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Vindya Sabbineni
Department of Agriculture Meteorology, VNMKV, Parbhani, Maharashtra, India

Khobragade AM
Department of Agriculture Meteorology, VNMKV, Parbhani, Maharashtra, India

Mamatha Koraboina
Department of Agriculture Meteorology, VNMKV, Parbhani, Maharashtra, India

Corresponding Author:
Vindya Sabbineni
Department of Agriculture Meteorology, VNMKV, Parbhani, Maharashtra, India

Quality aspects of tomato as influenced by sowing windows and varieties

Vindya Sabbineni, Khobragade AM and Mamatha Koraboina

Abstract
A field experiment was conducted at Vegetable Research Center, Department of Horticulture, VNMKV, Parbhani to study the effect of weather parameters on quality aspects of tomato. The experiment was conducted in Factorial Randomized Block Design with three replications in *rabi* season of 2015-16 and treatments consists of 4 dates of sowing *i.e.* 26th August 2015 (MW-35), 9th September 2015 (MW37), 23rd September 2015 (MW39) and 7th October, 2015 (MW41) at 15 days intervals and two varieties V_1 (Phule raja) and V_2 (PKM-1), and found that total soluble solid content, acidity were not significantly influenced by either dates of sowing or varieties under the study. However, the ascorbic acid content in the tomatoes was varied among the dates of sowing and between the varieties *i.e* crop sown in D_2 (MW-37) observed highest ascorbic acid content (23.34 mg/100g) and found to be significantly superior over the all other dates of sowing and the var. Phule raja reported highest ascorbic acid (*i.e.*20.38 mg/100g) and significantly superior over the PKM-1.

Keywords: Quality aspects, tomato, sowing windows, varieties

Introduction
Tomato universally treated as 'Protective Food', and a rich source of minerals, vitamins, & organic acids (healthy acid). Tomatoes are important source of Lycopene, Vitamin-A, B & also excellent source of Vitamin-C. The pulp and juice are digestible and blood purifier. This neutraceutical effect of tomato is attributed to 'lycopene' a major carotenoids present in tomatoes. It can be processed into juice, paste and sauce or sold as fresh tomato for salad and pickle ingredient. Ascorbic acid 15 mg to 20 mg /100g edible portion. It is also rich in Citric acid and Mallic acid, Glutamic acid is an amino acid mostly present in tomato. Tomato contains many important minerals like Na, K, Ca, Mg, P, K, Fe, Zn, and Boron. The alkaloid present in tomato is called tamatin and the coloured pigment is called Lycopene. Lycopene content is high at 21 °C. Lycopene appears to be relatively stable during food processing and cooking (Radzevicius *et al* 2009) [6]. Brandon Jewell (2004) [2] reviewed that the conditions that affect plant growth will also affect fruit development, ripening and quality. Temperature, humidity, shading, nutrition, post-harvest O_2 concentration and salinity of irrigation water are currently being researched as potentially influencing fruit softening due to their effects on cell wall structure and integrity, by keeping this in view an experiment has been conducted with the objective to study the effect of weather parameters on quality aspects of tomato.

Material Methods
A field experiment was conducted at Vegetable Research Center, Department of Horticulture, VNMKV, Parbhani, Maharashtra State located at 19^0 16'N latitude and 76^0 47' longitude, 408.50 MSL in *rabi* season 2015-16. The experiment was laid out in Factorial Randomized Block Design with 8 treatment combinations and 3 replications. The treatments comprises of four dates of sowing i.e. 26th August 2015 (SMW-35), 9th September 2015 (SMW-37), 23rd September 2015 (SMW-s39) and 7th October 2015 (SMW-41) at 15 days intervals and two varieties, V_1 (Phule raja) and V_2 (PKM-1) were selected for experimentation.
The experimental plot was medium black cotton soils, with uniform texture and well drained, the plot was ploughed and then harrowed thrice to bring the soil to fine tilth. Raised beds of 6m x1m (L x B) size were prepared. The upper layer of 5 cm of each raised bed was mixed with equal quality of well rotten farm yard manure (FYM) and sieved soil. Seeds were sown in rows at 10 cm apart on 4 different dates of sowing at fifteen days intervals.
Healthy and uniform seedlings of Forty days old were selected and transplanted at each scheduled date of transplanting, before each transplanting light irrigation was given to avoid damage to roots during uprooting. Seedlings were transplanted on one side of ridge in the plots.

Life saving Irrigation was given immediately after each transplanting and continued till the seedlings were established. The gap filling was done with uniform and healthy seedlings.

Nitrogen, Phosphorus and Potash fertilizers were applied through Urea, Single super phosphate (SSP) and murate of potash (MOP), respectively @ 100 kg N ha^{-1}, 50 kg P_2O_5 ha^{-1} and 50 kg K_2O ha^{-1}. Nitrogen in the form of urea was applied in two split doses i.e. ½ dose of N and full dose of P_2O_5 and K_2O was applied one day before transplanting of seedling as basal. Remaining dose of nitrogen was applied one month after transplanting. Plots were irrigated immediately after the application of fertilizers. Inter cultivation operations like gap filling, irrigation, weeding, hoeing, need based plant protection measures and stalking were taken up. Fifteen fruits from five observational plants from each treatment were selected after 90 days after transplanting for observation of quality parameter.

Total soluble solids (%)

Erma Japan hand refractrometer was used to measure the total soluble solids of 15 selected fruits of each treatment. (Kader et al. (1978) [4].

Ascorbic acid content (%)

Ascorbic acid content of all the treatment were estimated by using 2, 6 Di- chloro phenol indophenols visual titration method and was expressed in per cent (A.O.A.C., 1990) with computed by using following formula.

$$\text{AA=Vit. C (mg/100gm)} = \frac{Y}{X} \times \frac{\text{Vol. of extract}}{\text{Vol. of extract taken for titration}} \times \frac{100}{\text{Wt. of sample}}$$

where,

Y= 1mg AA X= Dye factor

Acidity content (%)

Sample was titrated against 0.1 N NaOH, using Phenolphthalein indicator, change in color was observed from pale colour to light pink colour. And expressed in percentage calculated by using the formula.

$$\% \text{ Total Acidity} = \frac{\text{Titrate} \times \text{Normality of alkali} \times \text{Volume made up} \times \text{Equivalent weight of acid} \times 100}{\text{Volume of sample taken for estimation} \times \text{weight or volume of sample taken} \times 100}$$

Weather conditions

The weekly meteorological data pertaining to rainfall ,temperature and relative humidity prevailed during crop growth period from September 2015 to March 2016 was recorded at Central Meteorological Observatory, V.N.M.K.V., Parbhani. The total rainfall received during the crop growth period was (155.8 mm) over 16 rainy days. The average maximum temperature of 31.2 ^{0}C and average minimum temperature of 15.2 ^{0}C was recorded. Morning and evening mean relative humidity (RH) was 78% and 37%, respectively. The mean maximum BSS during crop growth period was 7.6 hrs. and mean evaporation during crop growth period was 5.3 mm.

Results

Total soluble solids, ascorbic acid content and acidity are quality parameters of the tomato hence, the influence of the dates of sowing on quality aspects was analyzed by the standard methodologies and the results implicated that

Total soluble solid (°B)

Mean total soluble solid content was not significantly influenced by different date of sowing windows but more TSS was reported in first date of sowing *i.e* SMW-35 (4.6°B) than other treatment on other hand lowest TSS was reported in D_4 (MW-41) (4.1°B), Between the varieties of the experimentation non-significant variation is observed, the variety Phule raja having more total soluble solid of (4.5°B) than PKM-1 (4.2°B).

Ascorbic acid content (mg/100g)

The mean ascorbic acid content was influenced significantly by different sowing windows and varieties. Second date of sowing (SMW-37) reported more ascorbic acid content *i.e* 13.3 mg/100g while lower ascorbic acid found in first date of sowing (MW-35) *i.e.*11.1mg/100g and between the varieties under the study Phule raja having significantly more ascorbic acid content (12.7 mg/100g) than PKM-1 (11.5 mg/100g). Interaction effect between date of sowing and different variety was found to be significant and the similar trends in the results was notified by Chakraborty (2007) [3]

Acidity Content

Acidity content was not significantly influenced by sowing windows and varieties. Mean acidity content was more in first date of sowing (SMW-35) (*i.e.*1.5) than other treatments, while less mean acidity found in fourth date of sowing (SMW-41) (*i.e* 1.2), between the varieties acidity content was reported more in variety Phule raja (1.3) than PKM-1 (1.4).

Table 1: Mean Quality parameters as influenced by sowing windows and varieties of tomato

Treatments	TSS (°B)	(AA mg/100g)	Acidity
Dates of sowing			
D_1-MW-35	4.6	11.1	1.5
D_2-MW-37	4.5	13.3	1.3
D_3-MW-39	4.4	11.5	1.4
D_4-MW-41	4.1	11.8	1.2
SE+	0.22	0.24	0.1
CD at 5%	N.S.	0.74	N.S
Varieties			
V_1-Phule Raja	4.5	12.7	1.3
V_2-PKM -1	4.2	11.5	1.4
SE+	0.15	0.17	0.07
CD at 5%	N.S.	0.52	N.S
Interaction (D×V)			
SE+	0.31	0.34	1.57
CD at 5%	N.S.	1.05	N.S

Sowing dates–D_1 (MW-35), D_2 (MW-37), D_3- (MW-39), D_4- (MW-41) Variety-V_1-(Phule Raja), V_2-(PKM-1)

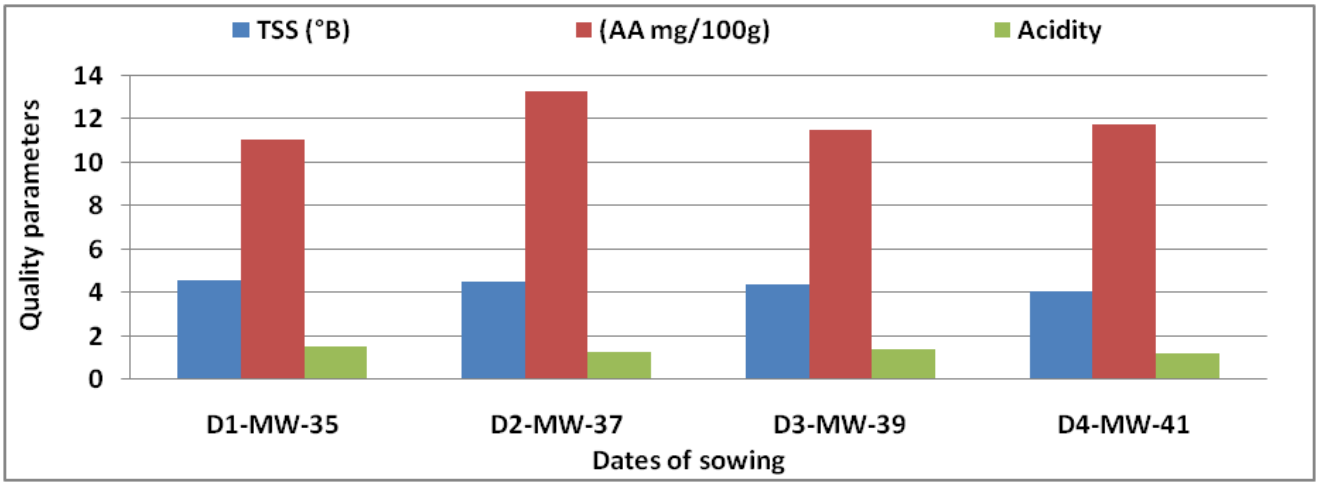

Fig 1: Quality aspects of tomato as influenced by sowing windows

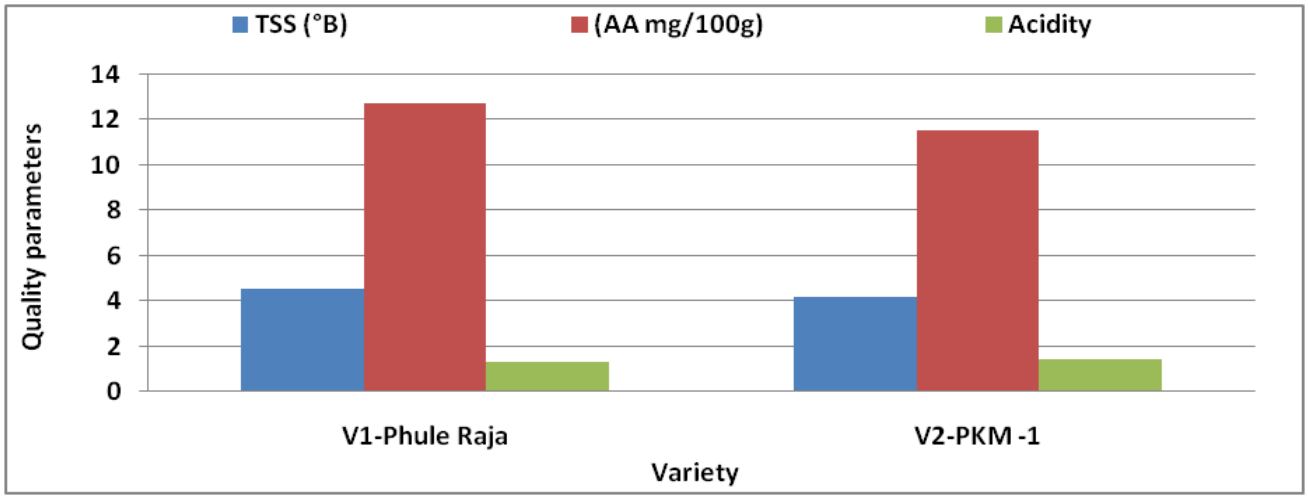

Fig 2: Quality aspects of tomato as influenced by varieties

Conclusion

Based on the results it can be concluded that total soluble solid content and acidity were not significantly influenced by either dates of sowing or varieties under the study, However, the ascorbic acid content in the tomatoes was varied among the sowing windows and between the varieties *i.e* crop sown on D_2 (MW-37) reported highest ascorbic acid content (23.34 mg/100g) and found to be significantly superior over all other dates of sowing and the Phule raja variety reported highest ascorbic acid (i.e.20.38 mg/100g) and significantly superior over PKM-1

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