

## **Original Research Article**

### **Effect of organic manures and chemical fertilizers on growth, yield and quality traits of summer squash (*Cucurbita pepo* L.)” cv. Punjab Chappan Kaddu**

#### **Abstract**

The present investigation was conducted during 2019 at DAV University, Jalandhar, to find out the effect of organic manures and chemical fertilizers on **growth and yield** of summer squash (*Cucurbita pepo* L.) cv. Punjab Chappan Kaddu. The experiment consisted of eleven treatments and three replications. Out of these, an application of 25% of recommended dose of chemical fertilizer + vermicompost @ 15t/ha had a beneficial effect on minimum days to first female flower (74.67 days), minimum days to first fruit set (76.33), minimum days to first fruit harvest (78.33). The maximum plant height (122.85cm) was recorded in 25% recommended dose of chemical fertilizer + FYM @ 25t/ha. 75% of recommended dose of chemical fertilizer + **EM Bokashi @ 2.5q/ha** resulted in minimum days to male flower appearance. The maximum sex ratio (0.38), was obtained with the application of 50% recommended dose of chemical fertilizer + EM Bokashi @ 3q/ha. Enhanced growth parameters due to application of organic and inorganic fertilizers in combination could be due to the supply of **nitrogen, phosphorous and potassium** through the organic and inorganic sources of nutrients at optimum level. The maximum number of picking (26) and maximum number of fruit per plant (9.85) were obtained with the application of 50% recommended dose of chemical fertilizer + EM Bokashi @ 3q/ha. The maximum fruit yield per plant (2.20 kg), fruit yield per plot (26.26 kg), fruit yield per ha (405.57q) were recorded with the application of 50% recommended dose of chemical fertilizer + vermicompost @ 15t/ha. The maximum TSS (2.40B°) were recorded with the application of 75% of recommended dose of chemical fertilizer + FYM @ 20t/ha while, the ascorbic acid was maximum (52.50mg/100g) when 25% of recommended dose of chemical fertilizer + vermicompost 15t/ha were applied. The highest net returns were obtained when 50% of recommended dose of chemical fertilizer + FYM @ 25t/ha was applied which was followed by the application of 25% of recommended dose of chemical fertilizer + FYM @ 25t/ha. The highest benefit: cost (4.5) was obtained with the same treatment.

**Keywords:** Summer squash, FYM, Vermicompost, EM Bokashi.

#### **Introduction**

**Comment [C1]:** It is necessary to mention the parameters clearly to provide a smooth reading.

**Comment [C2]:** Abbreviation of what?

**Comment [C3]:** ???

**Comment [C4]:** Is this based on the analysis results in this study?

Summer squash (*Cucurbita pepo* L.), is an important crop of the family Cucurbitaceae. It is grown during summer in tropical and subtropical conditions throughout the world. Its immature fruits are harvested for consumption as cooked vegetable and curries. It also possesses medicinal value and thus used as medicinal plant (Majeed and Mahmoud 1988). The total global area under pumpkin, squash and gourd is 204.29 **MH** and global production is 2764.39 **MT** (Anonymous, 2018). India produces about 556.98 **MT** of pumpkin, squash and gourd from an area of 58.02 **MH** (Anonymous, 2018). In Punjab, Cucurbits occupy 5<sup>th</sup> rank in area (17.01 thousand ha) and production (270.45 thousand tonnes) among different vegetable crops (Anonymous, 2019). Summer squash is a rich source of fiber, potassium, calcium, vitamin A, B and C, carotene and carbohydrates. Per 100g edible portion contains 94.8g moisture, 3.5g carbohydrates, 0.5g protein, 0.1g fat, 0.02mg thiamin, 18g vitamin C, 1mg calcium and 0.6mg iron (Dhaliwal, 2018). It also helps in preventing cancer, heart disease and asthma (Sood *et al.*, 2008).

Comment [C5]: ??

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Like human beings and animals plants also require food for their growth and development. To meet the increasing population we need to increase the agricultural production through various types of cultivations and practices, including type and method of fertilization. With the indiscreet use fertilizers the productivity of land has been compensated. Therefore, there is need of only safe/effective fertilization method which is low cost and environmental friendly. Equilibrium of nutrients in plant roots environment plays vital role in plant growth and high yield crop. Organic manures sustain cropping systems through better nutrient recycling and improve the physical, chemical and biological properties of soil. Commonly used organic manures are **FYM**, vermicompost, poultry manure, biogas slurry, urine and liquid manure etc (Kumar *et al.*, 2018). Though single nutrient source may not supply the rest of required nutrients for the plant but integrated use of all sources is required for balanced plant nutrition and it is necessary to make the

Comment [C9]: This is unnecessary information.

Comment [C10]: ???

judicious use of fertilizers in right proportion for harvesting better yield. Thus it has been realized that chemical fertilizers must be integrated through more economic and eco-friendly organic manure to achieve sustainable productivity with high quality and minimum deterioration of the environment. Keeping in view the above mentioned facts and figures the present investigation was planned to find out the effect of organic manures and chemical fertilizers on growth, yield and quality traits on summer squash (*Cucurbita pepo* L.).

## Materials and Methods

The present study was carried out at the experimental farm of Faculty of Agricultural Sciences, DAV University, Jalandhar in 2019 to study the effect of organic manures and chemical fertilizers on yield and yield contributing traits of summer squash (*Cucurbita pepo* L.). The experiment was laid out in Randomized Block Design and three replications. The variety grown for the investigation was Punjab Chappan Kaddu. Total eleven treatments viz, T<sub>1</sub> (Absolute control), T<sub>2</sub> (100% of recommended dose of fertilizer (N:P:K = 100:50:40 kg/ha), T<sub>3</sub> (75% of recommended dose of chemical fertilizer + FYM @ 20t/ha), T<sub>4</sub> (50% of recommended dose of chemical fertilizer + FYM @ 25t/ha), T<sub>5</sub> (25% of recommended dose of chemical fertilizer + FYM @ 25t/ha), T<sub>6</sub> (75% of recommended dose of chemical fertilizer + Vermicompost @ 10t/ha), T<sub>7</sub> (50% of recommended dose of chemical fertilizer + Vermicompost @ 15t/ha), T<sub>8</sub> (25% of recommended dose of chemical fertilizer + Vermicompost @ 15t/ha), T<sub>9</sub> (75% of recommended dose of chemical fertilizer + EM Bokashi @ 2.5q/ha), T<sub>10</sub> (50% of recommended dose of chemical fertilizer + EM Bokashi @ 3q/ha), T<sub>11</sub> (25% of recommended dose of chemical fertilizer + EM Bokashi @ 3q/ha). The soil of the experimental field was sandy in texture having pH of 7.6 with

**Comment [C11]:** This is research aim. This is not belonging here. Moreover, this sentence repeats the last sentence in 'Introduction' section.

**Comment [C12]:** Use this experimental treatment names in the 'Abstract' for a smooth reading and consistency.

**Comment [C13]:** Describe in detail, please.

**Comment [C14]:** Describe in detail whether this is 75% of all substances (N, P, and K) or a partial substance (N, P, or K only).

**Comment [C15]:** Please be precise on the type of soil.

available nitrogen (195.70kg/ha). The organic manure (FYM, Vermicompost and EM Bokashi) and inorganic fertilizers (Urea, DAP and MOP) was applied in experimental field as per the treatments wise and all the cultural practices were done at regular interval. The data on growth, yield and quality traits were obtained and analyzed statistically.

**Comment [C16]:** Please be precise on the method.

**Comment [C17]:** Please describe this in detail in separate sub-section/paragraph.

It has to be clear about the timing and technique of plant growth observation, harvesting, and fruit quality analysis. It also has to be clear on the statistical analysis method for the validation of the work.

## Results and discussion

Analysis of Variance (ANOVA) revealed that the treatments significantly influenced all the characters under study except harvest duration.

**Plant height (cm):** Plant height was reported to be significantly influenced by different combination doses of organic and inorganic nutrient sources in terms of integrated nutrient management as compared to control. Plant height was maximum (122.85 cm) when plants were supplied with 25% of recommended dose of chemical fertilizer +FYM@25t/ha and minimum (69.85 cm) in control where no fertilizer was applied to plants. This may be due to the fact that combined application of FYM and inorganic fertilizers increased the absorption of nutrients especially nitrogen which enhanced the cell division and cell elongation resulting in increased plant height. These findings corroborate the finding of Vishwakarma *et al.* (2007), Mahmoud *et al.* (2009) and Das *et al.* (2015). The finding are also in line with finding of earlier researcher *viz.*, Martinetti and Paganini (2006), Pradhu *et al.* (2006), Mulani *et al.* (2007), Azarmi *et al.* (2009), Eifediyi and Remison (2010), Thriveni *et al.*, (2015), Singh *et al.* (2017), Geethu *et al.* (2018), Dash *et al.* (2018) and Baghel *et al.* (2018) who also reported increased plant height with use of Integrated Nutrient Management in other cucurbits.

**Comment [C18]:** T2 shows a high plant height (> 100 cm) as well as T6, T8, T9, and T11, which are improved from T1. How do you discuss the results?

**Comment [C19]:** Why it should be a combination?

**Comment [C20]:** There is no data of nitrogen absorption in this study. How do you use the nitrogen as the reason of your findings?

**Days to first male flower appearance:** T<sub>9</sub> (75% of recommended dose of chemical fertilizer + EM Bokashi @ 2.5q/ha) resulted in minimum days to male flower appearance (65.00) and maximum days (74.33) were observed in T<sub>1</sub> (absolute control). The earliness in flowering may be due to better translocation of nutrients to the aerial parts of the plants and enhancement of reproductive phase due to combined effect of organic and inorganic fertilizers as compared to exclusive inorganic fertilizers. The results are in line with the findings of Martinetti and Paganini (2006), Ezzo *et al.* (2012), Thriveni *et al.* (2015), Vishwakarma *et al.* (2007), Anjanappa *et al.* (2012) and Singh *et al.* (2017) who observed earliness with Integrated Nutrient Management.

**Comment [C21]:** What is the advantage and disadvantage (meaning) of these finding?

**Comment [C22]:** Why it is so?  
Is the pure chemical fertilizer disturb the flowering system of the plants?

#### **Days to first female flower appearance:**

Significant effect of different treatments was observed for days to first female flower appearance. Minimum days to first female flower (74.67) was observed in T<sub>8</sub> (25% recommended dose of chemical fertilizer +vermicompost @ 15t/ha) which was significantly at par with all other treatments except T<sub>1</sub> (Absolute control) which produce first female flower after 83 days. Maximum number of days to first female flower was observed in T<sub>1</sub> (Absolute control) which was significantly highest among all.

**Comment [C23]:** Statistical analysis results are not written in the table. This doubt the results as a 'significant effect'.

**Comment [C24]:** No statistical evidence is provided in the table.

Earliness is an important character in summer squash. Though earliness is considered as a genetically controlled trait, other factors like environmental, cultural practices and nutrition of plants can also influence it to an appreciable extent. Among the major nutrients, P plays a vital role in imparting earliness. The results clearly indicate better translocation of nutrients to aerial parts of the plants when fertilizers were applied in the integrated forms i.e. combination of organic and inorganic fertilizers which resulted in earlier female

**Comment [C25]:** Why it is so?

flower appearance in all the treatment combinations than the absolute control in which no fertilizers were applied. This might be due to better nutritional status of the plants which was favoured by the treatments. Increased production of leaves might help to elaborate more photosynthates and induce flowering stimulus, thus affecting early initiation of flower bud. Early vigorous growth seen in treatments with organic manures would have helped to synthesize more cytokinin by these plants which might have helped to the translocation of these synthesized cytokinin as well as more quantity of available phosphorus through xylem vessels and accumulation of cytokinin and phosphorus in these axillary buds would have favoured the plants to enter into reproductive phase (Amrithalingam and Balakrishnan, 1988). The results are in line with the findings of Martinetti and Paganini (2006), Ezzo *et al.* (2012), Kumar *et al.* (2012), Thriveni *et al.* (2015), Vishwakarma *et al.* (2007), Anjanappa *et al.* (2012) and Singh *et al.* (2017).

#### **Sex ratio:**

Sex ratio which is expression of ratio of female flowers to male flowers was maximum (0.38) when 75% of recommended dose of chemical fertilizer +FYM @ 20t/ha or 50% of recommended dose of chemical fertilizer +Vermicompost@15t/ha was applied to the plants. Lowest sex ratio (0.19) was observed in T8 (25% recommended dose of chemical fertilizer + vermicompost @ 15t/ha). The reason behind the more number of female flowers may be due to the supply of nitrogen, phosphorous and potassium through the organic and inorganic sources of nutrients at optimum level. It was minimum when no fertilizers were applied. The lowest sex ratio

**Comment [C26]:** Please find the research demonstrates this statement to support your suggestion.

may be due to the production of almost same number of pistillate flowers as that of staminate flowers. The results are in conformity with the finding of Anjanappa et al. (2012), Gill *et al.* (2012) and Singh *et al.* (2017).

**Comment [C27]:** What do they say in their studies and how you link with your findings?

### Days to first fruit set:

Minimum days to first fruit set (76.33) was observed when plants were supplied with 25% of recommended dose of chemical fertilizer + vermicompost @ 15t/ha and 50% of recommended dose of chemical fertilizer + EM Bokashi @3q/ha. The earliness might be also due to the enhanced production of growth promoting substances like gibberellic acid, IAA by application of vermicompost which induce the earliness of female flower production. Sreenivas *et al.* (2000) and Kameswari *et al.* (2010). Bokashi is an organic fertilizer produced by fermentation of organic material such as rice bran. It contains both decomposed and undecomposed organic matter, microbial biomass and intermediate and ultimate substances produced by microbes produced during fermentation (Yamada et al., 2003). The earliness in fruit setting in the plants supplied with 50% of recommended dose of chemical fertilizer + EM Bokashi @3q/ha could be due to the presence of microbes which could have enhanced the production of growth promoting substances like gibberellic acid, IAA as observed with the application of vermicompost. The integrated approach of nutrient application has improved earliness fruiting as compared to unfertilized plot. These findings are in line with the finding of Arshad *et al.* (2014) and Moharana *et al.* (2017). The results of present finding revealing earliness included application of organic and inorganic fertilizers in optimum level corroborate with the finding of earlier researcher Martinetti and Paganini (2006), Ezzo *et al.* (2012), Kumar et al. (2012), Thriveni *et al.* (2015), Vishwakarma *et al.* (2007), Anjanappa *et al.* (2012) and Singh et al. (2017).

**Comment [C28]:** This result is not in line with the early male and/or female flower appearance. Why it was happening?

**Comment [C29]:** These hormones are functioning in plant growth. How they relate to the fruiting?

**Comment [C30]:** In fact, your data on the earliest flower appearance and the highest sex ratio were found under different treatment. How do you discuss this?

**Comment [C31]:** Vermicompost and FYM may include the similar microbes. It is still unclear on your discussion, why it only happened in the soil with Bokashi.

### Days to first fruit harvest:

The result revealed that the minimum days to first fruit harvest (78.33) were recorded with treatment T<sub>8</sub> (25% of recommended dose of chemical fertilizer + vermicompost @ 15t/ha). Maximum days to first fruit harvest 87.00 was observed in T<sub>1</sub> (Absolute control) which was significantly highest among all. Least number of days to fruiting in most of the treatment combinations except T<sub>1</sub> where no fertilizer was applied may be attributed to the fact that the judicious integration of organic manures with inorganic fertilizers are capable of supplying optimum level of nutrient along with favourable growing media efficient in inducing early flowering in the very treatment. These results are in close conformity with the experimental findings of Vishwakarma *et al.*, (2007) in spine gourd, Mohan *et al.*, (2016) and Singh *et al.*, (2018) in cucumber.

**Comment [C32]:** Is it because the treatment showed the earlier first fruit set? If so, why T<sub>10</sub> did not show the same result here? If not, why it was so?

**Comment [C33]:** No statistical evidence in the table.

**Comment [C34]:** What about the pure 100% inorganic fertilizer effects?

**Comment [C35]:** What do you mean with 'close comfirmity'?

### Harvest Duration

The effect of organic and inorganic fertilizer was non-significant for harvest duration. It was maximum (54.33 days) in T<sub>5</sub> (25% of recommended dose of chemical fertilizer + FYM@25t/ha) and T<sub>8</sub> (25% of recommended dose of chemical fertilizer + Vermicompost@15t/ha) while it was minimum (47.67 days) in T<sub>1</sub> (Absolute control). Non-significant effect of organic and

**Comment [C36]:** There is no statistical evidence in the table

**Comment [C37]:** Where is the statistical evidence?



inorganic fertilizer for harvest duration in the current study indicated that plants were provided with enough nutrients to continue fruit production irrespective of the components of different fertilizer treatments as per the potential of the cultivar.

### Number of picking

It was noticed that T<sub>10</sub> (50% of recommended dose of chemical fertilizer + EM Bokashi@3q/ha) showed maximum (26) number of picking. This was statistically at par with all the treatments except T<sub>4</sub> (50% of recommended dose of chemical fertilizer + FYM@25t/ha) showing 17.67 picking and T<sub>1</sub> (Absolute control) resulting 15.67 picking. Minimum number of picking (11.00) was observed in T<sub>3</sub> (75% recommended dose of chemical fertilizer + FYM @ 20t/ha) which was significantly lowest among all the treatments.

More number of picking is related to earliness and more number of female flowers in a particular treatment. The reason behind the more number of female flowers in almost all the treatments may be attributed to the supply of nitrogen, phosphorous and potassium through the organic and inorganic sources of nutrients at optimum level.

### Number of fruit per plant

**Comment [C38]:** It is unclear on the discussion through this conclusion.

- 1) Is there any relationship between flower appearance, fruit sets, first fruiting, and this parameter?
- 2) There are no nutrients data in the soil applied with different fertilizers.
- 3) Why enough nutrients are related to the long harvest duration?
- 4) What is the meaning of 'as per potential of the cultivar', while you used one cultivar to all treatments in this study?

**Comment [C39]:** What's the difference between 'number of picking' and harvest duration'? This unclear information is caused by the missing on the methods description.

**Comment [C40]:** No statistical evidence.

**Comment [C41]:** Where is the statistical evidence of this conclusion?

**Comment [C42]:** Where are the data of these substances supply in the soil? How do you know the supplies were optimum for the plants?

Data revealed maximum number of fruit per plant (9.85) in T<sub>10</sub> (50% of recommended dose of chemical fertilizer + EM Bokashi@3q/ha). The minimum number of fruits per plant (3.97) was observed in T<sub>1</sub> (Absolute control). It was observed that number of fruits per plant was higher in plants which were supplied with integrated use of organic manures and chemical fertilizers than in cases where only inorganic fertilizers T<sub>2</sub> were supplied and when no fertilizers were supplied T<sub>1</sub>. This could be due to the fact that integrated use of organic manures and chemical fertilizers increased major elements like nitrogen, phosphorous and potassium through organic manures application which might have accelerated the synthesis of chlorophyll and amino acids leading to more translocation of photosynthates from leaves to fruits resulting in increased number of fruits per plant. Similar findings were also recorded by Martinetti and Paganini (2006), Multani *et al.* (2007), Azarmi *et al.* (2009), Eifediyi and Remison (2010), Mohan *et al.* (2016) and Mohrana *et al.* (2017).

**Comment [C43]:** What do they find and discuss which is related to your findings?

### Fruit yield per plant

Aggrandized yield in T<sub>7</sub> (50% of recommended dose of chemical fertilizer +Vermicompost@15t/ha) (2.20 kg) may be caused due to an ample concentration of endogenous plant growth regulators like auxin, vitamins and mineral in vermicompost which may have contributed to superior fruit characteristics encouraging more number of fruits per plant resulting in increased fruit yield per plant. Endogenous auxins are known to stimulate more number of female flowers in the plant as revealed from higher sex ratio in T<sub>7</sub>, could be the reason of maximum fruit yield per plant. The results are in close conformity with the findings of Kameswari *et al.*, (2010). Similar findings were quoted from the experimental trial conducted by Shreeniwas *et al.*, (2000) in ridge gourd, Prabhu *et al.*, (2006)

**Comment [C44]:** Where is the data of these substances?

**Comment [C45]:** There is no data of the endogenous auxins. How do you confidently provide this conclusion?

**Comment [C46]:** ??

and Narayanamma et al., (2010) in cucumber. Likewise, the possible reason behind higher number of fruits resulting in highest fruit yield in T<sub>7</sub> may be attributed to the earliness in female flower emergence, allowing maximum number of female flowers throughout the life span leading to more number of fruits which has ultimately contributed to the highest yield in T<sub>7</sub>. These findings are in congruence with the findings of Anjanappa et al., (2012) in cucumber, Thriveni et al., (2017) in bitter gourd and Singh et al., (2018) in cucumber.

### **Fruit yield per plot (kg)**

Maximum fruit yield per plot (26.26 kg) was observed in T<sub>7</sub> (50% of recommended dose of chemical fertilizer +Vermicompost@15t/ha) which was significantly higher than all other treatments. Higher yield due to integrated nutrient management was reported earlier in pumpkin by Ghayal et al. (2018) in cucumber, Bindiya et al. (2006), in sponge gourd and ridge gourd by Nair and Nair (2006), in bitter gourd by Mulani et al. (2007) and Sood and Vidya Sagar (2008). The results are in confirmatory with the finding of earlier researchers viz., Sreeniwas et al. (2008), Prabhu et al. (2006), Azarmi et al. (2009), Sunaryo (2010), Narayanamma et al. (2010), Bindiya (2014), Das et al. (2015), Threveni et al. (2015), Mohan et al. (2016), Nayak et al. (2016), Nager et al. (2017), Kumar et al. (2017) and Kharga et al. 2019 who observed increased yield with the application of vermicompost as organic source of fertilizers.

### **Fruit yield per hectare (q/ha)**

**Comment [C47]:** What are the relationships between their findings and your findings?

**Comment [C48]:** They use 'vermicompost' only? If so, it is different from yours, which used combination of vermicompost and chemical fertilizer in a particular rate. So what is the point of this comparison?

**Comment [C49]:** The fruit yield 'per plot' and 'per ha' would express the same. Why do you calculate both of them?

As observed in fruit yield per plant and fruit yield per plot, fruit yield per hectare was maximum in plants supplied with 50% of recommended dose of chemical fertilizer +Vermicompost@15t/ha (405.57q). It might be due to balanced nutrition, better uptake of nutrients by the plants which helped for better fruit set and fruit yield. More number of fruits per plant and fruit yield per plant, fruit yield per plot ultimately resulted in highest fruit yield per ha. Maximum yield of summer squash in present study could be due to the influence of vermi-compost in combination with NPK enhanced the synthesis of photosynthate by increasing the growth hormones and amino acids. These findings are in close conformity with earlier results obtained by Sreenivas *et al.* (2008), Prabhu *et al.* (2006), Azarmi *et al.* (2009), Sunaryo (2010), Narayanamma *et al.* (2010), Kumar *et al.* (2012), Bindiya (2014), Tavali *et al.* (2014), Das *et al.* (2015), Threveni *et al.* (2015), Mohan *et al.* (2016), Kanaiyia and Daniel (2016), Fawaz *et al.* (2016) Nayak *et al.* (2016), Nager *et al.* (2017), Kumar *et al.* (2017) and Kharga *et al.* 2019 who observed increased yield with the application of vermicompost as organic source of fertilizers.

## TSS

Among the treatment the quality as influenced by various INM treatment in huge conduct when contrasted with control. The maximum TSS of edible fruit was observed in T<sub>3</sub> -75% of recommended dose of chemical fertilizer + FYM@ 20t/ha (2.40°B) followed by T<sub>8</sub> (25% of recommended dose of chemical fertilizer +Vermicompost@15t/ha) and T<sub>11</sub> (25% of recommended dose of chemical fertilizer + EM Bokashi@3q/ha) which resulted in TSS to the tune of 2.23 and 2.20, respectively. Minimum TSS (0.73) was found in T<sub>4</sub> (50% of recommended dose of chemical fertilizer + FYM @ 25t/ha) which was statistically at par with T<sub>1</sub> (Absolute

Comment [C50]: ???

Comment [C51]: ???

Comment [C52]: What do you mean with this? Did you analyze the 'edible fruit' and 'non-edible fruit' in this study? If so, what about the data of fruit yield have been mentioned above. Were the fruits 'edible' or 'non-edible'?

This is caused by unclear information on material and method section.

control) and T<sub>5</sub> (25% of recommended dose of chemical fertilizer +FYM@25t/ha) showing TSS to the tune of 1.23 and 0.93, respectively.

Quality characters like total soluble solids (TSS) in summer squash fruit were enhanced in a favorable way due to application of inorganic fertilizer and organic manure in an integrated manner. Treatment combinations consisting of FYM and vermicompost have resulted in higher TSS content. It might be due to the fact that combined application of FYM, vermicompost and inorganic fertilizers might have led to balance C: N ratio which resulted in satisfactory nutrient availability and increased plant metabolism, which ultimately lead to increased carbohydrate accumulation in fruits resulting in higher total soluble solids (TSS). Similar findings were reported by Thriveni et al. (2015), Singh et al. (2017) and Shree et al. (2018). Positive influences of substitution of inorganic fertilizer with different organic manures on TSS content have been reported by Vishwakarma et al. (2007). Kameswari and Narayanamma (2011) stated that application of poultry manure along with recommended dose of nitrogenous fertilizers and vermicompost improved the quality characters like TSS content in ridge gourd. According to Azarmi et al. (2009), Kanaijia and Daniel (2016) vermicompost had positive influences on growth, yield and quality of cucumber. From these reports, it is evident that the results of the present investigation are well supported by the findings of the earlier workers.

### Ascorbic acid

**Comment [C53]:** What do you mean with 'balance C:N ratio'?  
What C:N ratio?  
Where are the data of C:N ratio?

**Comment [C54]:** What do you mean with this?  
Where are the data?  
How do you know that it is satisfaction?

**Comment [C55]:** Where is the data?

**Comment [C56]:** What kind of similarity?

**Comment [C57]:** This is different from your study. They substitute the chemical fertilizer with organic manure, while you combine the two fertilizer types.  
How do you refer their study here?

**Comment [C58]:** Please be precise on what positive influences they have found?  
Since they use vermicompost only, while you combined vermicompost and chemical fertilizer, how do you refer their study here?

It was observed that influence of organic manures and chemical fertilizers were significant for ascorbic acid. The maximum ascorbic acid (52.50 mg/100g) was observed in T<sub>8</sub> (25% of recommended dose of chemical fertilizer + Vermicompost@15t/ha). The minimum ascorbic acid (15.67) was observed in treatment T<sub>1</sub> (Absolute control). This might be due to the more availability of micronutrient like B, Cu, Mn, Zn etc. with the application of vermicompost in integrated nutrient management which might have increased ascorbic acid content of fruit. These results are in accordance with the findings of Triveni *et al.* (2015) in bitter gourd, Das *et al.* (2015) in bottle gourd and Kameswari and Narayanamma (2011) in ridge gourd.

**Comment [C59]:** No statistical evidence in the table.

**Comment [C60]:** What are the relationships between ascorbic acid (fruit quality) and plant growth and/or plant yield?

**Comment [C61]:** Where are the data?

**Comment [C62]:** How do you refer their studies here?

### Relative economic

Relative economic in summer squash was calculated and presented in Table 2. Perusal of data on relative economics based on yield revealed that treatment T<sub>7</sub> (50% of recommended dose of chemical fertilizer + vermicompost @ 15t/ha) recorded maximum gross returns (368700) followed by T<sub>4</sub> (50% recommended dose of fertilizer + FYM @ 20t/ha) and T<sub>5</sub> (25% recommended dose of chemical fertilizers + FYM @ 25t/ha). Maximum Benefit cost ratio was revealed in treatment with maximum (4.5) in T<sub>4</sub> (50% of recommended dose of chemical fertilizer + FYM @25t/ha) and T<sub>5</sub> (25% of recommended dose of chemical fertilizer + FYM @25t/ha). Minimum benefit cost ratio (0.9) was observed in T<sub>11</sub> (25% of recommended dose of chemical fertilizer + EM Bokashi @3q/ha) followed by T<sub>3</sub>

**Comment [C63]:** No statistical evidence in the table.

(75% of recommended dose of chemical fertilizer + FYM @ 20t/ha) and T<sub>1</sub> (Absolute control). These results are also in conformity with finding of Patle et al., 2018.

**Comment [C64]:** These results are described, but not discussed at all.

## Conclusion

It may be concluded that with the application of T<sub>7</sub> (50% of recommended dose of chemical fertilizer + vermicompost @ 15t/ha) highest gross return was observed due to maximum yield per plant, yield per plot, yield per ha. However, with the application of 50% of recommended dose of chemical fertilizers + FYM @ 25t/ha and 25% of recommended dose chemical fertilizer + FYM @ 25t/ha has been found highest net returns and Benefit:cost was observed. This was due to the lower cost of cultivation with the application of FYM.

**Comment [C65]:** It is unclear on which one is recommended.

## References

1. Amrithalingam S and Balakrishnan R. 1988. Studies on the effect of Azospirillum, nitrogen and NAA on growth and yield of chilli. *South Indian J. Hort.*, **36**: 218.
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**Table 1:** Effect of organic manures and chemical fertilizers on growth, yield and quality of Summer squash (*Cucurbita pepo* L.)

Treatments	Plant Height (cm)	Days to first male flower appearance	Days to first female flower appearance	Sex ratio	Days to first fruit set	Days to first fruit harvest	Harvest Duration	Number of picking	Number of fruit per plant	Fruit yield per plant(kg)	Harvest Duration	Number of picking	Fruit yield per plot(kg)	Fruit yield/ha(q)	TSS	Ascorbic acid
T1	69.85	74.33	83.00	0.23	84.00	87.00	48.67	15.67	3.97	0.39	48.67	15.67	4.86	75.13	1.23	15.67
T2	101.18	71.00	75.67	0.34	76.67	79.00	53.00	23.00	5.67	0.65	53.00	23.00	17.07	263.51	1.73	38.33
T3	91.97	68.67	75.67	0.29	77.00	79.00	53.67	24.33	8.60	0.50	53.67	24.33	6.13	94.86	2.40	41.67
T4	90.65	71.33	75.33	0.29	76.67	79.00	53.67	17.67	9.33	1.87	53.67	17.67	22.48	346.98	0.73	36.67
T5	122.85	71.00	76.00	0.25	77.00	79.67	53.00	24.67	6.97	1.82	53.00	24.67	21.97	339.15	0.93	31.67
T6	100.87	70.33	77.33	0.33	78.33	81.00	52.33	22.67	8.23	1.49	52.33	22.67	17.88	276.05	1.93	25.00
T7	72.45	71.00	75.67	0.38	76.67	79.00	49.00	11.00	9.22	2.20	49.00	11.00	26.26	405.57	1.80	28.33
T8	114.13	67.33	74.67	0.19	76.33	78.33	53.00	25.67	5.75	1.62	53.00	25.67	19.47	298.29	2.23	52.50
T9	109.43	65.00	76.00	0.34	78.00	80.00	54.33	24.33	5.13	1.45	54.33	24.33	17.38	268.40	1.70	36.23
T10	71.00	67.33	75.00	0.38	76.33	78.67	54.33	26.00	9.85	0.90	54.33	26.00	10.71	163.39	1.73	26.23
T11	101.45	72.67	77.00	0.30	78.33	80.00	51.33	25.00	5.06	1.67	51.33	25.00	20.08	310.00	2.20	40.67
SEm±	11.2	2.34	1.34	0.05	1.05	0.77	1.86	1.88	1.05	0.07	1.86	1.88	0.94	14.45	0.271	6.17
CD 5%	23.52	4.91	2.83	0.04	0.74	1.09	N/A	3.96	2.20	0.16	N/A	3.96	1.98	30.37	0.569	14.17

**Comment [C66]:** The data are hardly understood. I strongly recommend you to put the data as an international scientific basis: xx ± yy (zz)

xx is the mean of data from the three replicates.  
yy is the standard deviation/error of the data from the three replicates  
zz is the letters showing the statistical analysis results.

**Table 2:** Economics of Summer squash cultivation as influenced by various nutrient combinations

Treatments	Total cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net return (Rs/ha)	B:C ratio
T1	53335	68300	14965	1.2
T2	62335	239560	177225	3.8
T3	70835	86240	15405	1.2
T4	69845	315440	245595	4.5
T5	68325	308320	239995	4.5
T6	130835	250960	120125	1.9
T7	164345	368700	204355	2.2
T8	162825	273180	110355	1.6
T9	150835	244000	93165	1.6
T10	167345	148540	-18805	0.8
T11	165825	281820	115995	1.6

**Comment [C67]:** The data are hardly understood. I strongly recommend you to put the data as an international scientific basis:  
 $xx \pm yy (zz)$

xx is the mean of data from the three replicates.  
yy is the standard deviation/error of the data from the three replicates  
zz is the letters showing the statistical analysis results.

UNDER PEER REVIEW