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# High yielding variety of Gujarat Tomato-6 for Saurashtra condition

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**Abstract**
A promising entry JTL-12-07 (GT-6) was developed through hybridization between Junagadh Ruby x JT-3, followed by pedigree method of selection. This entry was under testing from 2012-13 to 2016-17 during late *kharif* season at Junagadh, Anand, Navsari, Ladol and Thasara centers. On the basis of 14 testing trials, the culture JTL-12-07 (GT-6) has recorded higher mean fruit yield of 316.05 q/ha as compared to check varieties AT-3 (240.84 q/ha) and JT-3 (246.94 q/ha) which was 31.23% and 27.99% higher over all the three check varieties, respectively. Regarding quality parameters total soluble sugar (4.06%) and acidity (0.27%) was higher than check JT-3 (3.54 and 0.20) respectively, while total soluble solids ($6.5^0$Brix) was more than check varieties AT-3 and JT-3 ($6.0^0$Brix). Lycopene (4.73 mg/100ml) and ascorbic acid (21.59 mg/100 ml) was also higher than both the check varieties. Thus, the entry JTL-12-07 is proposed for recommendation for general cultivation during late *kharif* season in tomato growing areas of Gujarat State with the name Gujarat Tomato - 6 (GT-6).

**Keywords:** Tomato, fruit yield, GT-6 Variety, TSS, Locules

## Introduction
Tomato (*Lycopercicum esculentum* L., 2n=2x=24) is the most widely grown vegetable crop of both tropics and sub-tropical regions of the world. It belongs to the family *Solanaceae* and ranks second in importance among vegetables. China stood first in the major tomato growing countries followed by India, Turkey, Egypt, Iran, USA, Mexico, Italy, Brazil and Spain. Total area of world under tomato cultivation is 4.81 million hectares with 163.03 million tones production and 33.9 t/ha average productivity (2015-16).

Tomato ranks third in priority after potato and onion in India, but ranks second after potato in the world. India ranks second in the area (882 thousand hectares) and production (187.36 lakh tones) in the world. In India, Andhra Pradesh stood first in production (3354.47 thousand tones) followed by Karnataka, Madhya Pradesh, Telangana and Odisha. Whereas, Gujarat stood sixth position in production. In Gujarat, tomato was grown in 46400 ha with the annual production of 1319.11 thousand tones with a productivity of 28.43 t/ha (2015-16). The important tomato growing districts of Gujarat states were Anand, Kheda, Gandhinagar, Dang, Dahod, Narmada, Panchamahal, Banaskatha, Vadodara, Valsad, Sabarkatha and Bhavnagar.

Tomato (*Lycopercicum esculentum* L.) resides one of the most important horticultural crops in the world and since consumers demand more varieties of higher quality, there by strategies focused not only for increasing fruit yield, but quality continue to be of great interest. India has made tremendous progress in tomato production and productivity by evolving high yielding varieties. These varieties were very successful in increasing the tomato production from 74.62 lakh tones in 2001-02 to 187.32 lakh tones in 2015-16, however, a wide scope for increasing the inherent productivity potential of presently grown varieties.

To develop high yielding and better quality tomato variety with fruits are medium in size, flat round in shape with groove and attractive red colour. Plants are determinate in nature. Leaves are slightly broad and light green in colour. Branches are profuse in nature. Flowers are pale yellow in colour.

## Breeding Objective
To develop high yielding and better quality tomato variety with fruits are medium in size, flat round in shape with groove and attractive red colour. Plants are determinate in nature. Leaves are slightly broad and light green in colour. Branches are profuse in nature. Flowers are pale yellow in colour.

## Materials and Methods

A tomato genotype Gujarat Tomato–6 (JTL-21-07) was developed through hybridization between Junagadh Ruby x JT-3, followed by pedigree method of selection. Cross was made during 2006. The segregating generations were maintained from $F_2$ to $F_7$.This genotype was tested as an entry in Preliminary Evaluation Trial (PET) during 2012-13 and promoted to Large Scale Varietal Trial (LSVT) in 2013-14 to 2016-17 and tested at multi location *viz*., Junagadh, Anand, Navsari, Ladol and Thasara centers with two checks i.e. AT-3 and JT-3 in Gujarat State. Randomized block design with three replication. Because of its good performance in state trials, the entry GT-6 was tested under All-India Co-coordinated Varietal Trial under IET during 2015-16. It has been promoted in AVT-I during 2016-17 and AVT-II during 2017-18 in India.

## Results and Discussion

The result of fruit yield of Gujarat Tomato-6 (JTL-21-07) along with two local checks i.e. AT-3 and JT-3 are presented in Table-1. On the basis of fruit yield data from the state level trials at Junagadh, Anand, Navsari, Ladol and Thasara centers, Gujarat Tomato-6 had proven its superiority by giving significantly higher fruit yield at all the centers. The mean fruit yield of Gujarat Tomato-6 was 316.05q/ha as compared to check varieties AT-3 (240.84q/ha) and JT-3 (246.94q/ha) which was 31.23% and 27.99% higher over all the two check varieties, respectively. Similar finding were also reported by Nandapuri *et al.* (1973) [3] and Jivani *et al*., 2017 [2] in tomato.

The fruit of Gujarat Tomato-6 are medium in size, flat round in shape with groove and attractive red colour. Average fruit length of this genotype is 4.42cm with 16.15cm girth and 61.76 g fruit weight (Table-2). The fruit of Gujarat Tomato-6 contains higher total soluble solids ($6.5^0$Brix) was more than check varieties AT-3 and JT-3 ($6.0^0$Brix). Lycopene (4.73 mg/100ml) and ascorbic acid (21.59 mg/100ml) was also higher than both the check varieties (Table 3). Similarly results find with Jivani *et al.* (2017) [2] (Table-5).

Data presented in Table-4 indicate that the incidence of leaf curl virus, leaf blight and tomato wilt virus was found less as compared to check verities. The results were agreement with Nandapuri *et al.* (1977) [4] who also observed tomato variety Punjab Chhuhara tolerance to blight, TMV and wilt disease. With respect to the damage due to fruit borer (1.98 and 8.73) the proposed entry was superior to check varieties AT-3 (4.68 and 9.77%) and JT-3 (4.12 and 9.04%) at Junagadh and Anand centers, respectively. Similarly results find with Jivani *et al.* (2017) [2] (Table-5).

**Table 1:** Year wise yield performance of Gt-6 at different locations of Gujarat state under state level trials

| Year | Name of Trial | Locations | Fruit yield (q/ha) of GT-6 | Fruit yield of check varieties(q/ha) | | S. Em. ± | CD at 5% | CV % |
|---|---|---|---|---|---|---|---|---|
| | | | | AT-3 (a) | JT-3 (b) | | | |
| 2012-13 | PET | Junagadh | 356.70$^{abc}$ | 211.76 | 288.40 | 20.59 | 59.25 | 18.97 |
| Mean (1) | | | 356.70 | 211.76 | 288.40 | - | - | - |
| % Increased over | | | | 72.69 | 26.80 | - | - | - |
| 2013-14 | SSVT | Junagadh | 272.84$^{ab}$ | 220.06 | 222.53 | 12.71 | 37.79 | 10.21 |
| Mean (1) | | | 272.84 | 220.06 | 222.53 | - | - | - |
| % Increased over check | | | - | 23.98 | 22.61 | - | - | - |
| 2014-15 | LSVT | Anand | 333.28$^{b}$ | 280.35 | 180.92 | 20.61 | 59.70 | 12.71 |
| | | Junagadh | 283.64$^{ac}$ | 229.01 | 242.90 | 15.01 | 43.49 | 14.05 |
| | | Navsari | 289.60$^{abc}$ | 187.30 | 231.80 | 18.30 | 52.90 | 12.59 |
| | | Ladol | 390.32$^{abc}$ | 209.60 | 195.06 | 7.49 | 21.70 | 5.01 |
| | | Thasara # | 142.11 | 142.11 | 175.03 | 7.47 | 21.64 | 8.03 |
| Mean(4) | | | 324.21 | 226.57 | 212.67 | - | - | - |
| % Increased over | | | - | 43.09 | 52.45 | - | - | - |
| 2015-16 | LSVT | Anand | 303.50 | 284.88 | 256.74 | 22.45 | 65.24 | 11.37 |
| | | Junagadh | 259.27$^{abc}$ | 212.47 | 219.75 | 13.15 | 38.25 | 9.04 |
| | | Navsari | 312.82$^{ac}$ | 258.66 | 287.79 | 18.12 | 52.67 | 11.58 |
| | | Ladol # | 154.87 | 152.83 | 184.84 | 14.07 | 40.90 | 15.01 |
| | | Thasara # | 169.55 | 138.82 | 127.57 | 5.87 | 17.14 | 6.03 |
| Mean (3) | | | 292.20 | 252.00 | 254.76 | - | - | - |
| % Increased over | | | - | 15.95 | 14.70 | - | - | - |
| 2016-17 | LSVT | Anand | 307.56 | 289.04 | 275.87 | 19.12 | 55.21 | 10.21 |
| | | Junagadh | 230.79$^{c}$ | 185.68 | 225.31 | 16.07 | 46.56 | 11.80 |
| | | Navsari | 352.32$^{abc}$ | 255.60 | 269.30 | 19.27 | 55.83 | 11.40 |
| | | Ladol | 363.06 | 272.76 | 279.94 | 33.70 | 97.59 | 15.77 |
| | | Thasara | 358.95$^{abc}$ | 274.54 | 280.86 | 18.03 | 52.06 | 9.95 |
| Mean (5) | | | 322.54 | 255.52 | 266.26 | - | - | - |
| % Increased over | | | - | 26.23 | 21.14 | - | - | - |
| Over all mean (14) | | | 316.05 | 240.84 | 246.94 | - | - | - |
| % Increased over | | | - | 31.23 | 27.99 | - | - | - |
| Frequency of top non- significant group | | | 10/14 | 1/14 | 4/14 | - | - | - |

* Significant at 5% level than checks a=AT-3, b=JT-3 and c= DVRT-2

# Yield are not considered due to below state average yield

**Table 2:** Mean and range of ancillary observations recorded from 2012-13 to 2016-17

| S.N. | Character | GT-6 | AT-3 (C) | JT-3 (C) |
|---|---|---|---|---|
| 1 | Days to first picking | 99 (89-110) | 96 (82-110) | 95 (85-103) |
| 2 | Days to last picking | 143 (140-154) | 145 (116-166) | 142 (113-158) |
| 3 | Plant height (cm) | 64.42 (51.00-85.55) | 70.44 (53.22-96.66) | 68.24 (42.22-102.77) |
| 4 | Plant spread (cm) | 47.59 (34.40-49.44) | 44.31 (33.20-65.55) | 40.85 (30.35-53.88) |
| 5 | No. of branches | 3.2 (2.55-4.33) | 2.8 (2.20-3.33) | 3.3 (2.80-3.89) |
| 6 | No. of locules | 4.08 (4.66-3.33) | 3.08 (2.30-4.11) | 4.75 (3.44-5.77) |
| 7 | Fruit length (cm) | 4.42 (3.69-4.85) | 4.19 (3.8-4.94) | 4.85 (3.30-4.40) |
| 8 | Fruit girth (cm) | 16.15 (14.10-18.73) | 14.97 (13.50-17.16) | 15.96 (14.18-18.14) |
| 9 | Fruit weight (g) | 61.76 (53.00-83.30) | 48.57 (29.00-75.00) | 52.92 (37.30-75.00) |
| 10 | No. of fruits/plant | 52 (44-68) | 49 (43-64) | 40 (30-54) |
| 11 | No. of pickings | 10 (9-10) | 9 (9-10) | 9 (9-10) |

**Table 3:** Quality Parameters (Mean of two years)

| SN | Quality Parameters | GT-6 | AT-3 (C) | JT-3 (C) |
|---|---|---|---|---|
| 1 | Moisture (%) | 92.34 | 92.42 | 92.32 |
| 2 | TSS ($^0$Brix) | 6.50 | 6.00 | 6.00 |
| 3 | Total soluble sugar (%) | 4.06 | 3.86 | 3.54 |
| 4 | Protein (%) | 0.39 | 0.34 | 0.24 |
| 5 | Acidity (%) | 0.27 | 0.19 | 0.20 |
| 6 | Total Phenol (mg/100g) | 18.89 | 16.76 | 19.02 |
| 7 | Lycopene (mg/100ml) | 4.73 | 3.23 | 3.65 |
| 8 | Ascorbic Acid (mg/100ml) | 21.59 | 18.42 | 19.36 |

**Table 4:** Reaction to major diseases and major pest recorded from 2012-13 to 2016- 17 at Junagadh and Anand centers

| Disease | Year | Incidence (%) | | | |
|---|---|---|---|---|---|
| | | GT-6 | AT- 3(SC) | JT-3 (SC) | DVRT-2(NC) |
| Leaf curl (%) (Junagadh) | 2012-13 | 0.47 | 9.50 | 10.33 | 7.33 |
| | 2013-14 | 1.03 | 10.00 | 8.64 | 5.00 |
| | 2014-15 | 0.76 | 9.45 | 8.36 | 5.17 |
| | 2015-16 | 2.49 | 9.12 | 8.08 | 5.15 |
| | 2016-17 | 7.69 | 15.56 | 5.00 | 3.87 |
| | Mean | 2.49 | 10.73 | 8.08 | 5.30 |
| Leaf curl (%) (Anand) | 2014-15 | 39.22 | 35.00 | 45.00 | 50.00 |
| | 2015-16 | 34.38 | 31.25 | 40.63 | 40.63 |
| | 2016-17 | 3.17 | 6.34 | 14.10 | 1.72 |
| | Mean | 25.59 | 24.20 | 33.24 | 30.78 |
| Leaf damage (%) (Junagadh) | 2012-13 | 8.33 | 12.10 | 16.33 | 9.45 |
| | 2013-14 | 12.53 | 14.30 | 17.51 | 14.32 |
| | 2014-15 | 14.97 | 15.15 | 17.39 | 13.80 |
| | 2015-16 | 11.90 | 13.80 | 17.07 | 12.52 |
| | 2016-17 | 12.93 | 14.14 | 18.38 | 13.52 |
| | Mean | 12.13 | 13.90 | 17.34 | 12.72 |
| Leaf damage (%) (Anand) | 2014-15 | 9.97 | 12.59 | 6.56 | 10.18 |
| | 2015-16 | 5.65 | 8.10 | 7.60 | 8.86 |
| | 2016-17 | 12.31 | 6.75 | 10.72 | 4.57 |
| | Mean | 9.31 | 9.15 | 8.28 | 7.87 |

**Table 5:** Reaction to major insect-pests recorded from 2012-13 to 2016- 17 at Junagadh and Anand centers

| Disease | Year | Incidence (%) | | | |
|---|---|---|---|---|---|
| | | GT-6 | AT- 3(SC) | JT-3 (SC) | DVRT-2(NC) |
| Fruit borer (%) (Junagadh) | 2012-13 | 1.59 | 3.90 | 3.12 | 3.78 |
| | 2013-14 | 1.84 | 4.15 | 2.98 | 3.33 |
| | 2014-15 | 2.49 | 5.75 | 3.43 | 2.60 |
| | 2015-16 | 2.00 | 4.60 | 5.30 | 3.21 |
| | 2016-17 | 1.97 | 5.00 | 5.75 | 3.05 |
| | Mean | 1.98 | 4.68 | 4.12 | 3.19 |
| Fruit borer (%) (Anand) | 2014-15 | 8.35 | 15.28 | 7.12 | 11.00 |
| | 2015-16 | 7.05 | 8.29 | 11.13 | 11.78 |
| | 2016-17 | 10.80 | 5.75 | 8.87 | 4.33 |
| | Mean | 8.73 | 9.77 | 9.04 | 9.04 |

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