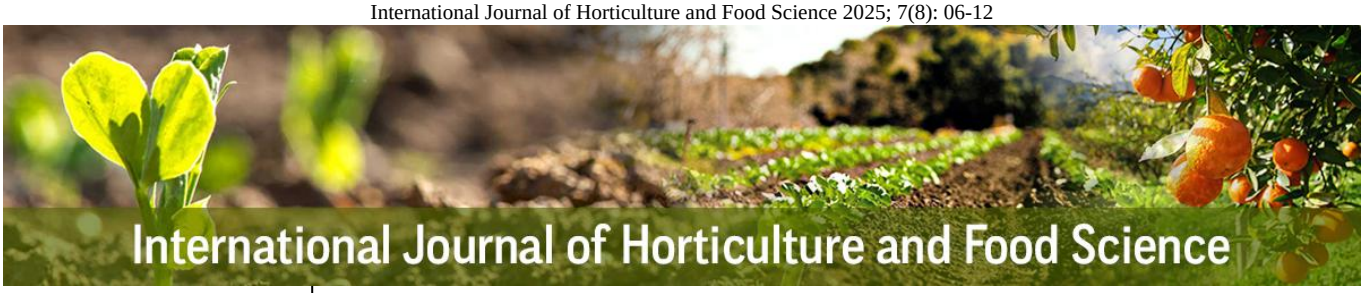

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Influence of *jeevamrut* and waste decomposer under different methods of application and fertility levels on growth, yield and quality of tomato

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Abstract
The present investigation entitled "Influence of *Jeevamrut* and waste decomposer under different methods of application and fertility levels on growth yield and quality of tomato" was carried out during *kharif* season with total twelve treatments and three replications. Result revealed that, among various liquid organic substances, o_1 (4% *Jeevamrut*) recorded significantly maximum plant height (73.84 and 122.60 cm) at 45 and 90 DAT, respectively, number of branches per plant (25.62), days to last picking (177.51), whereas minimum days to first flowering (40.37), days to first picking (86.90) and days taken from flowering to edible maturity (44.05). In case of yield and quality attributes, the significantly maximum average fruit weight (93.12 g), yield per plant (2.22 kg), yield per plot (18.45 kg) and yield per hectare (379.65 q), maximum fruit volume (95.31 cc), total soluble solids (4.70 ^{0}Brix), ascorbic acid (28.65 mg/100g), chlorophyll a (0.24 mg/g), chlorophyll b (0.13 mg/g) and total chlorophyll (0.35 mg/g) were reported in plants treated with o_1 (4% *Jeevamrut*). Amongst the methods of application, significantly maximum plant height (123.11 cm) at 90 DAT, early flowering (40.20 days), maximum average fruit weight (90.80 g), yield per plant (2.23 kg), yield per plot (19.03 kg), yield per hectare (391.46 q), total soluble solids (4.72 ^{0}Brix), ascorbic acid (28.95 mg/100g), chlorophyll a (0.24 mg/g), chlorophyll b (0.13 mg/g) and total chlorophyll (0.36 mg/g) content were found with treatment m_3 *i.e.* drenching at 30, 60 & 90 DAT + foliar spray at 15, 45 & 75 DAT. Supplementation of 100% RDF gave maximum plant height (72.23 and 121.99 cm) at 45 and 90 DAT, respectively, number of branches per plant (25.28), days to last picking (173.60), early flowering (40.60 days), early picking (89.13 days), days taken from flowering to edible maturity (45.51), maximum average fruit weight (90.14 g), yield per plant (2.18 kg), yield per plot (18.47 kg), yield per hectare (380.60 q), fruit volume (91.22 cc), total soluble solids (4.68 ^{0}Brix), ascorbic acid (28.61 mg/100g), chlorophyll a (0.23 mg/g), chlorophyll b (0.13 mg/g) and total chlorophyll (0.36 mg/g) content.

Keywords: Fertility levels, growth, *Jeevamrut*, method of application, quality, tomato and waste decomposer.

1. Introduction
India has diverse climate which ensures the availability of all kinds of fresh vegetables. It ranks second in vegetable production in the world after China. Tomato (*Solanum lycopersicum* L.) is versatile vegetable crop grown globally and ranks second in importance after potato. From nutritional point of view tomato is popularly known as "The Poor man's Apple" [25]. In India, tomato has become popular within the last six decades and plays vital role in Indian economy. It is cultivated on 8.14 lakh ha with the total production of 205.14 lakh tonne having productivity of 25.20 tonne per hectare [3].

Large quantities of tomato are used to produce sauce chutney, juice, ketchup, puree, paste and powder besides fresh consumption. Tomato tops in the canned vegetables. The fruit is rich in lycopene, which may have beneficial health effects. The red pigment in tomato *i.e.* lycopene is now being considered as the "world's most powerful natural antioxidant" [16].

Tomato is nutrient loving crop; out of various management practices the application of fertilizers plays major role for harnessing the optimum yields per unit area. Conventional agriculture has made an adverse impact on soil and plant health. Liberal rash use of chemical fertilizers, pesticides, and fungicides are responsible for deterioration of soil health. This eventually leads to high demand for integrated crop management approach to protect soil and

plant health. Cow is playing a vital role in Indian agriculture from centuries and has served as sources of nutrition for farming communities. The various liquid organic amendments *viz*., *Jeevamrut, Panchgavya* and *Beejamruta etc*. made by cow products. These are the cheaper and eco-friendly sources of nutrients. In these liquid manures, beneficial organisms survive and are helpful in phosphate solubilization, nitrogen fixation *etc*. [12, 27] have reported the presence of many beneficial micro-organisms *viz*., nitrogen fixers, phosphorus solubilizers, actinomycetes and fungi in *Panchagavya* and *Jeevamrut*.

National Centre of Organic Farming (NCOF), Ghaziabad has developed a waste decomposer culture which is used for quick composting from organic waste, soil health improvement and as plant protection agent. It is a consortium of microorganism extracted from desi cow dung. Farmers can do farming with the use of waste decompose without using chemical fertilizers and pesticides [7]. Very scanty of research work has been reported on these liquid organic substances, so that present investigation was planned and executed entitled "Influence of *Jeevamrut* and waste decomposer under different methods of application and fertility levels on growth yield and quality of tomato".

2. Materials and Methods

The present investigation was carried out during *kharif* season of 2019-20 at College Farm, College of Horticulture, Sardarkrushinagar Dantiwada Agricultural University, Jagudan, Dist. Mehsana, Gujarat. The details of material used and methods adopted during the present investigation in the field as well as in laboratory are briefly described in this chapter. The experiment was carried out with total twelve treatments comprising of three factors *viz*., liquid organic substances with two levels *viz*., o_1 (4% *Jeevamrut*) and o_2 (40% Waste decomposer); methods of application with three levels *viz*., m_1 (Drenching at 30, 60 & 90 DAT), m_2 (Foliar spray at 15, 45 & 75 DAT) and m_3 (Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT) and two fertility levels *viz*., f_1 (100% RDF) and f_2 (80% RDF). The experiment was laid out in Factorial Randomized Block Design with three replications.

The soil of experimental field was having an even topography with a gentle slope and good drainage. The soil of experimental site is sandy loam in texture with slightly alkaline in reaction, low in organic carbon and available nitrogen, medium in available phosphorus and high in potassium. The pH of the soil is almost neutral and normal in salt content.

Tomato cv. "Gujarat Anand Tomato 5" was used for the present study. This is promising one and was released from Main Vegetable Research Station, Anand Agricultural University, Anand in 2017. The seedlings were transplanted at 90 cm × 60 cm in 4.5 m × 3.0 m plots. Recommended dose of fertilizer adopted in tomato was NPK 125:50:50 kg/ha. Well decomposed FYM @ 20 t/ha was applied at the time of field preparation and recommended dose of fertilizer was applied as per treatment. The half dose of nitrogen and full dose of phosphorous and potassium was applied as a basal dose. Remaining half dose of nitrogen was applied as top dressing in two splits *i.e*. 40 and 70 days after transplanting. Irrigation applied through drip irrigation method having 4 lph dripper.

2.1 Preparation of liquid organic substances

In the present investigation, the following organic amendments were prepared freshly as per the procedure of NCOF, Ghaziabad and applied as per the treatments.

1. ***Jeevamrut*:** cow dung 10 kg, cow urine 10 liter, jaggary 2 kg, gram flour 2 kg and soil under live tree 1 kg were taken in plastic drum and volume was made up to 200 liters with the addition of water. The drum was kept in the shade and stirred twice in a day and covered it. After one week, *Jeevamrut* was ready and it was used application as per treatment.
2. **Waste decomposer:** For the preparation of waste decomposer, jaggary 2 kg was taken in plastic drum and volume was made up to 200 liters with the addition of water. Add 30 g of waste decomposer in a plastic drum containing jaggery solution. Avoided direct contact of contents with hands and mixed it properly with a wooden stick. Covered the drum and stirred it every day once or twice. After 5 days, the solution of the drum turned creamy and then it was used for application as per treatment.

The experiment was laid out in Randomized block design with factorial concept and replicated thrice. The observations were recorded periodically concerning growth, yield and quality parameters of tomato from five plants from each net plot by adopting standard methodology and treatments were analyzed statistically by adopting the standard procedures described by [23].

3. Results and Discussion

The experimental results obtained from the present investigation are described as follows.

3.1 Influence of *Jeevamrut* and waste decomposer along with various methods of application and fertility levels on growth and flowering of tomato

Data presented in Table 1 revealed that, growth parameters are significantly influenced by different liquid organic substances, methods of application and fertility levels. Significantly maximum plant height *i.e*. 73.84 cm and 122.60 cm at 45 and 90 DAT, respectively and number of branches per plant (25.62) were recorded in treatment o_1 (4% *Jeevamrut*). The minimum plant height of 66.71 cm and 108.81 cm at 45 and 90 DAT, respectively and minimum number of branches per plant (23.63) was recorded under the treatment o_2 (40% Waste decomposer).

An inquisition of the data from Table 1 revealed that significantly minimum days to first flowering (40.37) were recorded with treatment of o_1 (4% *Jeevamrut*) whereas, maximum days to first flowering (43.85) was found in treatment o_2 (40% Waste decomposer). The significantly minimum days taken from flowering to edible maturity (44.05) was recorded with treatment of o_1 (4% *Jeevamrut*) and maximum (49.16) in treatment of o_2 (40% Waste decomposer). The significantly minimum days to first picking (86.90) was recorded with treatment of o_1 (4% *Jeevamrut*) and maximum (95.64) in treatment of o_2 (40% Waste decomposer). The data revealed that the effect of various liquid organic substances on days to last picking was found significant. The maximum days to last picking (177.19) was recorded with treatment of o_1 (4% *Jeevamrut*) and minimum (162.54) in treatment of o_2 (40% Waste decomposer).

The application of *Jeevamrut* may have attributed to the faster enhancement of vegetative growth and storing sufficient reserved food materials for differentiation of buds into flower buds and consequently fruit growth and development ultimately resulted in early harvest. This was might be due to more vegetative growth from transplanting to floral bud caused nutrient stress and it resulted to early flower. The flowering period extend for long time due to supply of nutrient through top dress of fertilizer and higher cytokinin and auxin in the tissue by spray of organics on plant. These findings are in agreement with [24]in tomato [1] in sweet pepper and in pea [10].

The influence of methods of application on plant height at 45 DAT was found non-significant. Whereas, significantly maximum plant height of 123.11 cm at 90 DAT was recorded in treatment m_3 (Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT) which was at par with m_2 (Foliar spray at 15, 45 & 75 DAT) treatment. The minimum plant height (110.21 cm) was noted under the treatment m_1 (Drenching at 30, 60 & 90 DAT). Influence of methods of application on number of branches per plant was unable to produce significant variation.

Data showed significant difference for days to first flowering among different methods of application. Significantly minimum days to first flowering (40.20) were recorded with treatment of m_3 (Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT). The maximum days to first flowering (42.97) was found with treatment of m_1 (Drenching at 30, 60 & 90 DAT).

Inspection of data showed non significant difference for days taken from flowering to edible maturity, days to first picking and days to last flowering among different methods of application.

Amongst the different fertility levels, significantly maximum plant height of 72.23 and 121.99 cm at 45 and 90 DAT, respectively and maximum number of branches per plant (25.28) was recorded in treatment f_1 (100% RDF). The minimum plant height *i.e.* 68.33 cm and 109.42 cm at 45 and 90 DAT, respectively and minimum number of branches per plant (23.97) was noted under the treatment f_2 (80% RDF).

The results showed that the application of organic manure with combination of chemical fertilizer was found more beneficial for increasing the height of tomato plants. The better efficiency of organic manures in combination with inorganic fertilizers might be due to the fact that the organic manures would have provided congenial of soil physical condition and the micronutrients in an optimum range to the plant. Application of organic manures helped to promote the metabolic activity through the supply of such important micronutrients in the early growth phase which in turn must have encouraged the overall growth. [15] reported the highest plant growth due to the combined application of organic manures and chemical fertilizers in tomato.

Significantly minimum days to first flowering (40.60) were noted under the treatment of f_1 (100% RDF). The maximum days to first flowering (43.62) was noted under the treatment f_2 (80% RDF).

The better nutrient availability and nutrient uptake increased the growth and yield of crop. The possible reason for earliness in flowering might be due to accelerated photosynthesis and rapid translocation of photosynthates towards the initiating flower buds resulting in early flowering. [24] reported similar result from combination of vermicompost, liquid manure and RDF in tomato. These findings are in agreement in sweet pepper [1].

The influence of different fertility levels on days taken from flowering to edible maturity was found significant. The minimum days taken from flowering to edible maturity (45.51) was noted under the treatment of f1 (100% RDF) and maximum (47.70) in treatment f2 (80% RDF).

The influence of different fertility levels on days to first picking was found significant. The minimum days to first picking (89.13) was noted under the treatment of f_1 (100% RDF) and maximum (93.40) in treatment f_2 (80% RDF).

The enhanced effect of fertility level on days to last flowering registered significantly maximum day to last picking (173.65) was noted under the treatment of f1 (100% RDF) and minimum (166.08) in treatment f2 (80% RDF).

These findings are in agreement with [5] in tomato [4], in pepper [14], in pepper [17], in tomato [24], in tomato [1, 13] in bell pepper.

Table 1: Influence of *Jeevamrut* and waste decomposer along with various methods of application and fertility levels on growth and flowering of tomato

Treatments	Plant height (cm) 45 DAT	Plant height (cm) 90 DAT	Number of branches per plant	Days to first flowering	Days taken from flowering to edible maturity	Days to first picking	Days to last picking
Liquid organic substances (O)							
o_1: 4% *Jeevamrut*	73.84	122.60	25.62	40.37	44.05	86.90	177.19
o_2: 40% Waste decomposer	66.71	108.81	23.63	43.85	49.16	95.64	162.54
S. Em.±	1.242	1.93	0.32	0.65	0.62	1.21	2.28
C.D. at 5%	3.64	5.67	0.95	1.92	1.83	3.57	6.69
Methods of application (M)							
m_1: Drenching at 30, 60 & 90 DAT	69.38	110.21	24.30	42.97	46.41	93.16	164.51
m_2: Foliar spray at 15, 45 & 75 DAT	70.07	113.80	24.11	43.16	47.77	92.45	170.23
m_3: Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT	71.38	123.11	25.47	40.20	45.64	88.20	174.86
S. Em.±	1.52	2.37	0.40	0.80	0.77	1.49	2.80
C.D. at 5%	NS	6.94	NS	2.35	NS	NS	NS
Fertility levels (F)							
f_1: 100% RDF	72.23	121.99	25.28	40.60	45.51	89.13	173.65
f_2: 80% RDF	68.33	109.42	23.97	43.62	47.70	93.40	166.08
S. Em.±	1.24	1.93	0.33	0.66	0.63	1.22	2.28
C.D. at 5%	3.64	5.67	0.95	1.92	1.84	3.57	6.69
C.V.%	7.5	7.1	5.6	6.6	5.7	5.6	5.7

3.2 Influence of *Jeevamrut* and waste decomposer, methods of application and fertility levels on yield of tomato

Average fruit weight (g)

Amongst the liquid organic substances, treatment o_1 (4% *Jeevamrut*) registered significantly maximum average fruit weight (93.12 g) while, significantly minimum average fruit weight (80.56 g) was recorded with treatment o_2 (40% Waste decomposer).

Data showed that the influence of methods of application on average fruit weight (g) was found significant. Significantly maximum average fruit weight (90.80 g) was recorded with treatment m_3 (Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT) and minimum (83.98 g) in treatment m_1 (Drenching at 30, 60 & 90 DAT). The *Jeevamrut* and organic manure are environmentally safe organic amendment made from the products of cow. The application of organic manure as well as liquid manure such as *Jeevamrut* results in significantly higher growth, yield and quality of crops [38]. The finding corroborates with the results obtained [41] in bell pepper.

Influence of different fertility levels on average fruit weight (g) was found significant. Significantly maximum average fruit weight (90.14 g) was recorded in treatment f_1 (100% RDF). The minimum average fruit weight (83.54 g) was noted under the treatment f_2 (80% RDF).

It may be due to promotion of immense biological activities in soil and enhanced nutrient availability to crop with the application of *Jeevamrut*. These findings are in conformity with [4] in pepper, [14] tomato, in bell pepper [1, 18] in tomato and also reported positive effect of vermicompost on pepper [13].

Fruit yield per plant (kg)

The effect due to various liquid organic substances, methods of application and fertility levels treatment on fruit yield per plant (kg) and the mean data is furnished in Table 2.

An appraisal data due to various liquid organic substances application treatments were found significant for fruit yield per plant (kg). The significantly maximum fruit yield per plant (2.22 kg) was recorded with treatment of o_1 (4% *Jeevamrut*) and minimum *i.e.* 1.95 kg in the application of o_2 (40% Waste decomposer).

Influence of methods of application on fruit yield per plant revealed that significantly maximum fruit yield per plant (2.23 kg) was recorded with treatment m_3 (Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT). Whereas, the minimum fruit yield per plant (1.97 kg) was recorded with treatment m_1 (Drenching at 30, 60 & 90 DAT). Inspection of data disclosed significant difference for fruit yield per plant with different fertility levels. The maximum fruit yield per plant (2.18 kg) was recorded in treatment f_1 (100% RDF) and minimum fruit yield per plant (2.00 kg) was noted under the treatment f_2 (80% RDF).

Fruit yield per plot (kg)

The results pertaining to effect of different liquid organic substances, methods of application, fertility levels and its interaction on fruit yield per plot (kg) is summarized in Table 2.

Data mentioned in Table 2 revealed that the influence of different liquid organic substances treatment with respect to fruit yield per plot (kg) was found significant. The maximum fruit yield per plot (18.45 kg) was noted under the treatment of o_1 (4% *Jeevamrut*) and minimum yield per plot (16.94 kg) was noted under the treatment of o_2 (40% Waste decomposer).

The significantly maximum fruit yield per plot (19.03 kg) was recorded with treatment m_3 (Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT) whereas, the minimum fruit yield per plot (16.92 kg) was recorded with treatment m_1 (Drenching at 30, 60 & 90 DAT).

An appraisal of data indicated that influence of different fertility levels on fruit yield per plot was found significant. The maximum fruit yield per plot (18.47 kg) was recorded in treatment f_1 (100% RDF) and minimum fruit yield per plot (16.92 kg) was noted under the treatment f_2 (80% RDF).

Fruit yield per hectare (q)

Examination of the data on influences of different liquid organic substances on fruit yield per hectare revealed that the significantly maximum fruit yield per hectare (379.65 q) was recorded with treatment of o_1 (4% *Jeevamrut*); whereas, minimum yield per hectare (348.52 q) was noticed with treatment of o_2 (40% waste decomposer). The beneficial effects of *Jeevamrut* reported by [22, 28, 9] was attributed to higher microbial load and growth hormones which might have enhanced the soil biomass thereby sustaining the availability and uptake of applied as well as native soil nutrients which ultimately resulted in better growth and yield of crops. The results are in conformity with the findings of [6] in chilli and [13] in bell pepper.

The effect of different methods of application on fruit yield per hectare (q) was to be found significant. The maximum fruit yield per hectare (391.46 q) was noticed in the treatment m_3 (Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT).

Whereas, the minimum fruit yield per hectare (348.15 q) was noticed in the treatment m_1 (Drenching at 30, 60 & 90 DAT). Similar result was obtained in bell pepper [13].

From the above results, it was found that the *Jeevamrut* is liquid organic solution, prepared from cow dung, urine, legume flour, soil and jaggary. They contain macro nutrients, essential micro nutrients, many vitamins, essential amino acids, PGRs like IAA, GA and beneficial microorganisms [22, 20, 26].

Table 2: Influence of *Jeevamrut* and waste decomposer, methods of application and fertility levels on yield of tomato

Treatments	Average fruit weight (g)	Fruit yield per plant (kg)	Fruit yield per plot (kg)	Fruit yield per hectare (q)
Liquid organic substances (O)				
o_1: 4% *Jeevamrut*	93.12	2.22	18.45	379.65
o_2: 40% Waste decomposer	80.56	1.95	16.94	348.52
S. Em.±	1.20	0.06	0.45	9.27
C.D. at 5%	3.55	0.17	1.32	27.20

Methods of application (M)				
m_1: Drenching at 30, 60 & 90 DAT	83.98	1.97	16.92	348.15
m_2: Foliar spray at 15, 45 & 75 DAT	85.73	2.07	17.14	352.66
m_3: Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT	90.80	2.23	19.03	391.46
S. Em.±	1.48	0.07	0.55	11.36
C.D. at 5%	4.34	0.21	1.62	33.32
Fertility levels (F)				
f_1: 100% RDF	90.14	2.18	18.47	380.06
f_2: 80% RDF	83.54	2.00	16.92	348.12
S. Em.±	1.21	0.06	0.45	9.28
C.D. at 5%	3.54	0.17	1.32	27.21
Interaction effect				
O x M	6.13	NS	NS	NS
O x F	NS	NS	NS	NS
M x F	6.13	NS	NS	NS
O x M x F	8.67	NS	3.24	66.65
C.V.%	5.9	11.7	10.8	10.8

3.3 Influence of *Jeevamrut* and waste decomposer, methods of application and fertility levels on quality of tomato

Fruit volume (cc)

The data pertaining to fruit volume (cc) as influenced by various liquid organic substances, methods of application and fertility levels are furnished in Table 3.

Appraisal of data revealed that the influence of different liquid organic substances treatment on fruit volume (cc) was found significant. The maximum fruit volume (95.31 cc) was obtained from the treatment of o_1 (4% *Jeevamrut*) whereas, minimum fruit volume (77.07 cc) was obtained from the treatment of o_2 (40% Waste decomposer).

Looking to the influence of methods of application on fruit volume (cc) was to be found non significant.

Inspection of data disclosed significant difference for fruit volume (cc) with different fertility levels. The maximum fruit volume (91.22 cc) was recorded in treatment f_1 (100% RDF). The minimum fruit volume (81.16 cc) was noted under the treatment f_2 (80% RDF).

Fruit cracking (%)

An influence of different liquid organic substances, methods of application and fertility levels and its interaction was found non significant on fruit cracking (%).

Total soluble solids (^{0}Brix)

The effect of various liquid organic substances, methods of application and fertility levels and their interaction on total soluble solids (^{0}Brix) are presented in Table 3.

Data showed that the influence of different liquid organic substances on total soluble solids (^{0}Brix) was found significant. The significantly highest total soluble solids (4.70 ^{0}Brix) was recorded with treatment of o_1 (4% *Jeevamrut*) whereas, lowest total soluble solids (4.48 ^{0}Brix) was recorded with treatment of o_2 (40% Waste decomposer). The possible reason for increased TSS in organic manure is might be due the increased the activity of the hydrolytic enzyme which converted the complex polysaccharides into simple sugar. Growth regulators also increase translocation of photosynthetic metabolites from other parts of the plant towards developing fruits. This finding is in conformity with the result in tomato [19] [21], in bell pepper [13] and in chilli [11].

Data revealed that the influence of methods of application on total soluble solids (^{0}Brix) was to be found significant. The significantly the highest total soluble solids (4.72 ^{0}Brix) was recorded with treatment m_3 (Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT). Whereas, the lowest total soluble solids (4.44 ^{0}Brix) was recorded with treatment m_2 (Foliar spray at 15, 45 & 75 DAT). Accelerated mobility of phothosynthates from the source to the sink, enhanced metabolism of carbohydrates as influenced by growth hormones might have resulted in higher total soluble solids content. These findings are in accordance in bell pepper [13].

Influence of different fertility levels on total soluble solids (^{0}Brix) was found significant. The highest total soluble solids (4.68 ^{0}Brix) was recorded in treatment f_1 (100% RDF) and lowest total soluble solids (4.50 ^{0}Brix) was noted under the treatment f_2 (80% RDF).

Chlorophyll a content (mg/g)

Data revealed that the influence of different liquid organic substances with respect to chlorophyll a (mg/g) was found significant. The significantly maximum chlorophyll a (0.24 mg/g) was recorded in treatment o_1 (4% *Jeevamrut*) and minimum (0.20 mg/g) in treatment o_2 (40% Waste decomposer).

Significantly maximum chlorophyll a (0.24 mg/g) was recorded in treatment m_3 (Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT). The significantly minimum chlorophyll a (0.21 mg/g) was recorded with application of m_1 (Drenching at 30, 60 & 90 DAT).

Influence of different fertility levels on chlorophyll a revealed that significantly maximum chlorophyll a (0.23 mg/g) was registered in treatment f_1 (100% RDF) and minimum chlorophyll a (0.21 mg/g) was recorded in treatment f_2 (80% RDF).

Chlorophyll b content (mg/g)

The results pertaining to effect of different liquid organic substances, methods of application, fertility levels and its interaction on chlorophyll b (mg/g) is presented in Table 3.

Perusal of data from Table 3 revealed that the influence of different liquid organic substances with respect to chlorophyll b was found significant. The maximum chlorophyll b (0.13 mg/g) was recorded in treatment o_1 (4% *Jeevamrut*) and minimum chlorophyll b (0.12 mg/g) was recorded in treatment o_2 (40% Waste decomposer).

The significantly maximum chlorophyll b (0.13 mg/g) was recorded in treatment m_3 (Drenching at 30, 60 & 90 DAT +

Foliar spray at 15, 45 & 75 DAT). The minimum chlorophyll b (0.12 mg/g) was recorded with application of m_1 (Drenching at 30, 60 & 90 DAT) and m_2 (Foliar spray at 15, 45 & 75 DAT).

Influence of different fertility levels on chlorophyll b (mg/g) showed that significantly maximum chlorophyll b (0.13 mg/g) was recorded in treatment f_1 (100% RDF) whereas, minimum chlorophyll a (0.12 mg/g) was recorded in treatment f_2 (80% RDF).

Total Chlorophyll content (mg/g)

The results pertaining to effect of different liquid organic substances, methods of application, fertility levels and its interaction on total chlorophyll content (mg/g) is furnished in Table 3.

Perusal of data on total chlorophyll content was noticed that significantly maximum total chlorophyll (0.35 mg/g) was recorded in treatment o_1 (4% *Jeevamrut*) and minimum total chlorophyll content (0.33 mg/g) was recorded in treatment o_2 (40% Waste decomposer).

Significantly maximum total chlorophyll (0.36 mg/g) was recorded in treatment m_3 (Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT). The minimum total chlorophyll (0.31 mg/g) was recorded with application of m_1 (Drenching at 30, 60 & 90 DAT).

Influence of different fertility levels on total chlorophyll content was found significant. The maximum total chlorophyll (0.36 mg/g) was recorded in treatment f_1 (100% RDF) and minimum total chlorophyll a (0.32 mg/g) was recorded in treatment f_2 (80% RDF).

Ascorbic acid (mg/100g)

Data revealed that the influence of different liquid organic substances on ascorbic acid (mg/100g) was found significant. The maximum ascorbic acid (28.65 mg/100g) was recorded with treatment of o_1 (4% *Jeevamrut*) and minimum (27.78 mg/100g) in treatment of o_2 (40% Waste decomposer). The application of *Jeevamrut* resulted as effective growth stimulant that enhanced the biological efficiency of crops and nutrition quality of vegetables. Another reason for increased ascorbic acid content could be the increased efficiency of microbes and secretion of growth promoting substances which accelerates the physiological process like synthesis of carbohydrates and biochemical activities [27]. These results are in close accordance with and in tomato [19, 21], in bell pepper [13] and in chilli [11].

The effect of different methods of application on ascorbic acid was to be found significant. The maximum ascorbic acid (28.95 mg/100g) was noticed in the treatment m_3 (Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT). The minimum ascorbic acid (27.64 mg/100g) was noticed in the treatment m_1 (Drenching at 30, 60 & 90 DAT). Similar results were obtained in bell pepper [13].

The ascorbic acid data showed significant differences due to different fertility level treatment. The maximum ascorbic acid (28.61 mg/100g) was worked out into f_1 (100% RDF) and minimum ascorbic acid (27.82 mg/100g) was worked out into f_2 (80% RDF).

Table 3: Influence of *Jeevamrut* and waste decomposer, methods of application and fertility levels on quality of tomato

Treatments	Fruit volume (cc)	Fruit cracking (%)	Total soluble solids (^{0}Brix)	Chlorophyll a (mg/g)	Chlorophyll b (mg/g)	Total chlorophyll (mg/g)	Ascorbic acid content (mg/100g)
Liquid organic substances (O)							
o_1: 4% *Jeevamrut*	95.31	1.67	4.70	0.24	0.13	0.35	28.65
o_2: 40% Waste decomposer	77.07	1.70	4.48	0.20	0.12	0.33	27.78
S. Em.±	1.07	0.02	0.06	0.004	0.003	0.01	0.23
C.D. at 5%	3.15	NS	0.18	0.01	0.01	0.02	0.68
Methods of application (M)							
m_1: Drenching at 30, 60 & 90 DAT	84.61	1.69	4.61	0.21	0.12	0.31	27.64
m_2: Foliar spray at 15, 45 & 75 DAT	84.95	1.67	4.44	0.22	0.12	0.35	28.05
m_3: Drenching at 30, 60 & 90 DAT + Foliar spray at 15, 45 & 75 DAT	89.00	1.69	4.72	0.24	0.13	0.36	28.95
S. Em.±	1.32	0.03	0.08	0.01	0.004	0.01	0.29
C.D. at 5%	NS	NS	0.22	0.01	0.01	0.03	0.84
Fertility levels (F)							
f_1: 100% RDF	91.22	1.67	4.68	0.23	0.13	0.36	28.61
f_2: 80% RDF	81.16	1.70	4.50	0.21	0.12	0.32	27.82
S. Em.±	1.08	0.02	0.06	0.004	0.003	0.01	0.23
C.D. at 5%	3.16	NS	0.18	0.01	0.01	0.02	0.68
Interaction effect							
O x M	5.45	NS	NS	0.020	0.015	0.038	NS
O x F	4.46	NS	NS	NS	0.013	0.031	NS
M x F	NS	NS	NS	0.020	0.015	NS	NS
O x M x F	7.73	NS	0.44	0.028	0.022	0.053	NS
C.V.%	5.3	5.7	5.7	7.5	10.3	9.3	3.5

4. Conclusion

On the basis of result obtained from the investigation, it can be concluded that the application of 4% *Jeevamrut* by drenching at 30, 60 & 90 DAT + foliar spray at 15, 45 & 75 DAT with 100% RDF enhanced growth and yield parameters along with the quality of tomato. Moreover, this treatment also recorded the highest net income.

5. References

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