem – 7 was manually powdered using stone mortar and stored in polyethylene bags for vermicompost preparation and plant cultivation study.

2.3. COLLECTION OF EARTHWORMS

Specimens of adult Lampito mauritii were purchased from a vermiculture farmer at Sivathapuram village, Salem.

2.4. MAINTENANCE OF ADULT EARTHWORMS

The earthworm species were kept in cement pots (size of cm height cm in diameter) with substrate medium containing 50% cow dung and 50% soil and maintained under the laboratory condition (medium temperature 25 ± 2° C) during the course of this vermiculture study. The culture pots were covered with cotton clothes to protect the adult earthworms from their predators. Sufficient water was added in these tanks to maintain the optimum moisture condition for better survival and growth of earthworms (Mitchell et al., 1977; Kaplan et al., 1980; Reinecke and Kriel, 1981; Martin, 1982; Loehr et al., 1985; Reinecke and Venter, 1985; 1987; Hallatt et al., 1992; Parthasarathi, 2007).

2.5. COLLECTION OF VEGETABLE MARKET WASTES

The waste materials of vegetables were collected from the Salem vegetable market located at old bus stand near in Salem.

2.6. PARTIAL DECOMPOSITION OF VEGETABLE'S WASTE

A 500 litres circular plastic tank was used for the decomposition process of organic waste. Unwanted non -degradable waste materials present in the vegetable's waste were removed first and were cut into small pieces and filled in the tank. The tank was tightly closed with lid during decomposition process in order to avoid the liberation of foul smell. Sufficient water was poured regularly in the tank to ensure proper decomposition. Once in three days the decomposing materials were thoroughly mixed with wooden rod to ensure proper decomposition. Ideal semi decomposed organic matter can be obtained only after two months of decomposition. In each time at least 50 kg of dry semi decomposed organic manure can be obtained during this process. These materials were then manually powdered with a particle size less than 1 mm as suggested by Reinecke and Venter (1985) and stored in polythene bags.

2.7. PROCUREMENT OF PLASTIC POTS

Ten plastic pots of equal size (24 cm diameter and 25 cm height) were purchased from Salem, Tamil Nadu, for vermicompost preparation and plant cultivation study.

2.8. PREPARATION OF VERMICOMPOST

One set of five per cent substrate ratios (PSR) such as 100, 75, 50, 25 and 0 were prepared using dry soil and powdered decomposed vegetable's waste with volume by volume basis and mixed well. Four liters of substrate in each per cent ratio was taken in a plastic pot and sufficient volume of water was added into it to ensure optimum moisture condition as suggested by Martin (1982). 12 adult earthworms were introduced into each pot. The control (soil alone as substrate) experiments with 12 adult Lampito maurtrii, earthworms were also maintained simultaneously along with these media. Regular watering is a must for this culture study to provide optimum moisture condition to the earthworms. Survival of earthworm was also observed in the above said media during the course of study. But earthworm showed 100% survival only in the lower doses (upto 50 PSR) and hence the vermicompost production study was limited only upto 50 PSR doses.

2.9. COLLECTION OF VERMICOMPOSTS

At the end of 30 days of vermicompost production study, each substrate medium used by earthworms was collected as vermicompost and stored in separate polythene bags for raising green gram in pots.

2.10. CULTIVATION OF GREEN GRAM

2.10.1. PROCUREMENT OF GREEN GRAM SEEDS

The green gram (Vigna radiata) seeds were purchased from the Omalur, Salem

2.11. PREPARATION AND MAINTENANCE OF DIFFERENT PSR MEDIA

Six plastic pots were taken and to each 5 litres of 50, 25 and 0 PSR of partly decomposed and Vermicompost of vegetable market waste. Six seeds were placed in each pot at 2.5 cm deep and sufficient water

was poured in all the pots for proper germination of seeds. After seven days of seed sowing, only three plants were allowed to grow in each pot. These pots were kept in the terrace roof of Zoology Department for direct sunlight. The seedlings in the pots were regularly poured with sufficient water to ensure proper growth until all of them get harvested (60 days). Care was taken to see that the plants growing in the pots must be protected from predation, if any.

2.12. COLLECTION OF GROWTH DATA

Twenty days after seed sowing, the plants in the pots were measured their shoot height and counted their leaves once in 10 days. Parameters such as total flowers, total pods, pod length and total seeds per plant were also noted in all the plants during the course of this study.

III. RESULTS AND DISCUSSION

3.1. VERMICOMPOST PRODUCTION STUDY

The production of vermicompost by the earthworm, Lampito mauritii kept in 100, 75, 50, 25 and 0 per cent substrate ratios (PSR) prepared from partly decomposed vegetable market wastes with soil was observed for one month. The worms kept in 75 and 100 PSR media, none were survived even for 24 hours and hence the vermicompost production study was carried out only with the remaining PSR media. Though the waste materials used in the present study are of purely organic nature, the adverse effect noticed in 75 and 100 PSR media may be attributed to the presence of certain unwanted chemical substances which were added at the time of vegetable crop cultivation as it was revealed by the behaviour of earthworms as they come out of these media. Similar type of lethal effect was also noticed in the same earthworm species exposed to press mud by Udayakumar (2012), vegetable market wastes by Bakthavathsalam and Uthayakumar (2007), cabbage waste by Muruganandham and Bakthavathsalam (2009) and I.carnea plant materials by Bakthavathsalam et al. (2010c). However the culture study made by Ramalingam (1997) in the same species exclusively under press mud medium revealed a beneficial effect against our present reports.

3.2. EFFECTS OF VERMICOMPOST ON THE GROWTH OF GREEN GRAM

Mean values of stem length, number of leaves, number of flowers, number of pods, pod length and total seeds produced by green gram, Vigna radiata cultivated in pots using different per cent substrate ratios (50, 25 and 0) of partly decomposed vegetable market wastes and their vermicompost after using them by earthworm, Lampito mauritii were given in table 1 and 2 respectively. The plants raised in soil alone showed poor growth and yield values over other PSR studied. The results observed in different PSR media revealed a differential growth and yield of green gram and followed the trend in accordance with per cent substrate ratios.

Over all the results of all parameters observed in green gram plants revealed a differential and dose dependent effect with more growth and yield if they were in higher doses and less in lower doses. Of the 2 composed used, the plants raised in partly decomposed vegetable market wastes showed relatively lesser growth and yield over the plants raised in L.mauritii exposed vegetable market wastes. One important observations noted in the growth study of green gram with vermicompost obtained from vegetable market wastes was that the plants raised in higher PSR (50 PSR) though showed improved growth but are severely affected with insect pest of saprophytic nature due to their tender nature. This adversed effect noticed in the present study may be attributed with more nitrogen and organic carbon present in the vermicompost as suggested by Uthayakumar and Bakthavathsalam, 2009.

Similar type of saprophytic infections were also noticed in the studies made by Muruganandham and Bakthavathsalam (2009) in chilli plants cultivated in the composts obtained separately from cabbage waste and cow dung, Uthayakumar and Bakthavathsalam (2009) in black gram plants cultivated in decomposed vegetable market wastes, Purushothaman (2012) in the ladies finger plant cultivated in the vermicomposts obtained separately from black gram plant wastes, bagasse, cow dung and organic mixture Udayakumar (2012) in the black gram plants cultivated in decomposed sheep droppings, press mud, Pongamia leaves and organic mixture.

The results given in tables 1 and 2 undoubtedly proved that the application of vermicompost has a positive role on the growth and yield of green gram. This observation falls in line with many reports already made on these lines in other plants with vermicomposts obtained from different sources. There have been numerous experiments in which plants have been grown in pots with earthworms or their casts or vermicompost, where an increase in plant growth has occurred. Kale and Bano (1986) found that the vegetative growth of plants was influenced by Eudrilus eugeniae worm cast in a better way than chemical fertilizers. Line (1994) reported that vermicomposted mixture of wood waste and seaster waste showed an excellent growth of tomatos and lettuces. Kale (1994) has recorded excellent effect of vermicompost on the growth and yield of cereals, pulses, oil seeds, spices, vegetables, fruits, ornamental plants, cash crops and plantation crops.

Table 1: Mean values showing the number of leaves and stem length (cm) of green gram, Vigna radiata cultivated in pots using different per cent substrate ratios (PSR) of partly decomposed and vermicompost obtained from vegetable market wastes after using them by earthworm, Lampito mauritii

DAYS	PSR									
	100		75		50		25		0	
	No. of leaves	Stem length	No. of leaves	Stem length	No. of leaves	Stem length	No. of leaves	Stem length	No. of leaves	Stem length
20 day	-	-	-	-	4.3	6.2	2.3	5.4	2.0	5.1
	-	-	-	-	5.0	6.4	4.3	5.9	2.1	5.7
30 day	-	-	-	-	9.3	8.7	8.1	7.9	7.3	7.3
	-	-	-	-	9.6	9.0	8.3	8.2	7.6	7.9
40 day	-	-	-	-	14.3	11.0	12.5	9.2	10.6	8.8
	-	-	-	-	16.9	14.4	13.2	11.7	11.0	10.1
50 day	-	-	-	-	17.0	15.6	14.9	12.9	13.0	10.7
	-	-	-	-	20.0	19.8	15.6	15.7	14.0	13.0
60 day	-	-	-	-	18.8	16.0	15.3	13.3	13.5	11.2
	-	-	-	-	21.9	20.2	16.2	16.1	14.2	13.5

Upper and lower row values indicate Mean of 3 plants raised in partly decomposed and vermicompost of vegetable market wastes respectively.

Table 2: Mean values showing the number of flowers, number of pods pod length and total seeds produced by green gram, Vigna radiata raised through pot cultivation using different per cent substrate ratios (PSR) of partly decomposed and vermicompost obtained from vegetable market wastes after using them by earthworm, Lampito mauritii.

PSR	PLANT PARAMETERS			
	No. of flowers	No. of pods	Pod length	No. of seeds
100	-	-	-	-
	-	-	-	-
75	-	-	-	-
	-	-	-	-
50	21.0	19.7	4.4	125
	23.0	21.3	4.7	140
25	19.0	16.7	4.2	95
	20.3	17.3	4.4	105
0	16.6	13.0	4.0	68
	18.3	15.3	4.1	84

Upper and lower row values indicate Mean of 3 plants raised in partly decomposed and vermicompost of vegetable market wastes respectively.

Arulmurugan (1996) has studied the effect of vermicompost on growth, yield, protein and oil content of soybean and recorded an increase in plant height, root length, root volume, number of seeds per plant, protein and oil content of seeds together with increased uptake of NPK by plants. Vadiraj et al. (1996) noticed pronounced influence of vermicompost on the growth and yield of turmeric plant. Bakthavathsalam and Deivanayaki (2007) have also noticed a significance influence of vermicompost with or without rhizobium on the growth and yield of black gram cultivated through pot culture studies. Senapati (1993) reported that the emergence of tomato seedings in vermicompost is much better than in the recommended commercial potting compost.

Madhukeshwara et al. (1996) also reported that vermicompost increased the germination efficiency and growth of tomato and suggested that vermicompost can be used as an ideal and more economical organic

substitute for raising healthy nurseries which is a constraint before transplantation in the field. Ramalingam (1997) has studied the differential effect of organic manures (Cattle dung, form yard manure and pressmud) and vermicomposts (obtained from farm waste + pressmud, water hyauinth + pressmud and water hyauinth + pressmud slurry) on the growth parameters of tomato for 60 days from transplantation and found a many fold increase in the growth parameters of vermicomposts treated plants over organic manure treated plants. The mechanism whereby plant growth is stimulated by vermicompost or worm cast is not clear. However, it is believed that the stimulating effect observed in the plant growth or yield study could be due to synergic action of several factors, but the major claim goes to microbial metabolites – the growth regulators present in the vermicompost as suggested by Tomati et al. (1987; 1988).

Similarly Parthasarathi et al. (2008) have also conducted experiments using black gram plant administered with vermicompost obtained from press mud, sugarcane trash and bagasse mixture (8:1:1) under three different soils (clay loam, sandy loam and red loam) and found a significant increase in the yield of grains and the content of sugar and protein in seeds over the plants raised in soil or treated with NPK. Bakthavathsalam and Deivanayaki (2007) have also noticed significance influence on the growth, yield and protein content of black gram plant raised in pots after the application of vermicompost supplemented with or without Rhizobium (bio fertilizer) and Uthayakumar and Bakthavathsalam (2009) have also noticed an excellent improvement in the production of black gram plant raised in pots added with different doses of vermicompost obtained from vegetable market wastes.

Similarly many reports have been made in white radish but cultivated in different organic matters by Bakthavathsalam and Geetha (2004) using decomposed paddy chaff powder and weed plants materials, Subramaniyan and Bakthavathsalam (2009) using paddy straw waste vermicast, Jayaseelan and Bakthavathsalam (2009) using green gram plant waste vermicompost, Bakthavathsalam et al. (2010a) using partly decomposed organic mixture of coir waste, water hyacinth, cow dung and poultry excreta, Bakthavathsalam et al. (2010b) using vermicompost obtained from T.viride treated organic mixture containing coir waste, water lily, goat droppings and poultry excreta, Mathialagan and Bakthavathsalam (2010) using partly decomposed water hyacinth materials treated with T.viride and Umamaheswari and Bakthavathsalam (2010) using vermicompost of Polyalthia leaves and partly decomposed cow dung.

Over all the results of all parameters observed in green gram plants revealed a differential and dose dependent effect with more growth and yield if they were in higher doses and less in lower doses. One important observations noted in the growth study of green gram with vermicompost obtained from vegetable market wastes was that the plants raised in higher PSR (50 PSR) though showed improved growth but are severely affected with insect pest of saprophytic nature due to their tender nature. Present study of the two compost used, the plants raised in partly decomposed vegetable market wastes showed relatively lesser growth and yield over the plants raised in L.mauritii exposed vegetable market wastes.

3.3. CONCLUSION

The production of vermicompost by the earthworm, *Lampito mauritii* kept in 100, 75, 50, 25 and 0 per cent substrate ratios (PSR) prepared from partly decomposed vegetable market wastes with soil was observed for one month. Mean values of stem length, number of leaves, number of flowers, number of pods, pod length and total seeds produced by green gram, *Vigna radiata* cultivated in pots using different per cent substrate ratios (50, 25 and 0) of partly decomposed vegetable market wastes and their vermicompost after using them by earthworm, Lampito mauritii. Though adverse effect was noticed in survival of *Lampito mauritii* under higher dose of vegetable market wastes, good impact (yield) on the cultivation of green gram and hence it may be concluded and suggested that it can be used as not good feeding material for *Lampito mauritii* and also to used as good manure for green gram plants to yield more quality grains.

IV. REFERENCES

Aira, M, Monroy, F, Dominguez, J and Mato, S, (2002). How earthworm density affects microbial biomass and activity in pig manure. European Jour. of Soil bio., 38: 7-10.

Arulmurugan, K. (1996). Studies on the effect of vermicompost on growth, yield, protein and oil content of soybean (Glysine max (L.) Merril) cv. CO-1., M.Sc. (Agri.) Dissertation, Annamalai University, Annamalai Nagar, India.

Atiyeh R.M, Subler S, Edwards CA, Metzger J (1999). Growth of tomato plants in horticulture potting media amended with vermicompost. Pedobiologia, 43: 724-728.

Bakthavathsalam, R. and M. Deivanayaki (2007). Effect of Rhizobium on growth and yield of black gram, Vigna mungo (Hepper) cultivated in pots under different nutrient media. Environ. Ecol., 25S (2): 360 – 368.

Bakthavathsalam, R. and S. Uthayakumar (2007). Rate of cocoon production of the earthworm, Lampito mauritii cultured in different ratios of vegetable market wastes. Environ. Ecol., 25S (4): 1124 – 1128.

Bakthavathsalam, R. and T. Geetha (2004). Macronutrient analysis of vermicomposts and their effects on the growth of radish plant. Environ. Ecol., 22(4): 941 – 947.

Bakthavathsalam, R., S. Rajapandiyan, M. Purushothaman, M. Muruganandham and M. Deivanayaki (2010a). Utilization of coir waste mixture in the culture practices of earthworm and pot cultivation of white radish. Environ. Ecol., 28(2B): 1211 – 1215.

Bakthavathsalam, R., S. Uthayakumar, M. Purushothaman, M. Deivanayaki and Kannan. M (2010b). Effect of coir waste mixture on the production of cocoon, hatchling and vermicast of Eudrilus eugeniae and the growth of white radish. Environ. Ecol., 28(2B): 1220 – 1224.

Bakthavathsalam, R., S. Uthayakumar, M. Purushothaman, M. Muruganandham and R. Arulvizhi (2010c). Macro and micronutrients present in Ipomoea carnea and their effect on the growth and yield of green gram. Environ. Ecol., 28(2A): 1075 – 1079.

Bakthvathsalam, R. and Ramakrishnan, G. (2004) . Culture of earthworm using different organic wastes of agricultural importance. Environment & Ecology, 22(Spl-2): 386-391.

Bano K, Kale RD, Satyavathi GP (1993). Vermicompost as fertilizer for ornamental plants. In: Rajagopal, D., Kale, R. D. and Bano, K. (Ed.) Proc. IV National Symposium Soil, Biology. Ecology. ISSBE. UAS, Bangalore. pp. 165-168.

Benitez, E, Nogales, R, Masciandaro, G and Ceccanti, B, (2000). Isolation by isoelectric focusing of humic-urease complexes from earthworm (Eisenia foetida)-processed sewage sludges. Biology and Fertility of Soils, 31: 489–493.

Bouallagui H, Torrijos M, Godon J J, Moletta R, Cheikh R B, Touhami Y and Delgenes J P (2004) Biochem Eng J.,, 21, 93-197.

Buchanan, M.A., E. Russel and S.D. Block, (1988). Chemical characterization and nitrogen minerlization potentials of vermicompost derived from differing organic wastes. In: Edward, C.A. and E.F. Neuhauser, (Eds.), Earthworm in Waste and Environmental Management, SPB, Academic Publishing, The Hugue, pp: 231 -240.

Chakraborty B, Chandra AK, Chakraborty SK (2008) Effect of intregated nutrient supply and growth, leaf yield and field performance of mulberry (Morus alba) under semi irrigated lateritic soil condition of west midnapore district, West Bengal. J. Environ. Sociobiol., 5(2): 221-226.

Edwards, C.A. and I. Burrows, (1988). The potential of earthworms composts as plant growth media. In: Edward, C.A. and E.F. Neuhhauser (Eds.), Earthworms in waste and environmental management, SPB Academic Publishing, The Hague, pp: 21-32.

Ghosh M, Chottopadhya GN, Baral K, Munsi PS (1999). Possibility of using vermicompost in Agriculture for reconciling sustainability with productivity. Proceding of the Seminar on Agrotechnology and Environment. pp. 64-68.

Grappelli A, Tomati U, Galli E (1985). Earthworm casting in plant propagation. Hortic. Sci., 20(5): 874-876.

Hallatt, L., S.A. Viljoen and A.J. Reinecke (1992). Moisture requirements in the life cycle of Perionyx excavatus (Oligochaeta). Soil Biol. Biochem., 24: 1333 – 1340.

Jayaseelan, A. and R. Bakthavathsalam (2009). Nutrient analysis and the effects of green gram waste vermicompost and vermicasts on the growth parameters of radish plant. Environ. Ecol., 27 (4A): 1840 – 1844.

Joshi, P.C. and Chauhan, A. (2006) Composting of some organic materials using Eisenia foetida and Conventional microbial methods: A comparative study. Uttar Pardesh J. Zool. 26(1):123-125.

Kale R D, Bano K and Krishnamoorthy R V (1982) Pedobiologia.,, 23, 419-425.

Kale R.D, Bano K, Sreenivasa MN, Bagyaraj DJ. (1987). Influence of worm cast (vee comp. E.83 UAS) on the growth and mycorrhizal colonization of two ornamental plants. South Indian Hortic., 35: 433- 437.

Kale R.D, Bano, K (1986). Field trials with vermicompost (vee comp. E.83 UAS) an organic fertilizer. In Dash, M. C., Senapati, B. K. and Mishra, P. C. (Ed.) Proceding National Seminer Org. Waste Utiliz Vermicomp Part B: verms and vermicomposting. Five Star Printing Press. Burla, Orissa. pp. 151-156.

Kale, R. (1991) Vermiculture: Scope for New Biotechnology. Calcutta: Zoological Survey of India.

Kale, R.D. (1994). Consolidated technical report of the ADHOC scheme on promotion of vermicomposting for production of organic fertilizer.U.A.S., G.K.V.K., Bangalore, India.

Kale, R.D. and K. Bano (1986). Field trials with vermicompost (Vee. Comp. E. 83 UAS) an organic fertilizer. In: Proc. Nat. Sem. Org. Waste. Utiliz. Vermicomp. Part B: Verms and Vermicomposting (eds. M.C. Dash., B.K. Senapati and P.C. Mishra), Burla, Orissa, pp.151- 156.

Kaplan, D.L., R. Hartenstein, C.A. Edwards, E. F. Neuhauser and M.R. Malecki (1980). Physicochemical requirements in the environment of the earthworm Eisenia fetida. Soil Biol. Biochem., 12: 347 – 352.

Kaya M, Atak M, Khawar KM, Ciftci CY and Ozcan S. 2005. Effect of pre-sowing seed treatment with zink and foliar spray humic acids on field of common bean (Phaseolus vulgaris L.). J Agric Biol 7:875-878

Line, M.A. (1994). Recycling of sea star (Asterias amurensis) waste by composting. Biores. Technol., 49 (3) : 227-229.

Loehr, R.C., E.F. Neuhauser and M.R. Malecki (1985). Factors affecting the vermistabilization process - temperature, moisture content and polyculture. Water Res., 19: 1311 – 1317.

Madhukeshwara, S.S., K.N. Anil, Andani Gowda, M.T. Laxminarayana, Mariswamy Gowda and T.A. Sreeramasetty (1996). Establishment of tomato Lycoperison esculentum seedlings in different organic substrates. In: Nat. Sem. Org. Fmg. And Sust. Agri. (eds. G.K. Veeresh and K. Shivashankar), Bangalore, 41.

Mahajan A, Gupta R. D. (2009). Bio-fertilizer: their kinds and requirements in India. In: Mahajan A, Gupta RD (ed) Integrated Nutrient Management (INM) in a sustainable rice-wheat cropping system. Springer Netherland.

Manivannan, S. (2005). Standardization and nutrient analysis of vermicomposting sugarcane wastes, pressmud – trash – bagasse by Lampito mauritii and Perioynx excavatus and the effects of vermicompost on soil fertility and crop productivity, Ph.D. thesis, Annamalai University, Annamalainagar, Tamilnadu, India.

Martin, N.A. (1982). The effect of herbicides used on asparagus on the growth rate of the earthworm, Allobophora caliginosa. Proceedings of the 35th New Zealand Weed and Pest Control Conference, 328 – 331 pp.

Mathialagan, R. and R. Bakthavathsalam (2010). Utilization of Eichhornia crassipes in the reclamation process of acidic soil using white radish as test plant. Environ. Ecol., 28 (2A): 1053 – 1058.

Mitchell, M.J., R.M. Mulligan, R. Hartenstein and E.F. Neuhauser (1977). Conversion of sludges into “top soils” by earthworms. Comp. Sci., 18: 28 – 32.

Muruganandham, M. and R. Bakthavathsalam (2009). Toxicity, macro and micronutrients analysis and the effect of cabbage waste on the growth and yield of chilly plant. Environ. Ecol., 27(3A): 1345 – 1349.

Parthasarathi, K., M. Balamurugan and L.S. Ranganathan (2008). Influence of vermicompost on the physico – chemical and biological properties in different types of soil along with yield and quality of the pulse crop - black gram. Iran J. Environ. Health. Sci. Eng., 5(1): 51 – 58.

Purushothaman, M. (2012). A comparative study on the culture practices of two epigeic earthworms using selected organic wastes and their role in ladies finger cultivation. Ph.D. Thesis, Bharathidasan University, India.

Ramalingam, R. (1997). Studies on the life cycle, growth and population dynamics of Lampito mauritii (Kinberg) and Eudrilus eugeniae (Kinberg) (Annelida – Oligochaeta) cultured in different organic wastes and analysis of nutrients and microbes of vermicompost. Ph.D. Thesis, Annamalai University, Annamalai Nagar, India.

Reinecke, A.J. and J.R. Kriel (1981). Influence of temperature on the reproduction of the earthworm Eisenia fetida (Oligochaeta). S. Afr. J. Zool., 16: 96 – 100.

Reincke, A.J. and J.M. Venter (1985). The influence of moisture on the growth and reproduction of the compost worm Eisenia fetida (Oligochaeta). Rev. Ecol. Biol. Sol., 22(4): 473 – 481.

Reinecke, A.J. and J.M. Venter (1987). Moisture preferences, growth and reproduction of the compost worm Eisenia fetida (Oligochaeta). Biol. Fertil. Soils, 3: 135 – 141.

Senapati, B.K. (1993). Vermitechnology in integrated waste biomass management: concepts, prospects and problems. In: Biogas Slurry Utilization, Consartium on Rural Technology (CORT), New Delhi, pp.57-74.

Sinha R K and Sinha A K, (2000). Waste Management: Embarking on the 3R' Philosophy of waste Reduction, Reuse and Recycling'. INA Shree Publications, 319- 320.

Stancheva I, Mitova I, Petkova Z. (2004). Effects of different nitrogen fertilizer sources on the yield, nitrate content and other physiological parameters in garden beans. Environ Exp Bot 52: 277-282.

Subramaniyan, A. and R. Bakthavathsalam (2009). Utilization of paddy straw waste in the culture practices of earthworm and cultivation of radish plant. Environ. Ecol., 27(4A): 1664 – 1671.

Suthar S S, Watts J, Sandhu M, Rana S, Kanwal A, Gupta D and Meena M S (2005) Asian J Microbiol Biotech Envron Sci.,, 7, 541 -544.

Suthar, S. and S. Sing, (2008). Comparison of some novel polyculture and traditional monoculture vermicomposting reactors to decompose organic wastes. Ecological Engineering, 33: 210-219.

Tomati, U., A. Grappelli and E. Galli (1987). The presence of growth regulators in earthworm - worked wastes. In: On Earthworms (eds. A.M. Bonvicini pagliai and P. Omodeo), Selected symposia and monographs, U.Z.I., 2 Mucchi, Modena, 423 – 435 pp.

Tomati, U., A. Grappelli and E. Galli (1988). The hormone – like effect of earthworm casts, Biol. Fertil. Soils, 5: 288 – 294.

Tripathi, G. and P. Bharadwaj, (2004). Comparative studies on biomass production, life cycles and composting efficiency of Eisenia foetida (Savigny) and Lampito mauritii (Kinberg). Bioresource. Technol., 95: 77-83.

Udayakumar, (2012). A comparative study on the culture practices of eisenia fetida and lampito mauritii earthworms using sheep droppings, press mud and pongamia leaves and a pilot study on the cultivation of black gram (vigna mungo) using vermicomposts" Ph.D. Thesis, Bharathidasan University, Trichirapalli, India.

Umamaheswari, P. and R. Bakthavathsalam (2010). Role of Eudrilus eugeniae on the process of alkaline soil reclamation using Polyalthia longifolia (Sonn) tested through white radish cultivation. Environ. Ecol., 28 (2A): 1059 – 1065.

Uthayakumar, S. and R. Bakthavathsalam (2009). Analysis of vermicompost of vegetable market waste and its effect on the growth and yield of black gram. Environ. Ecol., 27(3A): 1332 1337.

Vadiraj, B.A., K. Siddagangaiah and V. Krishnakumar (1996). Response of coriander cultivars to the graded levels of vermicompost. In: Nat. Sem, Org. Fing. and Sust.Agric., (eds. G.K. Veeresh and K. Shivashankar), Bangalore, pp.47- 48.