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Role of organic nutrients on growth and yield of tomato: A review

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Abstract
Organic agriculture is an ecological production management system that promotes and enhance biodiversity, biological cycles, and soil biological activity. It is based on minimal use of off farm inputs and not to use chemical fertilizers to manage, restore, maintain & increase harmony. Organic is a labelling term which denotes products produced under the requirements of organic Food Production Act. The primary goal of the application of organic manures is to optimize health and productivity of inter dependent communities of soil life, plants, animals and people. The principal guidelines of use of organic manures are to use material ad practices that enhance ecological balance of natural systems and that integrate the parts of the farming system in to an ecological whole. Growers choose organic method for a variety reasons one of the attractions of organically produce is that sometimes it brings 10-30% premium in market place with lower investment ATTRA // Organic tomato production 1999). It is seen that, by using organic nutrient inflate the growth and yield promoters. In trial plots the flowering and fruiting properties was remarkably high along with higher shelf life than conventionally grown tomatoes. By the following experiments, it is resulted that, extract of organic product provides a useful resource which is beneficial for increasing the productivity of tomatoes. Organic based product is productive quality yielder and economically better for sustainable agriculture.

Keywords: organic agriculture; organic nutrient; shelf life; soil ecology; yield promoter

Introduction
The tomato (*Solanum lycopersicum* L.) is one of the world's most primary vegetable, with estimated total yield of about 159.347 million tonnes in 2011. It is most common on leading, widely consumed, day neutral, self-pollinated, annual, and economically important solanaceous fruit vegetables crop (Tekale *et al* 2017, Mishra *et al* 2019) [18]. Tomatoes are primary not only because of the enormous varieties found all over the world but also because they have high nutritional factors which are beneficial to human body. Tomato (*Solanum lycopersicum)* is one of the most important vegetable crops cultivated all over the India which comes next to potatoes in terms of area, occupies an area of 880 mt /ha. With an annual production of 18227mt / ha. and productivity of 20.7mt/ha (NHB -2013). But ranks as first in terms of processing crop. Tomato comes under family Solanaceae bearing chromosome number (2n =24). It is hermaphrodite and self-pollinated vegetable plant and originated from central region of Peru- equator region of South America. The fruits of tomatoes are enriched with (2.5-4.5%) of sugar, (10.6-1.2%) starch and contains minerals like potassium, calcium, sodium, magnesium, phosphors, boron, manganese, zinc, copper, iron etc. Besides these the fruit contain organic acids like ascorbic acid (vitamin-C), citric acid, malic acid and acetic acid which are very beneficial for our health and skin. Ethanol and acetaldehyde like volatile compounds control the flavour of the fruits. It is a natural blood purifier. Tomatoes are act as medicine by enhancing the secretions of gastric juice and heals the intestinal infections. Along with these properties of tomato, it is a leading commercialisation vegetable crop grown throughout the world due and consumed in a very versatile ways for a healthy plant's growth and development both organic and inorganic fertilisers are required. The natural ones are organic manures made from garden, farm, kitchen, and poultry waste as well as chemical fertilizers are synthetic in nature. By the vast use of these chemical fertilizers reduces the soil quality, porosity, and compaction by losing its water holding capacity. It also reduces the quality of fruits with their shelf life. It is also observed that the tomatoes which are grown organically behaving a better shelf life with higher content of phenolic compound and ascorbate as compared to chemical treated tomatoes. The organic manures like vermicompost, cow dung manure, bio fertilizers, FYM enhance the nitrogen content of the soil with addiction to enhance fruit quality and post-harvest life of the fruits (Zoran *et.al*.2014) [31]

Role of Organic Nutrients on Different Parameters of Tomato

1. Plant height
It is revealed that growth parameters of tomato were highly influenced by organic fertilizers in treatment. The treatment of FYM gave plant height 38.78cm, and the mixed application of vermicompost with Azospirillum as bio fertilizer shown the maximum plant height 62.38cm. Better vegetable growth might be due to fact that vermicompost and FYM supplying additional amount of nutrients and also improve the physio chemical and microbial environment of

rhizosphere feeding better expression of response (kumaran *et.al* 1998, Pal *et.al* 2005) [11]. FYM improves physical condition of soil like structure, moisture holding capacity and aeration (Manihar *et.al*. 2013, samawat *et al*. 2001, Rao *et.al*.2001) [22]. Generally, Solanaceous vegetables require large quality and major nutrients in addition to secondary nutrients such as calcium and sulphur for better growth (Mishra *et.al*, 2019) [18].

2. Number of leaves per plant

Organic manures have a great role to promote essential phyto hormones that enhances the formation of a greater number of shoot apex and leaves. They have a significant role in formation of new and healthy leaf. Maximum number of leaves 40.67 found on plants by application of vermicompost as basal dose. The least no of leaves per plant recorded at control 35.23 and followed by FYM, and Poultry manures. Earth worms in soil increases the delivery of organic carbon and nitrogen to soil and reduced C/N ratio retuned nitrogen in the available form to plants (Basheer *et al*. (2015)

3. Number of branches per plant

Application of vermicompost and Azospirillum Cd – BIF have shown maximum number of branches 6.53 and in poultry manures 4.38, in FYM 5.38 the control has minimum number of branches. Vermicompost is stable granular organic matter when added to soil of farm land provides passage for fast entry of air and water that helps the tomato plant a lot to increase healthy branches. There is abundance evidence that the concentrations of exchangeable calcium, sodium, phosphors and molybdenum are higher in earworm casts then in surrounding soils (Prasad *et.al*. 2017) [20]. These macro and micro nutrients efficiently fulfil tomato plant's nutritional requirements to promote more numbers of branches per plant.

4. Stomata conductivities

The most elevated worth of stomata conductivity was aqua ried from the application of vermicompost & Azospirillum, then amount reduces as per manures used like FYM, poultry manure, cow dung manures etc. The cow dung manure showed minimal conductivity. Worth of stomatal conductance was shown the entry place of gases like carbon dioxide and the worth of water fame leaving the stomata of beam stew leaf. It is well known that nitrogen & phosphors both are essential constitutes of protein and chlorophyll (Mishra *et.al* 2019) [18]. Tomato plants need more carbohydrates for better fruit yielding with respect to produce more juice, weights of fruits. As expressed by Andrew and Davies in 1998, expression in the net pace of photosynthesis and stomata conductivity of leaves are seen to happen at same time.

5. Chlorophyll content

Tomato fruits with the application of various organic sources of nutrients might be increase due to increase in photosynthetic activities and exhibited regulatory role on absorption and translocations of various metabolites resulted improved level of carbohydrates and other quality parameters of fruits through the way of enzymatic activity that stimulated by plant growth substances produced by application of organic manures and other similar observation has also been reported by (Ahlawant *et.al* 2009). Chlorophyll contains molybdenum, Magnesium, chlorine ions help in photosynthesis and light reaction. Vermicompost helps the plants to supply these essential nutrients that enhances photosynthesis and leaves deposit more carbohydrates in them which serve as sink for tomato fruits. FYM have also significant role in increase chlorophyll content of leaves of tomato plant.

6. Number of floral buds

The quality and quantity of floral buds in tomato plant which are significantly higher by application of vermicompost along with Azospirillum. Azospirillum help the plant to tolerate abiotic stress like osmotic stress thou tomato buds are very sensitive to it (Pal *et.al* 2015). Along with enhances phytohormones and defence strategy of plant against various pathogens. It also supplies essential organic nitrogen to the plants thus no need to apply external nitrogen to the newly formed buds of the plant. FYM and poultry manures also show effects but that is very negligible as compared to vermicompost.

Role of Organic Nutrients in Yields of Tomato Plant

1. No of fruits per clusters/plant

There is a great impact of the vermicompost with Azospirillum as bio fertilizer are the fundamental to increase natural qualities of the tomato. The number of organic product bunches per plant using the organic manure, the greatest number of natural product groups per plant was recorded by using vermicompost with Azospirillum biofertilizer (Singh *et al*., 2017) [23].

The cause of supply of supplements and organic manures with biofertilizers essentially affected efficiency of the plants. Number of natural products per plant was essentially higher in the event of natural wellsprings of supplements than the inorganic sources or the control. Plants created, the most elevated number of organic products when vermicompost and biofertilizer like Azospirillum was utilized alongside the two bio-manures. Joined utilization of bio manures displayed preferred outcomes over their lone use. Natural product yield differed fundamentally due to the treatment. Natural wellsprings of supplements delivered particularly preferable yields over that of the inorganic manures in the control treatment. Likewise, bio-manures additionally have positive effect on yield (Singh et al., 2018) [24].

2. Weight of tomato fruits

The heaviness of a tomato relies upon the assortment of tomato. Soil with zero trimming or trimming years, the treatment of vermicompost with Azospirillum biofertilizer had the most elevated tomato yield and dry weight tomato fruits which was fundamentally higher than that of the urea treatment (Singh *et al*., 2017) [23].

3. Number of seeds per fruits

Tomatoes are special among the Solanaceae in that they are the solitary seed that is immature. The quantity of seeds by using vermicompost with Azospirillum biofertilizer, product ordinarily goes from around 150 to at least 300 seeds for each natural product (Cormack *et al*., 2004) [17].

Conclusion

Now we clearly saw that the organic manures were very cheap than chemical fertilizers. They are easy to apply and can be produce in a very low budget. But the effectiveness was very much satisfying. The organic manures made the soil more alive, rich in nutrients and less compact as the sandy loam soil water holding capacity increased, for which plants needless water in the time of kharif season. The application of organic manure like cow dung, FYM manures, poultry manures and vermi compost etc gave the best results like juicy fruits, having more shelf life but treatment with vermicompost with Azospirillum biofertilizer gave also satisfying results in tomato yield. Alone vermicompost also provide more shelf life to the fruits (Gore *et.al*. 2011) [7]. These organic supplements were probably the first restriction component of plant growth and productivity in the treatment. Better production was when using organic manure as compared with the local fertilizer which are used by local farmer. It has already signified that phosphorous accessibility with organic manure and improved phosphorus application tended to be higher yielding activity (Mehdizadeh *et al*., 2013) [14]. But yield get with only organic fertilizer persists good amount and didn't differ from the best production independently. In especially, the use of vermicompost and cow dung compost proved to be very sufficient for the nutritional needs for the cultivation of tomatoes (Gore *et.al*. 2011) [7]

Overall, the utilization of organic manure, in the methods of culture should be advanced. It allows protection of soil fertility, while improving soil composition and availability of different elements. In reality, the increase in soil organic material to best level as a key feature of any organic production system. It appears to be economically more commercial than more expensive synthetic fertilizer. It can be concluded that the possibility to increase the tomato production by using the organic manure added with biofertilizers (Chatterjee *et al*., 2014) [6].

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