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Strawberry: Growth and Yield Influenced By Different Organic and Inorganic Sources – A Review

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ABSTRACT

Strawberry (*Fragaria x ananassa*) is the popular soft fruit and mainly grows in sub-tropical and hills at elevation of 3000 meters. It cultivated mainly in protected structure and produce best quality of fruits. In sub-tropic region strawberry require 20°-25° temperature maximum in day time and minimum 7° to 13° temperature at night time. As compare to all berries it gives early fruiting in short time (Shailynti Lyngdoh et al. 2014). The strawberry rich source of nutrients content like protein, Ca, P and K. These contain less source of Vit-A, Bi, B2, Vit-C, Niacin and good source of antioxidant (Shailynti Lyngdoh et al. 2014). In India, strawberry is mainly cultivated in hilly area like Himachal Pradesh, Uttaranchal, parts of Uttar Pradesh and Kashmir valley. But, now days it is also cultivated in north plain zone of India like Punjab, Haryana, Delhi, and some parts of Rajasthan. Maharashtra is the largest producer of strawberry in India. Now days, the production of strawberry is declined due to adverse climatic conditions viz. high temperature, low humidity and poor adaptation of agronomical practices. It requires more care and management as compare to the other crops. Because of its less adaption to the wider climatic conditions it requires controlled environment. Hence it increases the cost of cultivation. There is influence of different nutrients sources of the growth and yield of strawberry. Thus in this paper we reviewed about effect of different organic and inorganic sources on growth and yield attributes of strawberry.

Keywords: Strawberry, Inorganic sources, Hilly area, Yield

INTRODUCTION

Strawberry is mostly found in whole world and called fruits of love by the Roman Poets Virgil and Ovid in the first century. In England strawberry cultivated since the sixteen century. (Boriss et al., 2006). In last few decades the strawberry production and demand is increase

in international market. The U.S.A is the largest producer of strawberry in the world. The 28% world production is of strawberry is given by U.S.A.as per the food and agriculture organization of united nation Spain is the 8% production followed by the Russia, Korea, Japan and Poland.

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In India, strawberry is cultivated in hilly area like Himachal Pradesh, Uttaranchal, parts of Uttar Pradesh and Kashmir valley. But now a day it is also cultivated in north plain zone of India like Punjab, Haryana, Delhi, and some part of Rajasthan. Maharashtra is the largest producer of strawberry in India. According to national horticulture board of India the production of strawberry is 2014-15 is 8000MT and in 2015-16 it is 5000 MT. At present strawberry is also cultivated on soil. Its provides good result on soil but there are many problems like disease rotting, powdery mildew, black spot under soil cultivation. Mulching is very beneficial to control the weeds and to conserve soil moisture in strawberry field. Strawberry plants requires more potassium thus there is need to apply this nutrient from the inorganic sources to meet the need of the crop.

Review of literature :

Strawberry is mostly found in whole world and called fruits of love by the Roman Poets Virgil and Ovid in the first century. In England strawberry cultivated since the sixteen century. The potassium silicates are negative effect on the salinity of strawberry. The results shows that salinity decrease fruits yield of strawberry and K_2O_3Si is increase the fruits weight per plant. And they concluded that application of potassium silicates nutrients maintained growth and yield under salinity of soil. (Khatere et al., 2016). Some researcher (Ashwin et al., 2008) studied on the different pine bark soilless medium and found that plants grow on the pine bark soilless hanging bed pack and fertilized with a complete nutrient solution no effects on the row spacing. At 35cm plant spacing was significant grater plants as compare to the other less spacing. And number of leaf is greater in 35cm planting spacing and ore marketable value. And winter strawberry produce high plant densities and soilless may be viable.

On the soil, strawberry shows good result but many problem like disease of soil born and insect pest crate more effect on the quality and yield of the strawberry. Researcher (Kanto et al., 2006) found that the soluble

form of silicate in soil suppressed the disease and more effectively control powdery mildew of strawberry. And it is main cause of Harding of strawberry leaf. Soil depth and the water requirement effect on the productivity of strawberry (Basel et al., 2015). The results show that the depth of 7 cm of strawberry was 2115 kg in comparing with the depth of 15cm soil. Contains 1645 kg it means soil depth influence the productivity of fruits.

On soil and hydroponic growing strawberry create the differences in the productivity, fruits size, and plant height. The results of both method shows that 87% participant could prefer the hydroponic and 70 % prefer the soil growing strawberry. And the overall taste sweetness, and flavor is more in hydroponically grow strawberry. (Trefitz et al., 2015).

For nutrient availability in soil and soilless strawberry is depending on the BRIX value. The researcher said that no change in the fructose, glucose content. Content ascorbic acid, tocopherol and total polyphenolic compound is higher in soilless grown strawberry (Trefitz et al., 2015).The phosphatic fertilizer effect on the growth and yield of strawberry. They shows that the phosphatic fertilizer don't effect on the fruit growth and yield. But it shows direct effect on the fruits acidity it becomes increase and TSS decrease due to application of foliar phosphate fertilizer (Ulvi et al., 2009).

The component of variation of two domestic “Senga Sengana” strawberry varieties with two origin. They determine Ca, Mg, K, Fe, Zn, CU, and Mn by using spectrometer flame techniques and Cd and Pb applying by the graphite furnace technique. Then they found that the lead and cadmium level is below the detected limit ($0.004mg\ kg^{-1}$) and $0.016mg\ kg^{-1}$ respectively. And they recorded that the genotype and origin is direct effects on the cultivar as compared to filed techniques. (Mari Hakala et al., 2003).And effect of nitrogen fertilizer on growth and flowering of strawberry cultivar (*Fragaria × ananassa*). They recorded different nitrogen fertilizer time; the total

number of crown was not affected. The more flowering occurred when the N fertilizer start 1 week after the Short-day and the flowering and crown were increased. (Anita et al., 2009).

In open system take two variety 'Chandler' and 'Ofra'. Then check the effect on disease, yield, and quality in poly-house, open system and plastic tunnel. In results 'Chandler' variety shows more number of flowers in open condition 'Ofra' shows the maximum number of fruits per inflorescence in poly-house. Other things like highest crown in open condition and 'Ofra' show highest yield in plastic tunnel @40.2 t ha⁻¹. (Ashok et al., 2011).

The nitrogen is help to increase the chlorophyll in plants. The different nitrogen form influence on the root induced pH, and phosphatic activity in the strawberry plants. (Lidia et al., 2003).they gives results Ca(NO₃) increase the highest pH in soil and under (NH₄)₂SO₄ treatment gives the lowest pH values. The presence of (NH₄)₂SO₄, at pH 5.8 shows highest activity of phosphates in rhizosphere of strawberry plant. Like the other nutrient liquid potassium nitrate controlled the powdery mildew of strawberry in soil. Researcher told the silicate treated leaf are harder then check. The potassium silicate control the 85.6% control powdery mildew (Kanto et al., 2006).

Fertilizer is applied with water is influence the fruits per plants and weight. The nitrogen is applied with different concentration like 3.6, 7.2 or 10.8 mmol NI⁻¹ and applies urea, ammonium nitrate and potassium nitrate. They show (Papadopoulos et al., 1987) that 7.2 mmol NI increase the fruits weight and fruits per plants. Urea gives heist yield and better fruit setting. It is not effect on the soil salinity and residual soil NO₃-N, residual NH₄-N in the soils and low in ammonium nitrate. The different vermicomposting leachates increase the leaf area (10.1–18.9%), dry matter (13.9–27.2%) and fruits yield (9.8–13.9%). And the vegetables waste and vermicompost improve all parameter and make best fruits quality (12.6 and 17.8% higher, respectively). The worker (Arancon et al., 2004) said that the

vermicompost and vegetables waste use as best foliar fertilizer for strawberry. Vermicomposts is good fertilizer for strawberry. It is applied with the inorganic fertilizer into the top soil. The four replication are taken by the researcher on RCBD plots. They said that the vermicompost is increase the growth and yield of strawberry 37% and plants shoot biomass 37%, 40% in number of flower and 36% in the number of runner. This vermicompost also effect on the microorganism activities (Arancon et al., 2006). The food waste and paper waste with the vermicomposting is influence on the growth and yield of six week old strawberry. The results shows by vermicompost increase the dehydrogenase activity and microbial biomass-N. It correlates with the increase amount of NH₄-N, NO₃-N and orthophosphates in the vermicompost. And also increase the microbial activity and the plants tolerance to the pathogen and nematodes also.

The poultry litter is used as a fertilizer source of organic matter and stabilized nitrogen. But P not fix with the poultry litter. In the fresh poultry litter leaf nitrogen is more than composted poultry litter. They (Preusch et al., 2004) said that the composted poultry on plant Nitrogen rate was increase and higher Phosphorus uptake by the plants.

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