

Effect of inorganic, organic manures and bio fertilizer on growth and yield of Round melon

Introduction

Round melon (*Praecitrullus fistulosus*) belongs to family Cucurbitaceae. It is one of the most important summer vegetable grown and is one of the excellent plants it is gifted by the nature having composition of all the essential constituents that are required for normal and good human health (**Kirtikar and Basu, 1998**). It is a warm season, annual, rich in minerals and vitamins and is monoecious vegetable vine grown in irrigated and arid areas of the sub-continent region. (**Khan *et al.*, 2001**).

Recently a great attention was drawn towards the application of bio organic farming to avoid the heavy use of chemicals that causes numerous environmental problems or troubles (**Lampkin 1990**). The concept of integrated nutrient management by the use of organic manures or residues and mineral fertilizers together can help for sustainable crop production, along with maintaining the soil ecosystem. The organic manures play an important role in increasing growth, yield and other yield components of many crops. **Ryan *et al.* (1985)** worked on organic manures in tomato crop and reported that organic manures significantly affected tomato plant height, leaf area and fruit number per plant. (**Abd El-Rahman and Hosny 2001**) stated that using organic manure improved the yield and yield components of egg-plant fruits. Organic manures increase the organic matter in the soil. Organic matter in turn releases the plant food in available form for the use of crops. However, organic manures should not be seen only as carriers of plant food. These manures improves the water holding capacity of soil and also help to improve the drainage in clay soils. They provide organic acids that help to dissolve soil nutrients and make them available for the plants. The complementary use of organic and inorganic fertilizers has been recommended for long term cropping. Nutrients from mineral fertilizers enhance the establishment of crops while those from mineralization of organic manures promotes yield when both fertilizers were combined (**Basel and Sami, 2014**). Superiority of vermicompost is due to its nutritional richness, quick mineralization and more availability of N and other plant nutrients (**Mujahid and Gupta, 2010**). Organic fertilization is also important

for providing plant with their nutritional requirements without having an any impact on the environment (**Njoroge, W.J. and Manu, C. 1999**). Use of organic manures increases the plant growth characteristics namely plant height, number of leaves and shoots per plant, fresh and dry weight of shoots of plants (**Nandekar and Swarkar 1990; Said 1997; Zhang *et al.*, 1998**) . K is the most important inorganic solute in cell metabolism. It affects water-, osmotic- and turgor potentials and is directly involved in cell wall extensibility and volume (**Hsiao and Lduchi, 1986**). Suitable K status improves the plant's adaption to water/salt stress. Vermicompost in presence of biofertilizers influence the plant metabolism by enhancing the solubility and availability of applied nutrients and moisture retention capacity (**Akbar *et al.*, 2009**). Azotobacter species are free living bacteria which grow well on a nitrogen free medium and are an important source of bio-fertilizers. These bacteria utilize atmospheric nitrogen gas for their cell protein synthesis. This cell protein is then mineralized in soil after the death of the Azotobacter cells thereby contributing towards the nitrogen availability of the crop plants thus resulting in a strong symbiotic relationship (**Haller and Stople, 1985**). They also secrete some compounds like auxins, cytokinin and antibiotics improving growth and productivity of the crops (**Forlain *et al.*, 1995**). Biofertilizer is a substance which contains living micro organisms which ,when applied to the seed or plant surfaces or soil colonizes the rhizosphere or the interior of the plant and promotes growth by increasing the supply or availability of primary nutrients to the host plant.

Problem Background

- Heavy use of inorganic fertilizers causes nutrient leaching from soil by adding non required or harmful chemical element in soil which reduces yield but also harmful for the consumers health.
- Farmers are full dependent on chemical fertilizers which is not safe for our future cultivation processes
- Loss of required microbes in soil due to heavy use of chemical fertilizers
- Chemical fertilizers polluting our soil environment hence are not eco friendly
- We can not develop totally sustainable agriculture
- More disease among people are due to chemical treated food that is eaten largely by our population.
- Excessive use of chemical is the major cause behind all the problems that occurs in soil and consumer health.

Review of literature

Ojeniyi (1981) reported that total dependence on inorganic fertilizers may be accompanied by fall in soil organic matter, increased soil acidity and degradation of soil physical properties and structure and increased erosion.

Cooke, (1982) stated that inorganic fertilizer is an artificially prepared manure with a variable concentration of plant food and are available in the form of single fertilizer, incomplete fertilizer and complete fertilizer. Single fertilizer contain only one fertilizer element e.g. Ammonium sulphate (N), urea (N), super phosphates (P₂O₅), muriate of potash (K₂O), etc. incomplete fertilizer contain two fertilizer elements. A typical example is Ammonium sulphate (N + S) while complete fertilizers contain all three elements (NPK) which are the focus of attention in fertilizer formulation.

Cooke (1982) stated that fertilizers allow us to raise soil fertility so that the yield of crops need no longer be limited by the amounts of plant nutrients that the natural system can supply and factors other than nutrition then set the limit to productivity.

Marscher, (1995) reported that nitrogen is very important for plant growth because it is part of protein and nucleic acid which are basic component of plant protoplasm and chlorophyll, which are indispensable for photosynthesis. Phosphorus is also an essential element of plant structure as well as component of energy compound like Adenosine Tri-Phosphate (ATP) .

Adepetu,(1997) It has been abundantly shown that combined use of organic and inorganic fertilizers is required for sustainable soil productivity under intensive continuous cultivation in Nigeria.

Eneji et al, (1997); Ojeniyi and Adeniyi,(1999) stated that the combined use of organic and chemical fertilizers has proved a sound soil fertility management strategy in many countries such as Tanzania, India and Central African. The tendency to supply all nutrients through chemical fertilizers has to be avoided as this has deleterious effect on soil productivity. Studies carried out in southwest Nigeria have recommended combinations of farmyard manure and NPK fertilizer for sole and inter cropped maize.

Ojo and Olufolaju, (1999) stated that both the colour and flavour of fruits may be poor and sugar and vitamin content of certain vegetables are adversely affected by excessive nitrogen. Phosphorus is needed to stimulate flowering and fruit formation while potassium is for seeds setting. NPK fertilizer is therefore needed for good crop yield in *Solanum spp.* cultivation .

According to Ojeniyi (1995) cited in Ojeniyi (2002) reported that there are problems that arise with continuous use of inorganic fertilizers. Most farmers apply fertilizer without soil test, thus wrong amount and type may be applied. Deficiency of secondary and micronutrients occur in soil and crop, if the common NPK type is consistently used.

Follet *et al.*, (1981) stated that heavy doses of chemical fertilizers and pesticides are being used by the farmers to get a better yield of various field crops. These chemical fertilizers and pesticides decreased soil fertility and caused health problems to the consumers. Due to adverse effects of chemical fertilizers, interest has been stimulated for the use of organic manures.

Ghugare *et al.*, (1988), Hesse and Mishra, (1982) stated that addition of compost improves soil structure, texture and tilth. Bio composts have gained importance since the fertilizers and pesticides cause a lot of environmental problems and health hazards and soil degradation.

Costa *et al.*, (1991) observed that addition of manure increases the soil water holding capacity and this means that nutrients would be made more available to crops where manures have been added to the soil.

Murwira HK, Kirchman AK (1993) observed that nutrient use efficiency might be increased through the combination of manure and inorganic fertilizer.

Lian,(1994) stated that a judicious and combined use of organic and inorganic sources of nutrients is essential to maintain soil health and to augment the efficiency of nutrients.

Agbede, and Kalu, (1995); Okigbo, (2000); Adekiya *et al*, (2012) stated that organic and inorganic fertilizers have their merits and demerits. For instance, organic fertilizers are slow release nutrient sources. This implies that crops can suffer initial starvation from nutrient immobilization prior to mineralization. They are also required in large quantities which may not be readily available to small scale farmers.

Sinha, (1998) and (2004), Sinha et al. (2009) stated that the ‘Green Revolution’ in the 1960s and 70s ushered by the heavy use of agro-chemicals, increased food productivity but also created several socio-economic and environmental problems like decreased nutritional quality of food produced, decreased soil fertility, higher demand for water for irrigation, soil and water pollution and pesticide poisonings.

Okigbo, (2000) reported that inorganic fertilizers ensure quick availability of nutrients to crops they have limited residual effect of the applied nutrients and their reckless use can create nutrient imbalance that limits the uptake of other essential nutrients and cause soil acidity leading to low crop yields.

Abdalla et al.,(2001) and Adam et al.,(2002). Reported that application of bio fertilizer encouraged plant growth and productivity of many crops was studied by some investigators

Ramesh et al.,(2005) , Kumar, (2005) stated that the organic manure could increase the fertility and productivity of the land and produce nutritive and safe food. Recycling biowaste of different resources in the form of compost can be an alternative to meet the increasing demands for organic manures; this will also help to reduce environmental pollution arising out of accumulated biowastes .

Jagadeesan,(2005) stated that biowastes could be recycled by adopting simple and suitable techniques in compost making and preparing enriched manure. These improved technologies not only reduce the quantity but also improve the quality of compost with better plant nutrients.

Mandal, (2009) reported that the pesticide remains in vegetables can cause neurological and blood disorders, lung ailments and affect the reproductive system of women.

Sharma (2009) reported that indiscriminate use of chemical fertilizers in the wake of Green Revolution in India has pushed the State to the brink of health hazards like ‘blue baby syndrome’ and cancer man civilization.

Chukwu et al, (2012) reported that the use of both organic and inorganic fertilizer by farmers has been reported to increase yield and sustain soil productivity.

Asadu and Unagwu,(2012) many research works showed that the use of several organic materials especially cow dung, poultry droppings and farm yard manure as

soil amendments is suitable for increasing crop production particularly among subsistent farmers in West Africa.

Olatunji and Ayuba,(2012) reported that the uses of fertilizers are highly needed to replenish nutrients taken out from the soil by harvest crops and to supplement more nutrients to boost yield.

Manh and Wang, C. Ho. (2013) This study was conducted in National Pingtung University of Science and Technology during winter season to determine the effect of vermicompost on productivity of muskmelon seedling (*Cucumis melo* L.).

Joshi et al. (2013) concluded that the use of vermicompost as an organic fertilizer is considered a better alternative to inorganic fertilizers.

Ding et al. (2016) revealed that the application of both organic and inorganic fertilizers are beneficial for the stability of the original soil microorganism community structure.

Biswas et al.(1985); Wani and Lee, (1995); Katyal et al. (1994). Suggested that the role and importance of biofertilizers in sustainable crop production has been reviewed by several authors .

Rao, (1986) reported that besides N₂ fixation, *Azotobacter* synthesizes and secretes considerable amounts of biologically active substances like B vitamins, nicotinic acid, pantothenic acid, biotin, heteroxins, gibberelins etc. which enhance root growth of plants .

Narula and Gupta, (1986) suggested that another important characteristic of *Azotobacter* association with crop improvement is secretion of ammonia in the rhizosphere in the presence of root exudates, which helps in modification of nutrient uptake by the plants.

Sarig et al., (1988) reported that the ability of *Azospirillum* to produce plant growth regulatory substances along with N₂ fixation stimulate plant growth and thereby productivity. The changes that occur in the plant roots help in transport of minerals and water.

Okon and Itzigshohn, (1995) revealed that beneficial effects of *Azotobacter* and *Azospirillum* on plants are attributed mainly to an improvement in root development, an increase in the rate of water and mineral uptake by roots, displacement of fungi and plant pathogenic bacteria and, to a lesser extent, biological nitrogen fixation.

Goel et al., (1999) stated that the Biofertilizer includes mainly the nitrogen fixing, phosphate solubilizing and plant growth promoting microorganisms.

Bloemberg et al.,(2000) revealed that microbiological fertilizers are important to environment friendly sustainable agricultural practices .

Alam et al., (2002). Stated that Bacteria are more effective in phosphorus solubilization than fungi .

Gupta,(2004) stated that *Rhizobium*, Blue Green Algae (BGA) and *Azolla* are crop specific, bio-inoculants like *Azotobacter*, *Azospirillum*, Phosphorus Solubilizing Bacteria (PSB), Vesicular Arbuscular Mycorrhiza (VAM) could be regarded as broad spectrum biofertilizers.

Gull et al., (2004) stated that the PSB solubilize the fixed soil P and applied phosphates resulting in higher crop yields.

Chen et al., (2006) reported that among the whole microbial population in soil, phosphate solubilising bacteria (PSB) constitute 1 to 50%, while phosphorus solubilizing fungi (PSF) are only 0.1 to 0.5% in P solubilization potential .

Ngoc et al., (2006) stated that the microorganisms involved in P solubilization as well as can enhance plant growth by enhancing the availability of other trace element such as iron (Fe), zinc (Zn), etc.

Khan et al., (2007) stated that evidence of naturally occurring rhizospheric phosphorus solubilising microorganism (PSM) dates back to 1903 .

El- Habbasha et al., (2007); Yosefi et al., (2011) stated that Bio-fertilizers containing beneficial bacteria and fungi improve soil chemical and biological characteristics, phosphate solutions and agricultural production.

Venkateshwarlu,(2008) revealed that Biofertilizers play a very significant role in improving soil fertility by fixing atmospheric nitrogen, both, in association with plant roots and without it, solubilise insoluble soil phosphates and produces plant growth substances in the soil. They are in fact being promoted to harvest the naturally available, biological system of nutrient mobilization.

Chang and Yang,(2009);Banerjee et al., (2010) stated that the use of PSB in agricultural practice would not only offset the high cost of manufacturing phosphate fertilizers but would also mobilize insoluble in the fertilizers and soils to which they are applied .

Anandaraj and Delapierre, (2010) stated that the small dose of biofertilizer is sufficient to produce desirable results because each gram of carrier of biofertilizers contains at least 10 million viable cells of a specific strain.

Purposed Research Objectives

- To evaluate the effect of inorganic fertilizers, organic manure and biofertilizers on growth and yield of round melon crop.
- To evaluate the effect of inorganic fertilizers, organic manure and biofertilizers on quality improvement of fruit of round melon.
- To evaluate the effect of inorganic fertilizers, organic manure and biofertilizers on economic potential for round melon crop cultivation in the subtropics of Punjab.

Research Methodology

Experiment Site:

This experiment is conducting in Field of Lovely Professional University, Phagwara which is situated at protected cultivated farm area side.

Experiment Detail:

Ten different treatment combination for inorganic , organic and bio fertilizers along with one control were imposed on Tinda variety Punjab Hybrid in Randomized Block Design with three replications.

1) Layout of the Experiment :

- Variety Punjab Tinda
- Design RBD For 3 Factors (Randomized Block Design)
- Treatments 10
- No. of replication 3
- Total no. of plots 30
- Total Area LxB (21m x 15m = 315 meter per square)
- Spacing 1.5 m x 1 m (R x P)
- No. of seedlings used 180
- Sowing time 15th March , 2018
- Transplanting time 19th April , 2018

RBD Field Layout

Replication 1	Replication 2	Replication 3
T1	T2	T3
T2	T1	T4
T3	T4	T6
T4	T5	T9
T5	T7	T1
T6	T3	T10
T7	T8	T5
T8	T6	T7
T9	T10	T8
T10	T9	T2

2) Observations:

- Days to flowering
- No. of flowers / vine
- Days to fruit setting
- Days to maturity of fruit
- No. of fruits / vine
- Average fruit weight
- Size of fruit
- Colour of fruit
- Vine length
- Fruit Yield

3) Treatment Details:

- T1 - Organic Fertilizer (Vermicompost + Biokhad)
- T2 - Inorganic fertilizer (Urea + DAP + MOP)
- T3 - Biofertilizer (Azotobactor + PSB)
- T4 - Control (without any application)
- T5 - T1 + T2 (50 % + 50%)
- T6 - T1 + T3 (50% + 50 %)
- T7 - T2 + T3 (50 % + 50 %)
- T8 - T1 + T2 + T3 (50 % + 25 % + 25 %)
- T9 - T2 + T3 + T1 (50% + 25 % + 25 %)
- T10 - T3+ T1 + T2 (50 % + 25 % + 25 %)

4) Material Required:

- Seedlings
- Vermicompost , Biokhad
- Urea, DAP, MOP
- Biofertilizer

Expected Result

More healthy vine , more yiel, more good quality & early maturity chances are more in combine application of of inorganic , organic, biofertilizer treated plants.

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PRE-DISSERTATION

SYNOPSIS

SUBMITTED BY

JYOTI
(11719134)

**In partial fulfilment for the award of the degree
Of
Master of science in Horticulture
(Vegetable Science)**

**Under Guidance
of
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Assistant Professor
School of Agriculture**

**Lovely Professional University
Phagwara – 144411 Punjab, India
27th November, (2018)**

DECLARATION

I hereby declare that this synopsis entitled “**Effect of inorganic , organic and bio fertilizer on growth and yield of Round melon (*Citrullus vulgaris var. fistulosus*)**” is an authentic record of my work carried out at Lovely Professional University as requirement for degree of **Master of science** in discipline of **Horticulture (vegetable science)**. Under the guidance of **Dr. Rajni Tiwari Assistant Professor , Department of Horticulture, School of Agriculture** and no part of this Synopsis has been submitted for any other degree.

Jyoti
(Registration No.-11719134)
M.Sc Horticulture (Vegetable Science)

DECLARATION

I hereby declare that this synopsis entitled “**Effect of inorganic , organic and bio fertilizer on growth and yield of Round melon crop (*Citrullus vulgaris var. fistulosus*)**” is an authentic record of my work carried out at Lovely Professional University as requirement for degree of **Master of science** in discipline of **Horticulture (Vegetable Science)** is a research work carried out by **Jyoti (Registration No. 11719134)** under my supervision and that no part of this synopsis has been submitted for any other degree.

(Signature of Supervisor)

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