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Parveen Gill
Department of Zoology, Chaudhary Charan Singh Haryana Agricultural University, Hisar Haryana, India

Sudhakara Rao Dommalapati
Department of Chemistry and Biochemistry, Chaudhary Charan Singh Haryana Agricultural University, Hisar Haryana, India

Dharambir Singh
Department of Zoology, Chaudhary Charan Singh Haryana Agricultural University, Hisar Haryana, India

RK Gupta
Department of Zoology, Chaudhary Charan Singh Haryana Agricultural University, Hisar Haryana, India

Naresh Kumar
Department of Agricultural Meteorology, Chaudhary Charan Singh Haryana Agricultural University, Hisar Haryana, India

Corresponding Author:
Parveen Gill
Department of Zoology, Chaudhary Charan Singh Haryana Agricultural University, Hisar Haryana, India

Comparative effect of different organic fertilizers with chemically synthesised urea on various growth parameters of *Solanum melongena* in favorable environmental condition

Parveen Gill, Sudhakara Rao Dommalapati, Dharambir Singh, RK Gupta and Naresh Kumar

Abstract
The assessment of different organic fertilizers as compared with chemically synthesised urea, cow dung, vermicompost and urea on growth parameters of brinjal (*Solanum melongena*) in 16 pots. Pots in, first, second and third rows were treated with vermicompost, urea and cow dung respectively and fourth rows was kept as control, one plant was grown as per pot and five different growth and yield parameters *viz*. height of plant, diameter of the stem, dry weight of plant, total weight of fruits and number of fruits per plant were recorded. Plants treated with vermicompost exhibited best overall growth in comparison to other treatments.

Keywords: Comparative, organic fertilizers, chemically, *Solanum melongena*

Introduction
The most important aspect of compost produced by earthworms is that it is 100% organic. There are no harmful chemicals and it does not need to be mixed with anything. Vermicomposting produces a product that is naturally beneficial for plants in several different ways. The most significant benefit is that the nutrients in earthworm compost are very easily absorbed by the roots of plants. Unlike chemical fertilizers, vermicompost is not easily flushed from the soil because of the worm mucus that it contains. Plants are longer to obtain the nutrients and get the maximum benefit. Microorganisms: As the compost is passing through the body of the worms it is enriched with bacteria and microbes. These help plants to become more disease resistant and also repel some plant pests. The presence of increased microbial activity can make the area much more attractive to birds which also help to remove plant pests. As the compost works on the plants and they become healthier the need for pesticides is reduced. The reduction in pesticides helps the area to recover faster and can start an improvement cycle that will run on. If we compares this with the typical cycle when chemical fertilizers are used. The chemical fertilizers might increase plant yields but they do nothing for plant health. Continued use of chemical fertilizers inevitably leads to a breakdown in the soil. Ammonia and salts build up which attack the plants making them less able to withstand disease. Earthworm compost contains hormones that help plants to grow. Germination of seeds is encouraged, the growth of the plant is stronger and the crop yield improved. This natural support for the plants is not available with chemical fertilizers. The distribution of the compost through the soil also helps to encourage healthy root growth.

Material and Methods
The effect of different treatments of urea, vermicompost and cow dung were studied on brinjal (*S. melongena*) for each of the vegetable crop, 16 pots were prepared. In first row, four pots with cow dung as fertilizer; In second row, four pots with urea as fertilizer; In third row, four pots with vermicompost as fertilizer and in fourth row four pots were kept as control. One plant was grown in each pot. Total five growth and yield parameters *viz*. height of the plants, diameter of the main stem, dry weight of the whole plant (except fruit and roots), number of fruits per plant and the total weight of fruits per plant were recorded. Plant heights were measured with the help of a meter tape from the ground level to the tip of apical shoot/flower of the tallest shoot at maturity. Average plant height was calculated and expressed in cms. Stem diameter was also measured at the maturity stage with the help of a Vernier Calliper at two and half cm above the ground level and expressed in cm.

The dry matter yield of the plants (excluding roots and fruits) were recorded after harvesting. The main stem of plant were cut from ground level and dried in an oven at 60±5 ºC and weighed. The well grown fruits were handpicked, counted and weighed. Number of fruits per plant (in each treatment) and their total weight in grams was recorded after uniform interval of time at maturity.

Statistical Analysis

The standard statistical tools were used for analysis of data recorded in different experiments. The experimental design for screen house study was completely randomized block with four replicates (tubs). A critical difference (CD) was calculated between the treatments by CRD (*in vitro*), accordingly, using Software "OPSTAT", developed at the Computer Center, College of Basic Science and Humanities, CCS Haryana Agriculture University Hisar.

Result

Plant height (Fig.1) at harvest was significantly different among various fertilizers treatment the maximum plant height was observed 72.86 cm in vermicompost treated pot followed by 65.46 cm in urea, 52.55 cm in cow dung and 45.52 cm in control treatment.

The maximum stem diameters (Fig.2) was observed 1.98 cm in vermicompost treated followed by 1.46 cm in urea, 0.93 cm in cow dung and 0.83 in control treatment.

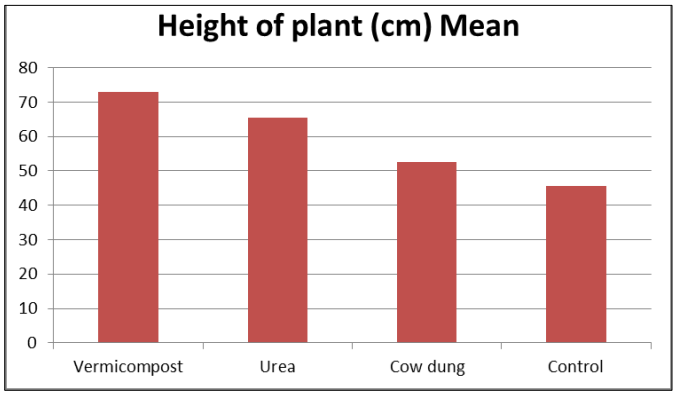

Fig 1: Average height of brinjal plant in different fertilizers

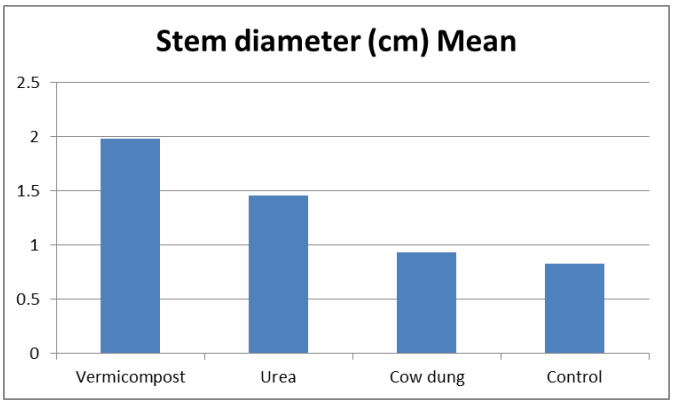

Fig 2: Average stem diameter of brinjal plant in different fertilizers

The fig.3 explain that the maximum number of fruit was observed 11.24 in vermicompost treated pots followed by 9.58 in urea, 8.00 in cow dung and 4.76 in control treatment. The fig.4 shows that the maximum weight of fruit was observed 143.11gm in vermicompost treated pots followed by 133.00 in urea, 120.87gm in cow dung and 50.94gm in control treatment.

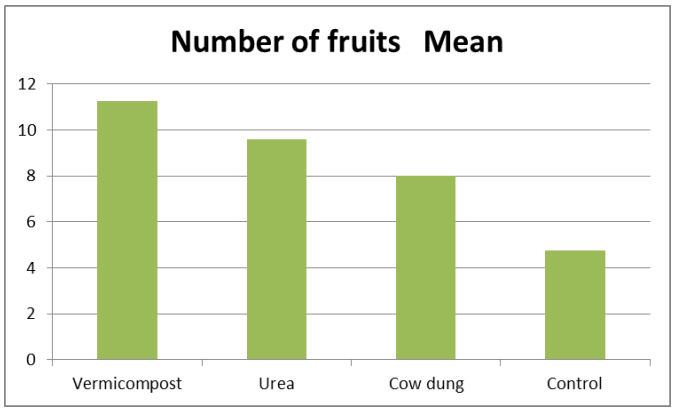

Fig 3: Average number of fruit of brinjal plant in different fertilizers

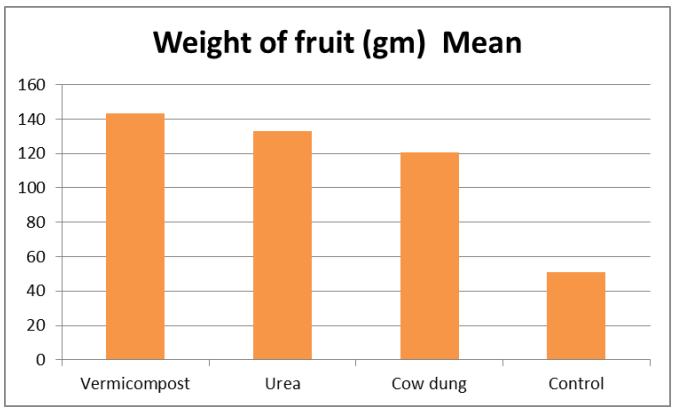

Fig 4: Average weight of fruit of brinjal plant in different fertilizers

The dry matter yield was observed 43.95gm in vermicompost treated followed by 33.32gm in urea, 26.18gm in cow dung and 17.78gm in control treatment as shown in fig.5.

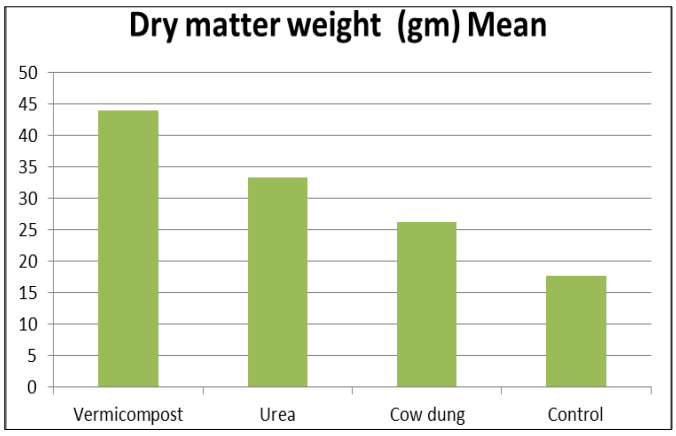

Fig 5: Average dry weight of brinjal plant in different fertilizers

Discussion

Organic wastes are extensively increasing with increased human populations, intensive agriculture and industrialization. The disposal of wastes has become important for a healthy quality of environment. The conversion of a negative waste into beneficial materials is one of the most important aspects of resource recycling and environmental cleaning. In this regard recycling of utilizable organic wastes is feasible.

The recycling of wastes through vermicomposting reduces problems of disposal of agricultural wastes. Vermicomposting is used not only as an alternate source of organic fertilizers but also to provide economical animal feed protein for the fish and poultry industries worldwide. The vermicomposts have

more available nutrients per weight than the organic waste from which they are produced. Jambhekar, (1992) [10] reported that the application of vermicomposts increased available N, P and K content in soil. Nutrients present in vermicomposts are readily available for plant growth. Transplantation of earthworms and mulching facilitate transfer of nutrients to plants (Ismail, 2000) [9]. Vermicompost contains plant hormones like Auxin and gibberlins and enzymes which are believed to stimulate plant growth and discourage plant pathogens. It improves the fertility and water holding capacity of the soil. It also enriches the soil with useful microorganisms which add different enzymes like phosphatases and cellulase to the soil.

There has been a considerable increase in research dedicated to the study of the effects of compost-like materials on soil properties and the plant growth. The enhanced growth in plants may be because of presence of more amount of available nitrogen vermicompost which is essential for the synthesis of structural proteins (Edwards 1988) [6].

In the present investigation the recommended dose of vermicompost and chemical fertilizer both has resulted in more number of fruit per plants but minimum was found with control. These results are in agreement with those of Patil *et al.,* (1998) [14] and Bajpai *et at.,* (1963) [2] who also worked on effect of vermicompost and fertilizers on yield of crops.

Increase in all vegetative growth and yield parameter character indicating superiority of vermicompost over the other treatments tested in this study. This may have been due to ability of vermicompost to add biological agents' fungi and bacteria which improve the soil texture reduce the toxicity of fertilizer and also provide the nutrition to plants. These finding are in accordance with Vadiraj *et al.,* (1998) [16] and Sublar *et al.,* (1998) [15]. The increase in the number of fruits by addition of nitrogen and phosphorus separately has also been observed by Cheema *et al.,* (2001) [4]. The better growth due to nitrogen fertilizer has also been reported by Hocking *et al.,* (2003) [8].

The external environment conditions significantly influence the overall plant growth. The environments consist of atmospheric and soil conditions. Healthy soil is one of the most important factor effecting yield and other qualities of vegetable crops. In the present investigation, effect of vermicompost on different attributes of local vegetable crops was seen. Brinjal and tomato are the important vegetable crops of India. Chemical fertilizers are often used to increase the crop yield which lead to deterioration of environment of soil fauna (Larelle and Marten, 1992; Bhatnagar and Palta, 1996) [11, 3]. Vermicompost on other hands ensure maintenance of soil texture and quality and easy availability of large many soil nutrients. Compost can be made five times more quickly through vermitechnology as compared to other traditional method.

The results of several long-term studies have shown that the addition of compost improves the physical properties of soil by decreasing the bulk density and increasing the water holding capacity of soil (Weber *et al*., 2007) [17].

The plant growth hormones may become adsorbed on to humic fractions so the plant growth response is a combined hormonal/humic one. The gibberellins and the cytokinins from vermicomposts in aqueous solution have significant effect on the plant growth. However, such substances may be relatively transient in soils and we hypothesize that transient plant growth regulator such as IAA, which are water-soluble and degraded in light, may become adsorbed on to humates and thereby become much more persistent in soils and media and act over a much longer period to influence the plant growth. (Hayes 1997) [7].

A large beneficial microbial population and biologically active metabolites, particularly the gibberellins, cytokinins, auxins and group B vitamins were observed with the application of vermicompost alone or in combination with the organic or the inorganic fertilizers. It resulted in a better yield and quality of the diverse crops and the application of vermicompost along with chemical fertilizers recorded a higher yield of brinjal. Among the various organic manures, the compost produced by earthworms (vermicompost), is a rich source of macro and micronutrients Bano and Kale (1987) [1]. Curry and Byrne (1992) [5] found that the nitrogen derived from earthworms could supply 30 per cent of the total crop requirement as it is a potential source of readily available nutrients for plant growth. It not only supplies a good amount of different nutrient elements but also contains beneficial microbes like nitrogen fixing bacteria, mycorrhizae and growth promoting substances. Same result were observed by Mamta *et al.,* (2012) [12] and parveen Gill *et al.,* (2018) [13] that the effect of vermicompost on plant height, number of leaves and fruits weight were higher in the vermicompost treated field of brinjal and tomato crop as compared to control and no disease incidence was observed in the fruit of vermicompost treated plot.

Conclusion

Composted materials are therefore gaining acceptance as organic fertilizers in sustainable agriculture and there has been a considerable increase in research dedicated to the study of the effects of compost-like materials on soil properties and the plant growth.

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