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A COMPARATIVE GROWTH ANALYSIS OF CROP THROUGH THE ORGANIC FARMING METHODS IN ANDHRA UNIVERSITY CAMPUS, VISHAKHAPATNAM, ANDHRA PRADESH

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The organic farming widely known as the one of the sustainable agricultural practices with the use of natural methods to cultivate the crops. This promotes the soil health, biodiversity and ecological balance aiming to create a harmonious farming system. organic farming shows effective crop yield, enhances the quality of food, reducing pollution and many more. This comparative study is set to observe the growth patterns of the three crop varieties i.e., *Hibiscus sabdariffa, Brassica nigra, Amaranthus blitum* in raised beds by using two organic manures are Vermicompost and Farmyard Manure during the time period of 13th December, 2024 to 26th April, 2025. During the observation, Farmyard Manure obtained significant growth compare to Vermicompost. This experimental study is done within the Andhra University Campus radius. Thereby, the study aims to explain the major impact on crop growth, productivity and provides a valuable insight into the potentiality of organic farming in promoting sustainable agricultural practices and environmental conversation.

Keywords: Andhra University, Growth Analysis, Organic Farming, Organic Manure – Farmyard manure and Vermicompost, Sustainable Agriculture.

Introduction

Organic Farming has become a new revolution in the agriculture field, which provides chemical-free food, which justifies the statement "take from nature and give back to nature". The threat behind chemical farming has created a social awareness among the world, which thus shifted the focus on organic farming. This is also a natural and alternate way to overcome environmental problems like global warming, pollution reduction, climate change mitigation, conversation of biodiversity, and food security. Among all, the organic farming is gaining more attention because of its positive effect on the ecosystem[1]. The gradual increase in population needs more food in a healthy way, which raised a problem that brought many challenges to farmers and scientists, thus, to solve these challenges scientists opted for organic farming[2]. This is an initiated answer for the environmental problems caused by the excess use of the synthetic fertilizers in the field. Though organic farming cost higher than the conventional agriculture but it is much advantageous as it not only promises to produce higher yields but also ensures security for these higher yields. Organic Farming is a system of agricultural production method based on the use of the natural resources which excludes synthetic fertilizers, pesticides[3].

Sir Albert Howard, known to be the father of Modern Organic Agriculture, a British botanist who developed this concept along with his wife Gabrielle Howard, and other botanists who are F.H. King, Rudolf

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Steiner and some others what they believed is that the usage of animal manures as composts and for biological based pest control which results in improved or better farming even Sir Albert Howard stated that the health of soil, plant and man is one and indivisible[4]. However, the term 'Organic farming' was given by Lord Northbourne[5]. It was originated in early 20th century and the action for rapid increase in changed farming practices. In present scenario, India ranks 9th in the world's organic agricultural land[6]. The demand for these organic products is high in the metropolitan cities where now a bridge between consumers and producers which increases the profits of the farmers with a good quality and chemical free healthy products at a considerable price and are regulated internationally and legally enforced by the organizations such as the European Union and Individual nations based in the large part on standards set by the International Federation Of Organic Agriculture Movement (IFOAM), which was established in 1972 along with the regional branches like IFOAM Organics Europe and IFOAM Asia. Since the 1990, the demand for organic food has been increasing rapidly. As per the current scenario, the organic farming is practiced in 188 countries with approximate of 96,000,000 hectares worldwide farmed organically by 4.5 million farmers which representing a total of 2% world farmland. Overall, this farming system results a healthy sustainable ecosystem[6].

Basically, four principles which organic farming follows:

Principle of health – It applies to the soil health and quality enhancement which can provide healthy and nutritious crops to consume for animals and humans thereby gives a healthy lifestyle.

Principle of fairness – It applies for assuring the fairness regarding all the environment, life and other practices. Majorly, focuses on the poverty reduction, food sovereignty and social costs.

Principle of ecology – It simply based on the roots of organic farming which balances the ecological systems and its cycles within a specific environment through farming systems.

Principle of care - It applies on the farming practices done with precautionary care to protect the present and future generations and the environment from risks[7].

Materials and Methods

Study Area:

The Andhra University was established in the year 1926, which is located between 17º 35' to 17º 40' N and 83º20' to 83º 25' E. The University South Campus, College of Science and Technology was established in 1946 by Professor M.O.P. Iyengar. The Botany department is located between 17.7228 °N, 83.3247 °E in Visakhapatnam[8] (Figure 1).

Figure 1. Study Area for organic farming cultivation

Time Period:

The time duration for the organic cultivation is from 13th December, 2024 to 26th April, 2025 during this period the plant growth of shoot system gradually observed every week. This experimented done in time period of research. These three crops are most likely to be winter crops and can harvest in 3 – 4 months.

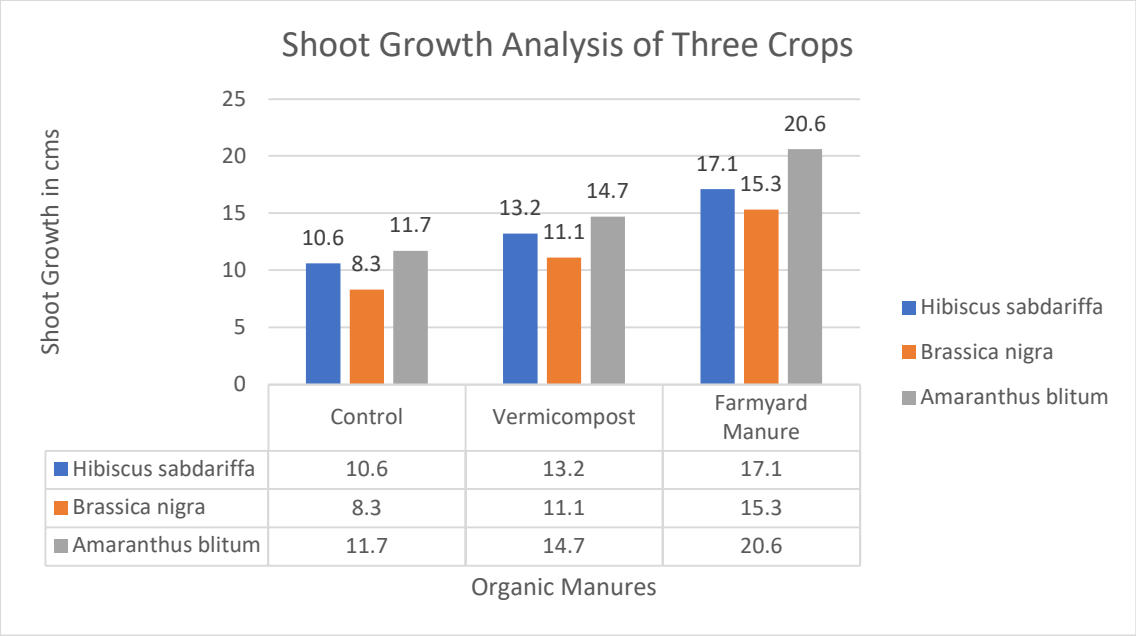

Figure 2. The Bar Graph representing average growth analysis of plant species in different organic manures.

Organic Manures:

To study the growth, the two organic manure practices were followed i.e., Vermicompost and Farmyard Manure.

VERMICOMPOST –

known to be the artificial rearing of earthworms' excreta produced in the vermiculture. It acts as an eco-friendly fertilizer which is rich in humus and helpful for growth of the plants. This compost results in the significant reduction of total organic carbon and increases the nitrogen in the soil. By using this, it enhances the plant growth by suppressing diseases in plants, increases the microbial activities in the soil, improves water retention and aeration which benefits the environment by reducing the amount of waste going to the landfills. For the compost preparation, the site selection is utmost important because it should be shady with high humidity, water supply and coolness. Then, red earthworms (*Eisenia fetida*) are introduced in the organic waste materials which consume and pass in digestive system thereby gives out in granular form of excreta known as cocoons, vermicompost or black gold. This is a biological process by the earthworms which is rich in micro and macro plant nutrients also aids in plants growth promotion and crop productivity. Vermicompost can mix either directly into the soil or can mix with the water to make a liquid fertilizer known as worm tea[9].

FARMYARD MANURE –

Farmyard manure is a mixture of animal faeces, urine and crop residues. It is another natural organic fertilizer derived from organic sources without any synthetic additives which are available to fix the soil fertility and its structures, water retention and nutrient deficiency in the soil[10]. Farmyard Manure contains a high proportion of organic material which feeds the soil organisms and also necessary for maintaining active soil life. The Farmyard Manure is made either solid phase i.e., dung or liquid phase i.e., urine[11]. Farmyard Manure breaks the animal waste and plant matter to enrich the soil with nutrients. The decomposed manure consists of N, P, K with a percentage of Nitrogen (N) with 0.5 – 1.5%), Phosphorus pentoxide (P2O5) with 0.2 – 0.4% and Potassium oxide (K2O) with 0.5 – 1.0%.

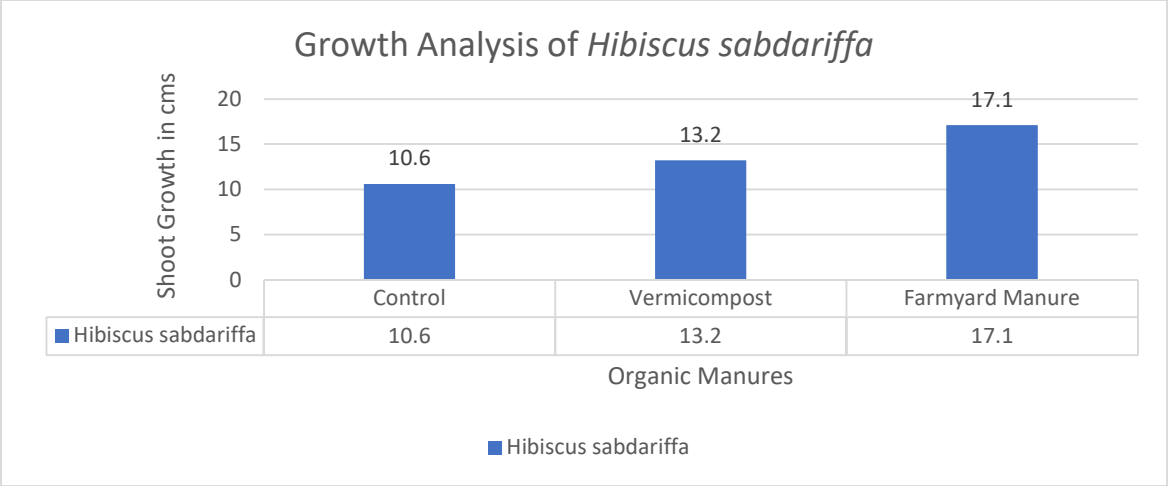

Figure 3. The Bar Graph representing growth analysis of *Hibiscus sabdariffa*

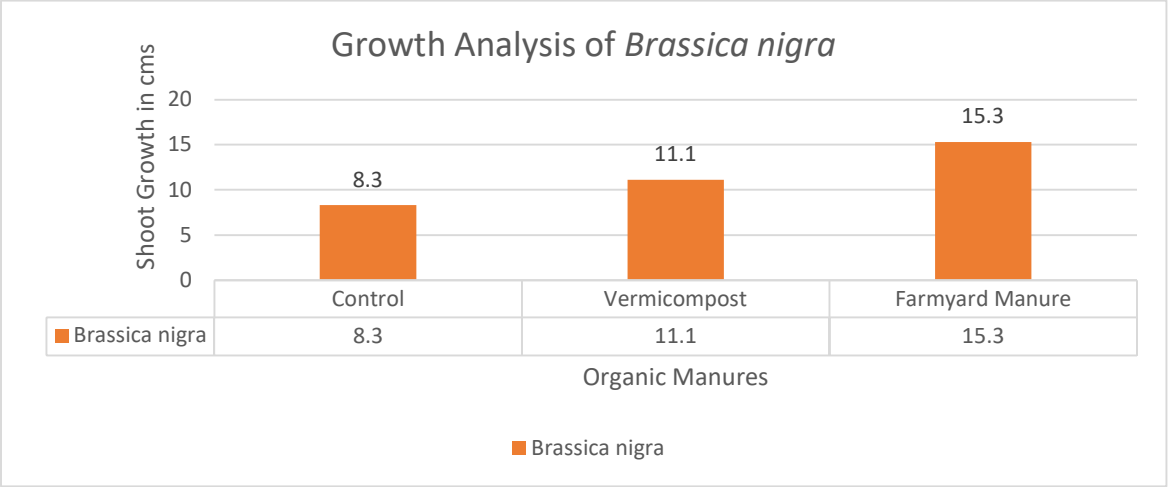

Figure 4. The Bar Graph representing growth analysis of *Brassica nigra.*

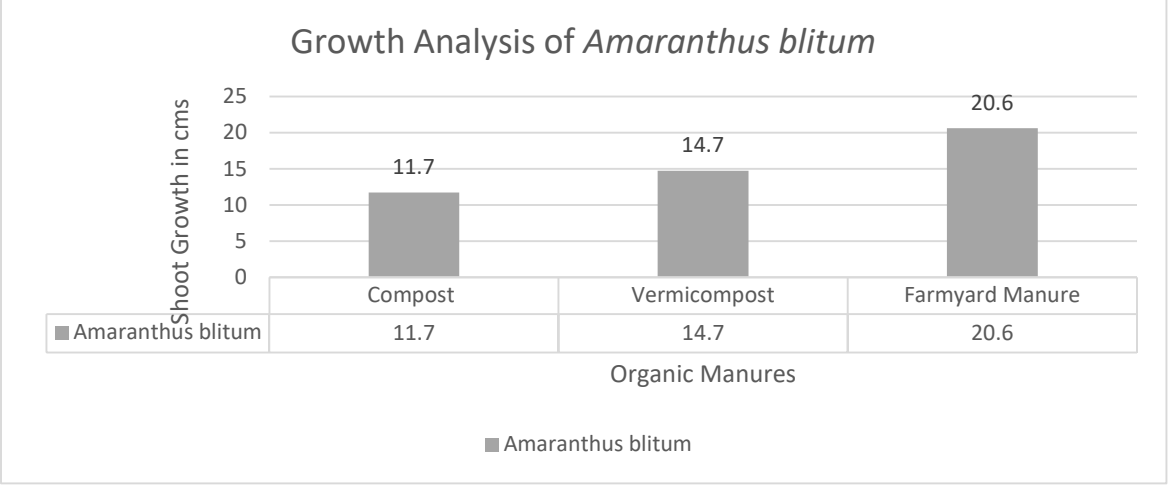

Figure 5. The Bar Graph representing growth analysis of *Amaranthus blitum.*

Figure 6. A picture of *Hibiscus sabdariffa* plant – shoot growth, flowering and calyces.

Figure 7. A picture of *Brassica nigra* plant – shoot growth and flowering.

Figure 8. A picture of Amaranthus blitum plant – shoot and spikelet.

The main constituents of Farmyard manures are – ***Dung*** is solid excreta which contains undigested portion of the animal feed where it is mixed with digestive juices and alimentary canal tissues and microbial cells etc., with the moisture present is about 70 – 80 percent in dung. ***Urine*** is liquid excreta which is composed of the byproducts of nitrogen metabolism which consists 90 percent water, small amounts of urea, hippuric acid, sodium and potassium sulphates also with chlorides and phosphates of Ca, Mg, K and Na. ***Litter*** is a mixture of straw where the leaves used as bedding material for cattle for rest which absorbs the urine and adds up the carbonaceous matter in the manure to ease for the decomposition[12]. For the manure preparation, the good site location which is sheltered from excess rain and direct sunlight. First, Collect all the available animal dung, urine and straw. In the compost pile, add a base layer of coarse materials like straw for good aeration and an alternate later of dung, urine and other organic materials like leaves or crop residues. This Pile should be moist and turn it for every few weeks for aeration and promotes to decomposition. This process takes several months to get completely decomposed depends on climate. When the manure looks like crumbly soil and dark color, it is ready for use in crops and fields[13].

Crop Varieties:

The crop varieties chosen are *Hibiscus sabdariffa, Brassica nigra, Amaranthus blitum* because these are mostly cultivated in the early or during the winter season as the yield are obtained in 3 to 4 months. These crops have an ability to complete their life cycle and reaches its harvest phase in short time. Mostly they can adapt to climate changes and their fast growth can suppress the weeds and shades the soil which can prevent from erosion, moreover,

these are nutritional crops which provides essential elements like minerals (iron, calcium, potassium, magnesium) vitamins like A, C, B – complex, protein content, dietary fiber, antioxidants, phytochemicals, low fat and calories which promotes a good health and grows well in well drained soils. Among these three, two are leafy vegetables and one is pulse crop.

Hibiscus sabdariffa, a green leafy vegetable which belongs to family Malvaceae and commonly known as Roselle or Indian Sorrel Leaf with its local name Gongura.

Brassica nigra, a pulse crop which belongs to family Brassicaceae and commonly known as Black Mustard with local name Avallu.

Amaranthus blitum, a green leafy vegetable which belongs to family Amaranthaceae and commonly known as green amaranth with its local name Thothakura.

Field Work

The allotted field area had a red soil type which is deficient in nutrients like nitrogen, phosphorus, organic matter and humus however, they can be rich in potash and potassium. They also had a low water holding capacity[14]. The allotted area measured in length 18m and in width 5m thereby this given area is divided into 9 equal size beds with length 4m and width 1.0m i.e., 3 each for Control {where no usage of organic manures or fertilizers, it is simply setup for comparing normal plant growth with manured plants}, Vermicompost and Farmyard Manure. In general, the raised bed type is commonly practiced because it not only useful to raise healthy, clean seedlings free from pests and diseases but also solves the problem like water logging during rainy seasons. A raised bed is prepared by rising in 10 – 15cm high to the ground level. A distance at least 50cm is to be left between the rows for a walk path[15].

These nursery beds are prepared by the following procedure:

1. A well-drained and fertile with a good sunlight, areas which are prone to water logging or strong winds should be avoided.
2. Removing weeds, stones, stumps and debris from the ground and level the soil which helps to prevents uneven water distribution.
3. Losen the soil by plowing or digging with a depth of 6-8 inches. Then raise the bed for 10-15cm high to improve drainage.
4. Watering is necessary inorder to maintain the moisture in the bed.
5. Now, mix 1kg of the organic matter i.e., Vermicompost and Farmyard Manure for each three beds a total of 3kg manure is used to improve the fertility of the soil.
6. 100 grams of raw seeds of each three crops are sowed by the broadcasting method. Proper space maintained for air circulation.
7. Sprinkling the water through pipes regularly and removing the weeds growing in the bed also protecting from pests and diseases[16].

Results and Discussion

The plant growth observation is made on the basis of the shoot system, this observation made from the time of seed sowed in the beds i.e., from 29th January, 2025. This is of a total 4-week observation on each individual plant growing in the two manures used and in control is recorded along with the average growth rate (Figure 2, Plate 1 and Table 1,2,3).

With reference to the manures and plant growth rate, the three crop varieties reveal different patterns of growth rate in each manure

In *Hibiscus sabdariffa*, the plant had a low growth rate in control whereas in vermicompost the plant had a constant growth rate but, in the farmyard manure, the

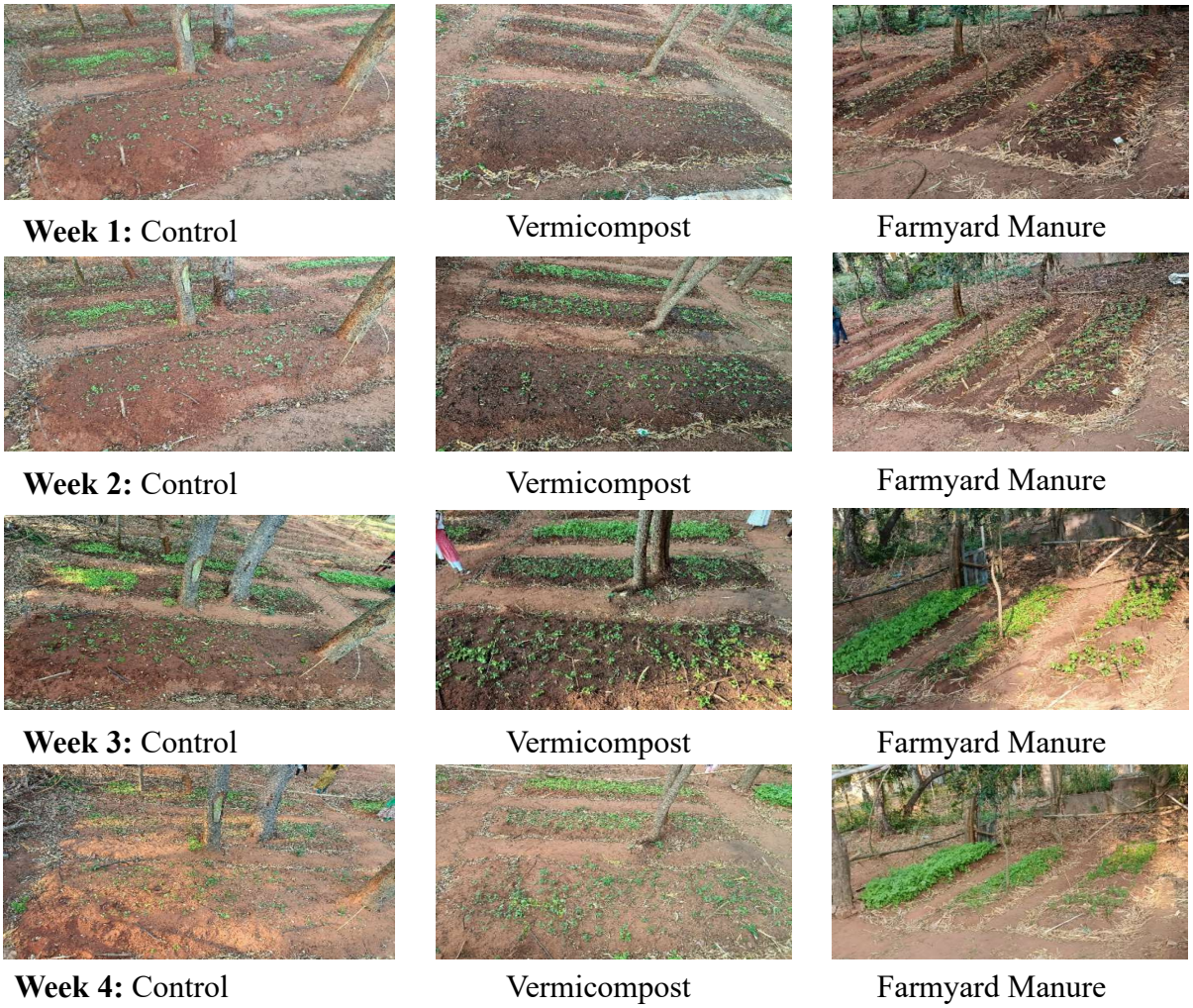

Plate 1: Weekly growth analysis in the raised beds of control, vermicompost and farmyard manure.

plant had a high growth rate with a significant increase between week 2 and 3. Thus, the sorrel plant when cultivated in Farmyard Manure it showed a good growth rate when in comparison with vermicompost and in control (Figure 3).

In *Brassica nigra*, the plant had a constant growth rate in control whereas in vermicompost the plant had a gradual increase but in between week 3 and 4 exhibited a significant increase in growth rate but, in the farmyard manure, the plant had a high growth rate between week 1 and 2 and with further increasing growth to week 3 and 4. Thus, the farmyard manure had showed a slight difference in growth rate of plant species than Vermicompost (Figure 4).

In *Amaranthus blitum*, the plant had a significant increase between the 4 weeks in control whereas in vermicompost the plant had significant growth between week 1 and 2 then had a slowed growth in week 3 and then had a significant growth rate in week 4 but, in the farmyard manure, the plant had a gradual increase between week 1 and 2 then had a mass growth in week 3 and constant growth in week 4. Thus, the plant growth had a vast growth difference in farmyard manure when in comparison to vermicompost and in control (Figure 5).

Therefore, with reference to the two manures (i.e., Vermicompost and Farmyard Manure) the FYM had a distinct good growth than Vermicompost and with reference to the crop varieties, the *Amaranthus blitum* showed a highest growth rate followed by *Hibiscus sabdariffa* and *Brassica nigra*. Along with growth, the plants have good flowering (Figure 6, 7, 8).

Conclusion

This experimental study highlights the growth analysis of crops in organic farming particularly in context of climate change, soil health and water scarcity. The organic farming aims to promote not only sustainable agriculture but also livelihoods of farmers. Hence, the organic farming is not only eco-friendly but it is a best way to reduce the pollution in the environment. On the obtained results, the Farmyard Manure showed the fastened growth rate when in comparison to the other manure Vermicompost. It is obvious that FYM is a great manure option for organic farming as plant species resulted the maximum growth in FYM. Therefore, by using organic farming methods the crop exhibits good growth and chemical free fruits and vegetables. Organic farming not only provides good health to humans but also reduces toxicity in the environment.

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