International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2021; 9(2): 207-209

Received: 09-12-2020
Accepted: 12-02-2021

Gaurav Singh
Postgraduate, Department of Horticulture Udai Pratap Degree College, Varanasi, Uttar Pradesh, India

Navneet Singh
Postgraduate, Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Pooshpendra Singh Dixit
Project SRF, NAHEP-CAAST, CSAUAT, Kanpur, Uttar Pradesh, India

Anshuman Singh
Postgraduate, Department of Fruit Science, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Ravi Pratap Singh
Postgraduate, Department of Fruit Science, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Gurav Singh Vishen
Postgraduate, Department of Fruit Science, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Shiva Raj Kumar Varma
Assistant Professor, Department of Horticulture, Udai Pratap Degree College, Varanasi, Uttar Pradesh, India

Corresponding Author:
Gaurav Singh
Postgraduate, Department of Horticulture Udai Pratap Degree College, Varanasi, Uttar Pradesh, India

Economic studies of the use of the bio-fertilizers in tomato (*Solanum lycopersicum* L.) var. Kashi Amrit

Gaurav Singh, Navneet Singh, Pooshpendra Singh Dixit, Anshuman Singh, Ravi Pratap Singh, Gurav Singh Vishen and Shiva Raj Kumar Varma

DOI: https://doi.org/10.22271/chemi.2021.v9.i2c.11809

Abstract
An investigation on the Economic studies of the use of the bio-fertilizers in tomato (*Solanum lycopersicum* L.) var. Kashi Amrit" was conducted at department of horticulture farm of Udai Pratap College, Varanasi during 2018-19 in winter season. benefit: cost ratio (6:10), TSS (4.210brix), ascorbic acid (15.93 mg/100 g), lycopene content (6.95 mg 100 g) and shelf life (20.40 days) were maximum with the same treatment combination (T11). All the growth, yield and quality characters were lowest in the treatment T1 i.e. RDF (250 kg each of NPK ha-1). By the study it can be concluded that the Integrated approach with both inorganic and bio fertilizers is economically viable with regard to growth, yield, and quality of tomato compared to application of RDF alone.

Keywords: Tomato, cost, benefit, ratio

Introduction
Tomato (*Solanum lycopersicon* L.) is a member of the family Solanaceae and the genus Solanum having chromosome number of 2n=2x=24. It is grown as an annual and herbaceous plant, typically growing up to 1-3 meter tall, with a weak woody stem that usually scrambles over other plants. It is a sexually propagated crop plant with tap root, complete or perfect and hypogynous flowers. It is a day neutral plant and bears compound inflorescence having four to eight flowers in each cluster. There is a light protective anther cone surrounding the stigma leading to self-pollination. In 1753, the tomato was placed in the genus Solanum by Linnaeus as Solanum lycopersicum. However, in 1768, Philip Miller placed it in its own genus, and he named it Lycopersicon esculentum. All the species of tomato are native to Western Southern America (Rick, 1976). The most likely ancestor of tomato is the wild cherry tomato formerly Lycopersicon esculentum var. cerasiforme. Tomatoes are commonly classified as determinate or indeterminate types. Determinate or bush types bear a full crop all at once and top off at a specific height. While, indeterminate types develop into vines that never top off and continue producing flower and fruits.

Because of its wider adaptability and versatility, tomato is grown throughout the world either in outdoors or indoors and ranking second in importance after potato in many countries including India. In India, total area was 0.789 million hectares with production 19.759 million tonnes and 25.042 tonnes per hectare productivity (Anonymous, 2018) [5]. In India the leading tomato growing states are, Karnataka, West Bengal, Maharashtra, Uttar Pradesh, Haryana, Punjab, Gujarat and Bihar.

Tomato is considered as "Poor man's Orange" and universally treated as 'Protective Food'. Tomato fruits are eaten raw or cooked. Tomato in large quantities is used for the preparation of several processed items like soup, juice, ketchup, puree, paste and powder. Tomato is a good appetizer and its soup is said to be a good remedy for patients suffering from constipation. It supplies vitamin 'C' and adds variety of colours and flavours to the food. Green tomatoes are used for pickles, preserves and ripen fruits are used as raw vegetable in salad. Tomato is known for its outstanding nutritive value, which is given as; per 100g of edible part of tomato fruits contain 93.10g moisture, 3.60g carbohydrates, 1.90g protein, 0.10g fat, 0.60g minerals,

0.70g fibers, 320 I.U. vitamin 'A' and 31mg vitamin C (Ascorbic acid). Tomato is also rich in medicinal value. The pulp and juice are digestible and act as promoter of gastric secretion and blood purifier. It is said to be useful against cancer of the mouth and sour mouth, etc. It is one of the best vegetable which keep our stomach and intestine in good order. Looking into continuous increasing population and their need, supply of vegetables are less than their daily requirements. Although, a lot of genetic studies have been done in tomato and as a consequence a large number of tomato varieties/hybrids have been developed. The selection of suitable parents for hybridization on the basis of phenotypic performance alone is not a sound procedure as phenotypically superior lines may yield poor recombinants in the segregating generations. It is, therefore, essential that parents should be selected on the basis of their genetic potential.

Cost economics

The economics of various treatment was calculated by converting the total tomato fruit yield into money value.

The benefit cast ratio was estimated on the basis of cast of cultivation, gross return and net return obtained from tomato plants the return per hectare was estimated in terms of fruit yield per hectare at existing market rate available during year.

- Net returns (Rs.ha-1)
  The cost of cultivation of tomato was worked out by considering the present price of inputs and the labour cost that were prevailing at the time of their use.
- Benefit/Cost ratio

Experimental site

The experiment was conducted at Department Of Horticulture Farm, Udai Pratap Autonomous College, Varanasi (Utter Pradesh) during Rabi season 2018-19.

Geographical location of experimental site

Department of Horticulture Farm Udai Pratap College, Varanasi (Uttar Pradesh) which in humid sub- tropical climactic zone. The place is situated between 25.00 to 26.00 north latitude and 82.00 to 83.00 east longitude on an elevation of about 80.71 meters from sea level in the genetic alluvial plains of eastern Uttar Pradesh.

Details of layout

Crop: Tomato
Variety: Kashi Amrit
Spacing: 75 cm × 60 cm
Replications: 3
Treatments: 12
Design: RBD
Plot size: 3.75 m × 3.0 m
Net plot size: 3.0 m× 2.40 m
Season: *Kharif* - 2018
Bio-fertilizers: *Azotobacter*, PSB and VAM

Soil analysis

Soil pH: The pH of soil was determined from 1:2.5 (Soil: Water) suspension by glass electrode using pH meter.

Standard error of mean

Standard error of mean (S.Em±) was calculated as follows:

$$\text{Standard error of mean} = \sqrt{\frac{\text{EMSS}}{r}}$$

Where

S.Em± = Standard error of mean
EMSS = Error mean sum of squares
r = Number of replication on which the observation is based

The treatment differences were tested by least significant difference at 5 percent of probability and calculated by the following formula:

$$\text{CD} = \sqrt{(2 \text{ x Error mean square})/r} \text{x t } 0.05$$

Where

CD = Critical difference
r = Number of replications of the factor for which C.D. is to be calculated.
$t_{0.05}$ = Value of percentage point of 't' distribution for error degree of freedom at 5 per cent level of significance.

Yield and yield attributing parameters

The yield attributing parameters *viz.*, No. of fruit per plant, Yield per plant (kg), Yield per ha (q), fruit weight (g) varied significantly due to integrated application of nutrients. The plants supplied with 100% RDF + *Azotobacter* + PSB + VAM recorded the maximum fruit weight (80.12 g), number of fruits (44.60), fruit yield per plant (3.57 kg)and fruit yield per hector 794.07 q/ha^{-1}.

Several workers have reported fruit length, fruit diameter fruit weight and fruit volume due to integrated management. Sathyajeet *et al.* (2014) recorded the better fruit attributes in tomato when plants are inoculated with 50 per cent N from inorganic source + 50m per cent N from poultry manure. Similar results were obtained by Azin *et al*. (2012), Chumyani *et al*. (2012), Mudasir *et al*. (2009), Ranjit and Bandopadhyay (2014) and Sathyajeet *et al.* (2014).

Increase in length and size of the fruits may be also due to complementary action of phosphorous and potassium which helps in synthesize the auxins which are responsible for the cell elongation by increasing the cell permeability to water and osmotic solutes of the cells. Besides, auxins are also responsible for inducing the synthesis of specific DNA dependent new m-RNA and specific enzymatic proteins causes increased cell plasticity and extension resulting ultimately in cell enlargement. Besides, increase in the fruit size might be due to the higher uptake of nutrients and more food material synthesis by plant when treated with bio-fertilizers. FYM is store houses of the nutrients in soil, which enhance the fruit length (cm) fruit diameter fruit weight (g), and fruit volume workers Mohankumar and Narasegowda (2010). The similar results were confirmative to the findings of Mudasir *et al*. (2009), Ranjit and Bandopadhyay (2014) and Sathyjeet *et al*. (2014).

Increase growth parameters *viz.*, plant height, leaf area, and weight, length and number of the fruits results in the maximum total yield. Increase in the total fruit yield might be due to better nutrient uptake as evident from the enhanced recorded growth and reproductive characters of the tomato plants in T15. The organic manures provides prolonged and better availability of nutrients during crop growth period, while, bio-fertilizer VAM and *Azotobacter* increased the availability of nutrients and growth promoting substances synthesized by micro-organisms (Sathyjeet *et al*., 2014). There are many reports indicating increased fruit yield due to the application of organic manures along with inorganic fertilizers as also was found in the present investigation as by Sudhakar and Purushothum (2008), Manoj Kumar Singh

(2014), Mudasir *et al*. (2009), Ranjith and Bandopadhyay (2014), Shashidhar (2000) and Satyjeet *et al*. (2014).

Benefit cost ratio: Maximum returns are obtained from the T_{11} treatment where combination of 100% RDF + *Azotobacter* + PSB + VAM. The benefit: cost ratio obtained from these treatment combinations was 6:10.

Table 1: Yield and yield attributes

Treatments	No. of fruit per plant	Yield per plant (kg)	Yield per ha (q)	Fruit weight (g)
T_1	27.40	1.60	355.33	58.36
T_2	35.40	2.52	560.34	71.23
T_3	36.80	2.66	591.82	72.37
T_4	33.60	2.33	517.96	69.37
T_5	37.40	2.75	610.53	73.46
T_6	32.80	2.31	512.84	70.36
T_7	37.80	2.77	615.38	73.26
T_8	34.20	2.40	534.05	70.27
T_9	41.80	3.31	736.14	79.25
T_{10}	38.00	2.94	653.13	77.35
T_{11}	44.60	3.57	794.07	80.12
T_{12}	38.20	2.99	665.10	78.35
SEM±	1.78	0.13	29.57	3.51
CD (0.05)	5.22	0.39	86.71	10.31

Table 2: Total cost of cultivation

Treatments	Tomato yield (q/ha)	Total cost of cultivation (Rs.ha^{-1})	Gross income (Rs.ha^{-1})	Net return (Rs.ha^{-1})	B:C ratio
T_1	355.33	91897	355330	263433	2:87
T_2	560.34	130976	560340	429364	3:28
T_3	591.82	111476	591820	480344	4:31
T_4	517.96	106968	517960	410992	3:84
T_5	610.53	111536	610530	498994	4:47
T_6	512.84	107271	512840	405569	3:78
T_7	615.38	111576	615380	503804	4:52
T_8	534.05	107315	534050	426735	3:98
T_9	736.14	112436	736140	623704	5:54
T_{10}	653.13	108175	653130	544955	5:03
T_{11}	794.07	113436	794070	680634	6:10
T_{12}	665.10	109175	665100	555925	5:09

Note: Sale price of tomato = Rs. 10 kg^{-1}

Conclusion

The study revealed that maximum fruit yield is coupled with favourable fruit set and quality Characters could be achieved by the integrated application of 100% RDF + *Azotobacter* + PSB + VAM in tomato (*Solanum lycopersicum*) var. Kashi Amrit. Hence, this could be recommended to achieve the satisfactory yield and quality of tomato with higher Cost: Benefit ratio.

Reference

1. Anchal D, Lenka NK, Sudhishri S, Patnaik US. Influence of Integrated Nutrient Management on production, economics and soil properties in tomato under on-farm conditions in Eastern Ghats of Orissa. Indian J Agri. Sci 2008;78(1):40.
2. Kondapa D, Radder BM, Patil PL, Hebsur NS, Alagundagi SC. Effect of Integrated Nutrient Management on growth, yield and economics of chilli cv. Byadagidabbi in Vertisol. Karnataka J Agri. Sci 2009;22(2):438-440.
3. Medhe NK, Gawadab V, Randivives N, Temkar BG. Effect of Integrated Nitrogen Management on yield and economics of green chilli (*Capsicum annum*) production. Green Frmg 2010;1(3):260-262.
4. Naidu AK, Kushwah SS, Dwivedi YC. Influence of organic manures, chemical and bio-fertilizers on growth, yield and economics of brinjal. South Indian Hort 2002;50(4-6):370-376.
5. Anonymous. Indian Horticulture Database, National Horticulture Board (NHB), Ministry of Agriculture, Government of India, Gurgaon, Haryana 2018.