INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

www.scienceandnature.org

EFFICACY OF LIGNO-PHENOLIC COMPOSTS IN THE GROWTH PROMOTION OF VEGETABLES

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ABSTRACT
Crop productivity is an outcome of various inputs involved in crop production along with soil factors. Agronomic practices have greater influence on the sustainability of a farm. Agrowaste recycling and thereby reducing the cost of cultivation is of profound importance in organic as well as in sustainable agriculture. Field experiments were conducted to study the efficacy of various composted ligno-phenolic agrowastes on the growth promotion of four different vegetable crops. The treatments included ayurvedic compost, coir pith compost, elephant dung compost, mixture compost and cow dung along with absolute control free of any treatments. The results showed that, application of ayurvedic compost recorded maximum plant height and yield in amaranth and tomato. Eventhough, cow dung application recorded highest plant height and yield in cow pea and Bhindi, among the composts, elephant dung and ayurvedic composts recorded maximum plant height respectively. The yield was maximum for mixture and ayurvedic composts in cow pea and bhindi respectively.

KEY WORDS: sustainability, recycling, agrowastes, ligno-phenolic compost.

INTRODUCTION

Sustainability has become a key word in modern agriculture. Increasing crop productivity with safer end products has become major thrust due to escalating demand for farm produce free of crop protection chemicals and chemical fertilizers. Sustainability in agriculture could be achieved by reducing the use of synthetic fertilizers through on –farm recycling of farm wastes which in turn results in decreased pest and disease incidences in healthy crops grown in biologically active soils (Neeson, 2004). Accumulation of ligno-phenolic agrowastes from various agro industries are causing very high environmental negative problems which results in reduced plant growth and contamination of water bodies. Composting is the most economical and sustainable option for the management of organic wastes which involves microbiological processes which goes on naturally with the help of native microorganisms in the soil. Use of organic manures as external nutrient sources is a logical alternative to expensive inorganic fertilizers in agriculture with an aim to reduce the cost of cultivation with cheap sources of mineral nutrients. The recycled organic wastes, house hold wastes and compost has commonly been adopted in the management of soil fertility (Alexander and Wagner, 2006). The recycling of organic residues not only reduces the need for additional fertilizers, but also provides organic matter and soil cover that are essential for sustainable agriculture (Brady, 1990). Moreover, the organic nature of composts makes the nutrients readily available without being wasted through leaching and drainage. However, the quality of compost and their nutrient status depends primarily on the source and type of organic materials composted, method of composting and its maturity. The present study is aimed at evaluating the effectiveness of composts prepared from various lingo-phenolic agrowastes using microbial consortium in four different vegetable crops.

MATERIALS & METHODS

Four different field experiments were conducted in different seasons to study the efficacy of various ligno-phenolic composts in growth promotion of vegetables. All the experiments were carried out in the research fields of College of Horticulture, Vellanikkara. The experimental plots were laid out in Randomised Block Design (RBD).The treatments include ayurvedic compost, coir pith compost, elephant dung compost, mixture compost and cow dung along with absolute control free of any treatments.

Amaranth and Tomato

For amaranth (var. Arun) and tomato (var. Mukthi), the nurseries were raised separately in earthen pots with sterilized potting mixture. Field experiment for amaranth was conducted in Jun –Aug, 2013 and Oct- Jan, 2014 for tomato. Main fields were prepared by through ploughing and levelling and trenches of 2.7 and 2.5 m length and 30 cm width was prepared for tomato and amaranth respectively. Composts/ cow dung were applied to the trenches as split– half basal and half 30 days after planting (DAP) @50 t/ha (amaranth) and 25 t/ ha (tomato) with thorough mixing. The seedling of amaranth and tomato were transplanted at specified spacing of 30 cm (amaranth) and 65 cm (tomato).

Cow pea and Bhindi

Main fields were prepared and trenches of size, 3m x 30 cm with 30 cm distance between the rows were prepared for both crops. Composts/ cow dung were applied in splits – basal and 30 DAP @ 20 t/ ha (cow pea) and @ 12 t/ha (Bhindi) and mixed thoroughly. Seeds were sown at 45 cm spacing in the prepared trenches.

Observations on plant height and yield were recorded from 10 plants randomly selected and labelled.

RESULTS & DISCUSSION

Soil amendments with composted organic matter have been practiced traditionally to improve soil fertility. Abundant research in this area has proved the ability of composted agrowastes to improve soil health and crop productivity (Espiritu, 2011; Sabitii, 2011; Badar and Qureshi, 2015). In the present study application of various ligno-phenolic composts had noticeable effect on the plant height and yield of all the crops were superior to control. The plant height showed variation with the type of crop and the type of compost applied. (Table -1).

TABLE 1. Influence of ligno-phenolic compost on plant height of vegetable crops

Sl. No.	Treatments	Treatment details	Plant height (cm)			
			Amaranth	Tomato	Cow pea	Bhindi
1	T_1	Ayurvedic compost	38.45 ^{a}	52.02 ^{abc}	42.56^{e}	60.99^{b}
2	T_2	Coir pith compost	24.5^{efg}	39.44^{cde}	44.25^{c}	56.06^{bc}
3	T_3	Elephant dung compost	36.4^{a}	47.32^{abcd}	52.4^{a}	54.70^{bc}
4	T_4	Mixture compost	28.55^{bcde}	44.46^{abcde}	43.93^{d}	62.6^{b}
5	T_5	Cow dung	32.20	46.26^{abcd}	47.23^{b}	88.97^{a}
6	T_6	Absolute control	20.05^{g}	34.47^{f}	37.8^{f}	42.77^{c}

Among the treatments, ayurvedic compost (T_1) recorded maximum plant height for amaranth (38.45 cm) and tomato (52.02 cm) followed by elephant dung in both cases 36.4 cm and 47.32cm respectively. In cow pea, maximum plant height was observed in the plants treated with elephant dung compost - T_3 (52.40 cm), whereas, maximum plant height, 88.97 cm was recorded in Bhindi with cow dung application. Plant height is one of the readily observable trait in plants treated with composts as reported by Abdelaziz *et al*. (2007) and Espiritu, 2011. Compost application has resulted in the increase in shoot length in green gram (Ibrahim and Mumtaz, 2014) and biomass in chick pea (Shazad *et al*., 2008).

Similar trend as in plant height was observed with respect to yield (Table -2) and T_1–application of ayurvedic compost recorded maximum yield in amaranth (8.66 t/ha) and tomato (13.7 t/ha) followed by elephant dung - T_3 with 7.8 t/ha in amaranth and 11.68 t/ha in tomato. In the yield parameter, both cow pea and bhindi showed maximum response to cow dung application (T_5) with 7.49 t/ha and 8.82 t/ha respectively. However, among the composts, ayurvedic compost (T_1) with a yield of 3.46 t/ha (Bhindi) and mixture compost 5.63t/ha (cow pea) recorded maximum yield.

TABLE 2. Influence of ligno-phenolic compost on yield of vegetable crops

Sl. No.	Treatments	Treatment details	Yield (t/ha)			
			Amaranth	Tomato	Cow pea	Bhindi
1	T_1	Ayurvedic compost	8.66^{ab}	13.7^{b}	5.13a	3.46^{b}
2	T_2	Coir pith compost	6.00^{cd}	7.40^{ef}	5.03^{a}	2.19^{bc}
3	T_3	Elephant dung compost	7.8^{ab}	11.68^{ab}	4.43^{ab}	1.27^{cd}
4	T_4	Mixture compost	5.34^{bcd}	13.22^{b}	5.63^{a}	2.43^{bc}
5	T_5	Cow dung	5.32^{bcd}	10.03^{cde}	7.49^{a}	8.82^{a}
6	T_6	Absolute control	4.00^{d}	6.58^{f}	1.43^{b}	0.43^{d}

Biocompost prepared from coir dust with enrichment has been reported to improve yield in medicinal plants (Reghuvaran and Ravindranath, 2010) and in potted mung bean (Espiritu, 2011). Mrabet *et al*. (2012) also reported similar results in which the addition of composts showed yield improvement in maize and lettuce crops.

CONCLUSION

This study showed that, organic composts from various ligno-phenolic agrowastes have positive influence on the plant growth characters like height and yield of amaranth, tomato, cow pea and bhindi. The effect of composts varied with respect to the source of compost and crop. Ayurvedic compost showed superior effects for both parameters in all crops. Elephant dung compost was also found equally good in improving plant height and yield in amaranth, tomato and cow pea.

ACKNOWLEDGEMENT

Authors thankfully acknowledge the financial support rendered by Kerala State Council for Science Technology & Environment

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