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P Bhuvanaswri
Department of Agronomy, Agricultural College and Research Institute, Madurai, Tamil Nadu, India

Dr. V Geethalakshmi
Department of Agronomy, Agricultural College and Research Institute, Madurai, Tamil Nadu, India

Dr. T Ragavan
Department of Agronomy, Agricultural College and Research Institute, Madurai, Tamil Nadu, India

Dr. V Krishnamoorthy
Department of Horticulture, Agricultural College and Research Institute, Madurai, Tamil Nadu, India

Dr. T Sivakumar
Department of Crop Physiology, TNAU, Coimbatore, Tamil Nadu, India, India

Correspondence
P Bhuvanaswri
Department of Agronomy, Agricultural College and Research Institute, Madurai, Tamil Nadu, India

Influence of planting dates and nitrogen doses on vegetative growth of tomato

P Bhuvanaswri, Dr. V Geethalakshmi, Dr. T Ragavan, Dr. Krishnamoorthy and Dr. T Sivakumar

Abstract
A field experiment was conducted at Ponnaniyar, Trichy, Tamil Nadu to investigate the performance of planting dates and nitrogen levels on tomato growth and yield during *Rabi,* 2016-17. The treatment combination comprised of four planting at bi-weekly interval [November 1st (D_1), November 15st (D_2), December 1st (D_3) and December 15st (D_4)] and three nitrogen levels [100 % RDN (N_1), 75 % RDN (N_2) and 125 % RDN (N_3)]. The treatments were evaluated in factorial concept of RBD and replicated thrice. It was found from the present investigation that growth and yield attributes were higher in early planted crops November 1st (D_1) coupled with 125 % RDN (N_3).

Keywords: Tomato, planting date, nitrogen levels

Introduction
Agriculture is the mainstay of the Indian economy, as it constitutes the backbone of the rural livelihood security system. Application of meteorology to agriculture is essential, since every facet of agricultural activity in an area depends on its weather. Climate change and climate variability are real concerns for the sustainable development of agriculture worldwide. While agriculture is a complex sector with the agricultural still being dependent on climate, because seasonal patterns of light, temperature, water, air humidity and carbon dioxide concentration (CO_2) are the main determinants for crop growth and consequently for crop productivity (Kemausuor *et al*., 2011; Kotir, 2011; Lee *et al*., 2012) [2, 3]. The knowledge about the impact of climate change on horticultural crops is much limited. Addressing problems of climate change is more challenging in horticulture crops compared to annual food crops. A significant impact of globalization on horticulture has been an increasing demand for quality improvement and the wider adoption of quality standards for fruit and vegetables. Horticulture contributes about 30 per cent to agriculture GDP, using only 17 per cent of the land area (State of Indian Agriculture 2015-16, GOI). It is estimated that the area under horticulture crops grew by about 2.7 per cent per annum with the increased productivity of 37 per cent between 2004-05 and 2014- 15. Among the horticultural crops in India, vegetable occupies an area of 9.5 million hectares during 2014-15 with a total production of 167 million tonnes with the average productivity of 17.6 tonnes per hectare.
Tomato (*Lycopersicon esculentum* Mill.) is one of the most versatile solonaceous vegetable crops widely cultivated in the world. It has considerable value in both fresh as well as in processed forms. Tomato is always in great demand to meet the requirement of culinary and processing industry. Considering the demand, productivity of tomato the need to boosted. Tomato being a sensitive crop, easily been subjected to weather fluctuations. Hence this investigation is framed to study the significance of meteorological parameters with the implementation of agricultural practices involved in the production, as adaptation strategies to forecast the climate change and assess the impact of weather on tomato productivity.

Materials and Methods
The experiment on PKM 1 tomato was conducted at farmer's field near Ponnaniyar dam, of Thiruchirappalli district during *Rabi* 2016-17 with different planting dates and N levels. The experimental site is situated at 10.51° N latitude and 78.21° E longitude at an altitude of 78.17 m above Mean Sea Level (MSL). The place enjoys a moderate climate and receives a normal rainfall of 850.6 mm in a year with mean maximum and minimum temperature of 37.4° C and 29.2° C respectively. The agricultural lands in the region are dominated by two major

soils *viz*., Sandy clay loam and clay loam soil which taxonomically comes under *Ustic* and *Isohyper thermic*. The treatment combination comprised of four planting at bi-weekly interval [November 1st (D_1), November 15st (D_2), December 1st (D_3) and December 15st (D_4)] and three nitrogen levels [100 % RDN (N_1), 75 % RDN (N_2) and 125 % RDN (N_3)]. The treatments were evaluated in factorial concept of RBD and replicated thrice. As per the recommendation, viable seeds of tomato @ 300g ha^{-1} were used for sowing. Seeds were sown in protray. Each cells were dibbled with two seeds. The field was ploughed thrice with cultivator to obtain a fine tilth and was leveled uniformly and raised beds were formed. Twenty eight days old seedlings were transplanted to the main field with a spacing of 60cm X 40cm. During the research period, irrigation was given to the field using bore well water. The biometric observations on growth attributes was recorded on 45 and 90 DAT and the yield attributes were recorded at the time harvest.

Results and Discussion

The results obtained from the present study as well as discussions have been summarized below and presented in Table 1

The analysis of variance showed that the main effect of planting dates significantly affected plant height. The early planted crops D_1 (November 1) grew taller than the other planting dates. Regarding nitrogen (N) levels, significant taller plants were produced from N_3 (125 % RDF). The maximum number of branches was recorded from the early planted crops (D_1) and the least number of branches was counted in the late planted crops of D_4 (December 15). Application of N at the rate of 94 kg ha^{-1} (N_3:125 % RDF) significantly recorded the maximum number of branches, whereas the least number of branches (3.52, 4.65) was counted from plots that received 56 kg ha^{-1} of N (N_2:75 % RDF). LAI was significantly higher in November 1st planted crop (D_1). Early planted (D_1) crop at 90DAP accumulated significantly the maximum dry weight (Fig 1) of 45.58 g $plant^{-1}$, whereas the lower dry matter (38.49 g $plant^{-1}$) was produced in D_4 (December 15). The main effect of N doses significantly influenced the dry matter production at all the growth stages of tomato. The treatments applied with 94 kg ha^{-1} of N (N_3) recorded significantly highest dry matter production (Fig 1).

The findings from the present investigation revealed that early planted crops applied with 125 % RDN grew taller as well produced maximum number of branches, LAI and attained higher dry weight throughout the crop growth phases comparatively. The vegetative growth gradually reduced with delayed planting dates from the optimum time of environmental conditions. This was in line with the results of Mutkule *et al.,* (2018), who reported that transplanting date greatly influenced the regulation of plant architecture as well as plant height of tomato. Increased application of N fertilizer enhanced the plant growth by improving the mitotic activity of cell division, expansion and elongation which finally improved the vegetative phase of the crop. The number of branches per plant has positive relationship with yield. Plant height and number of branches increased the photosynthetic efficiency and hence enlarged the leaf area index with maximum dry weight. The results of this experiment are in line with the findings of Ahmed *et al.* (2012) [1].

Conclusion

From this study it was proved that the early raised crop achieved potential yield, and the sowing window optimized for aerobic rice during *Rabi* season was September 12th. It was visualized that one per cent KCl hardened treatments was not effective during *Rabi* season because the treatments did not undergo the water stress condition.

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