INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

www.scienceandnature.org

ELEPHANT DUNG COMPOST: A NOVEL GROWTH MEDIUM FOR VEGETABLE SEEDLINGS

[1]Sally K. Mathew, [2]Gleena Mary, C.F. & [3]Sushama, P.K.
[1,2] Department of Plant Pathology, [3] Department of Soil Science & Agricultural Chemistry, College of Horticulture, Kerala Agricultural University, Vellanikkara - 680656

ABSTRACT
Success of seedling transplant is mainly dependant on the health of the seedlings and root injury caused during transplanting. Coco-peat is the commonly used medium in commercial potting substrates. Replacing common potting medium with compost has been already worked out in many countries. Here, the ligno-phenolic composts (elephant dung compost, ayurvedic compost, coir pith compost and mixture compost) were tested for their efficacy to support seed germination and seedling growth. Among the composts tested, elephant dung compost recorded maximum germination percentage and seedling vigour for amaranth. In case of tomato, even though maximum seed germination and vigour were recorded by mixture compost, elephant dung compost was equally effective with good germination percentage and seedling vigour. The use of elephant dung compost and other composts as a replacement to coco peat is an attractive alternative due to the added advantage of recycling of lignocellulosic agro wastes which can cause various environmental risks.

KEYWORDS: ligno-phenolic composts, seedling vigour, environmental risks.

INTRODUCTION

Healthy seeds/seedlings are the primary requirement for crop production, since seedling health decides overall crop health and final yield. Hence, horticultural nurseries targets production of quality seedlings with good morphological and physiological features. Survival of a newly planted seedling is largely dependent on the rapid extension of roots, which re-establish root–soil contact and absorb water to replenish water loss due to transpiration (Burdett *et al*., 1983). Plant root system determines the uptake of nutrients and water in addition to their role in maintenance of the plant structure, whereas aerial morphology decides the photosynthetic efficiency of the plant. The commercial nurseries produce seedlings in containers due to market demand and other advantages including greater production per surface unit, faster growth, lack of dependence on arable land *etc*. Nursery potting media mainly consists of peat, since it provides adequate aeration, moisture retention and support for the seedlings (Raviv *et al*., 1986). In many countries, introduction of several restrictions on the use of peat and other inert media has initiated the search for alternate, cost effective and environmentally safe potting media. Parallely, the increasing concern in waste recycling has led to the use of compost like substrates in potting medium (Ostos *et al*., 2008). Composts, being a product of thermophilic decomposition are comparatively free of pests, diseases and weed seeds. In addition, the nutrient status of composts will help in the reduction of costly inorganic fertilizers. Kerala, the land of temples and festivals are having good number of captive elephants which are used in festivals. The increased number of captive elephants has resulted in the accumulation of elephant dung rich in cellulose and lignin. This ligno-cellulosic waste takes longer time for natural biodegradation due to the complex nature of these biopolymers. The composting of this waste by different means has offered large quantity of highly nutritious organic manure which can be used as a replacement for traditional costly potting media. In this study, the feasibility of replacing costly growth medium for the production of vegetable seedlings was investigated through the study of the effect of elephant dung and other ligno-phenolic composts in growing vegetable seedlings.

MATERIALS & METHODS

The experiment was carried out in the Department of Plant Pathology, College of Horticulture, Kerala Agricultural University, Thrissur. The germination efficiency and seedling vigour of amaranth (var. Arun) and tomato (var. Anagha) were compared using composts prepared from various ligno-phenolic agrowastes like ayurvedic waste, coir pith, elephant dung, mixed substrate along with ordinary potting mixture as control. Composts and potting mixture were filled in protrays and the seeds of amaranth @ 5 seeds/ cell and tomato @ 2 seeds/cell were sown in four rows of each portrays filled with different composts. The protrays were moistened and kept for germination. Observations on early germination and germination percentage were recorded separately for each compost from three days after sowing. Seedlings carefully removed with intact root system, washed under running tap water to remove adhering particles, root and shoot length were recorded. Vigour index of the seedlings was calculated for tomato and amaranth using the formula.

Vigour index = (Root length + Shoot length) x germination percentage

RESULTS & DISCUSSION

The results of this experiment show that, it is possible to substitute coco peat by ligno-phenolic composts especially elephant dung compost for the production of vegetable seedlings in nurseries even though the effect varied with different composts.

Effect of ligno-phenolic composts on germination and vigour index of amaranth

The seed germination percentage indicates the speed of germination and efficiency of the compost to initiate germination. In this study, germination of amaranth seeds initiated on three days after sowing (DAS) in all the treatments and maximum germination (98.21 %) was observed within 6 DAS in elephant dung compost, mixture compost and coir pith compost against 55.35 per cent in control (Table -1). The use of different composts as growing medium showed marked increase in the vigour index of amaranth seedlings grown in all composts as compared to that in potting mixture. Among the treatments, maximum seedling length (7.65 cm) and vigour index (751.30) was recorded for elephant dung compost followed by mixture compost with seedling length of 7.64 cm and a vigour index of 750.32. Other treatments also showed good performances compared to control.

TABLE -1. Effect of ligno-phenolic composts on germination and vigour index of amaranth

Sl. No.	Treatments	Treatment details	Germination (%)	Seedling length (cm)	Vigour Index
1	T_1	Ayurvedic compost	76.78	7.60	583.52
2	T_2	Coir pith compost	98.21	6.97	684.52
3	T_3	Mixture compost	98.21	7.64	750.32
4	T_4	Elephant dung compost	98.21	7.65	751.30
5	T_5	Control (Potting mixture)	55.35	5.17	286.15

Effect of ligno-phenolic composts on germination and vigour index of tomato

Tomato seeds also showed germination from third day after sowing in elephant dung, coir pith and mixture composts, whereas, ayurvedic compost recorded germination only after fourth day of sowing. All treatments showed maximum germination within 6 DAS and T_3 –mixture compost recorded cent percent germination on sixth day followed by coir pith and elephant dung (Table -2). Tomato seedlings also recorded good seedling length and vigour index in all treatments except control. Maximum seedling length (9.97 cm) and vigour index of 997 were observed in tomato seedlings grown in mixture compost. Elephant dung compost was equally effective with seedling length of 9.17 cm and vigour index, 829.6 against control with seedling length , 5.67 cm and vigour index ,296.99.

TABLE 2. Effect of ligno-phenolic composts on germination and vigour index of tomato

Sl. No.	Treatments	Treatment details	Germination (%)	Seedling length (cm)	Vigour Index
1	T_1	Ayurvedic compost	73.80	7.44	549.07
2	T_2	Coir pith compost	92.85	7.52	698.23
3	T_3	Mixture compost	100	9.97	997.00
4	T_4	Elephant dung compost	90.47	9.17	829.60
5	T_5	Control (Potting mixture)	52.38	5.67	296.99

Several studies have addressed the effect of different types of composts including coir pith compost as potting or container medium on plant growth and yield (Baskaran nd Saravanan, 1997; Garcia – Gomez *et al*., 2002; Herrera *et al*., 2008). However, there are no studies concerning the use of elephant dung and other ligno-phenolic composts on seed germination and seedling growth of vegetables. Improvement in germination of paddy seeds with composted vegetable wastes has been reported by Jelin *et al*. (2013). Enhancement of plant growth characters by composts have been attributed to the physical, chemical and biological properties of the growing substrate. It is a well known fact that, IAA is an important regulator of shoot nad root length (Kaufman *et al*., 1995). The enhancement of seedling length and vigour index of plants grown in composts might be due to the induction of IAA production by these composts.

CONCLUSION

The results of the present study showed that, in spite of the variation in the nutrient status and quality, all the composts were equally competent in supplying essential nutrients which was evident from the per cent germination and vigour index of the plants. Further, the results also confirm that, it is possible to effectively substitute coco peat or any other growing medium with all of the tested composts. However, the elephant dung compost which supported good germination and seedling vigour of both amaranth and tomato can be used for the production of healthy and cost effective seedlings in horticultural nurseries. The use of elephant dung compost also adds to waste recycling which is a good example for sustainable agriculture.

REFERENCES

Burdett, A.N., Simpson, D.G. &Thompson, C.F. (1983) Root development and plantation establishment success. In *Tree Root Systems and Their Mycorrhizas*). Springer, Netherlands. 103-110 pp.

Garcia-Gomez, A., Bernal, M.P. & Roig, A. (2002) Growth of ornamental plants in two composts prepared from agroindustrial wastes. *Biores. Technol.* 83(2): 81-87.

Herrera, F., Castillo, J.E., Chica, A.F., & Bellido, L.L. (2008) Use of municipal solid waste compost (MSWC) as a growing medium in the nursery production of tomato plants. *Biores. Technol.* 99(2): 287-296.

Jelin, J., Dhanarajan, M.S., & Mariappan, V. (2013) Assessment of compost as a bio-fertilizer for the growth of paddy. *J. Environ. Biol.* 34: 6.

Ostos, J.C., López-Garrido, R., Murillo, J. M. & López, R. (2008) Substitution of peat for municipal solid waste- and sewage sludge-based composts in nursery growing media: Effects on growth and nutrition of the native shrub *Pistacia lentiscus* L. *Biores. Technol.* 99(6): 1793-1800.

Raviv, M., Chen, Y. & Inbar, Y. (1986) Peat and peat substitutes as growth media for container-grown plants. In The role of organic matter in modern agriculture. Springer, Netherlands. 257-287 pp.

Bhaskaran, M. & Saravanan, A. (1997) Effect of coir pith based potting mix and methods of fertilizer application on tomato. *Madras Agric. J.*84:476 -480.

Kaufman, P.B. Wu, L.L., Brock, T.G. & Kim, K. (1995) Hormones and the oriwentation of growth. In: Plant hormones: Physiology, Biochemistry and Molecular biology (ed.) Davies, P.J. Kluwer Academics, Netherlands.pp.547 -570.