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ORIGINAL RESEARCH ARTICLE



## Effect of transplanting dates on yield attributing characters of tomato (*Lycopersicon esculentum* Mill.) variety

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### ABSTRACT

The research was conducted on the field of Chagunarayan municipality (Tathali) from 23<sup>rd</sup> March to 17<sup>th</sup> June 2020 to observe the effect date of transplanting on attributing character of tomato Genotype. 23<sup>rd</sup> March, 6<sup>th</sup> April, 21<sup>st</sup> April, and 6<sup>th</sup> May are the four sowing dates laid out in the RCB design with three replications. And the data were observed in 10 days intervals for each planting time. The attributing character like plant height, leaf number, no of branches shows positive impact for early shown plant species, and development for later sowing date shows decreasing result. Therefore, the species planted before the planting time is beneficial from an economic point of view where the plant shows a positive growth rate on attributing character, and it can be considered for further research programs as well.

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### INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is deliberated as one of the utmost widespread vegetables amongst multiples vegetables grown up throughout the world (Shah *et al.*, 2021) and from a total farmed area of 4.85 million ha, current production is 182.3 million tons of fruits per year (FAOSTAT, 2019). Because of its amassed demands in day-to-day life quantities of tomato is being increased among growers as well as consumers. As it provides several vitamins, minerals, hormone precursors, and pigment lycopene, in today's generation it is being considered an indispensable component of the human diet (Boamah, 2010; Kallo 1993). In Nepal, an amiable atmosphere for the production of tomatoes is considered from October to March. Varieties planted in October with a suitable combination of varieties and ecological conditions contribute to the maximum yield of the Tomato (Jubaidur Rahmana, 2020). The Winter season was considered as mainly the growing season for tomatoes. However, nowadays it is also grown in the warm season. Study shows that high-temperature results in reductions in the production of flower and bud and is also the cause for flower drop. However, variances between varieties in the setting of

fruit under zenith temperature have been stated (FAO, 1990). Went became able to identify that the fruit set was copious solitary when the temperature ranges from 15°C to 20°C at night (Went, 1944). Throughout the world, the tomato is being grown as an annual crop using dissimilar light intensities, greenhouse designs temperatures, and apparatus that conclude yield differences throughout the various regions of the world. The study of favorable date of transplanting for tomato is necessary to acquire early as well as higher harvesting and yield of tomato (Emami, 2014). The tomato is a warm-season crop that can be grown at the temperature of 20-25°C, at the temperature: 21-24°C, the tomato increases admirable quality red color. Tomatoes are principally summer crops, but by extra inter-cultural efforts and management practices, they can be cultivated throughout the year. Rotation of tomatoes with non-Solanaceae crops can be the most effective and efficient management practice for a high production rate (Baby, 2013), where crop rotation enhances productivity and profit while also allowing for sustainable production and crop optimization (Shah *et al.*, 2021). In the world, it subjugates about 4.73 million hectares area with a production of 163.96 million tons (FAO, 2016). Tomato is considered the 3<sup>rd</sup> largest vegetable crop in the world consumed

after potato and onion.

In Nepal, tomato production is being frequently pretentious due to contrary ecological conditions. Records show that in some parts of the world night temperature drops below 5-6°C results in notable yield loss in tomatoes (Faruk Hossain, 2014). Thus late sowing or transplanting of tomatoes might persuade cold and freezing injury which display a noteworthy reduction in together growth, development, and tomato yield (Shahidul Islam, 2017), and causes late blight of tomato (*Phytophthora infestans*) which is favored by wet, dewy, high humidity weather and moderate temperatures of around 50 to 80°F (Ghorbani *et al.*, 2005). Therefore, to control the pathogenic activities proper management practices as maintaining soil capacity by enhancing nutrient control, proper use of fungicide and chemical fertilizer should be implemented (Shah *et al.*, 2021). Often early sowing and transplanting times do not produce berry much quicker than planting in the late season when the temperature is harsh (Dufault, 1990). The temperature can be considered as evidence in the fruit set. Crime reported that a low temperature of 7.2°C and a high temperature of 26.6°C in certain varieties had produced more flexible circumstances for fruit sets concerning the varietal temperature interfaces (Curme, 1992). For the production of crops, climate change is a considered foremost threat not only in developing countries like Nepal but also in developed country as well. Tomato consists of berry types of fruits with changeable bulk and weight found in diverse varieties that can donate to harvest. Tomato has a huge amount of water (%), calcium (%) for bone and teeth strength, and Niacin to fulfill vitamin requirements. Tomato is also a phytomedicinal plant, including flavonoids, vitamins, carotenoids, and phenolic compounds [hydroxycinnamic acid derivatives and flavonoids], minerals, and phenolic acid, among other things (Shah *et al.*, 2021). These all are pivotal for the metabolic activities of human beings (Olaniyi, 2010). Keeping in view, this investigation

was conducted to study the effect of transplanting dates on yield attributing characters of tomato (*Lycopersicon esculentum* Mill.) variety.

## MATERIALS AND METHODS

The research was conducted in the field of Chagunarayan municipality (Tathali) 27.6786° N, 85.4814° E, located in Chagunarayan municipality 08 Bhaktapur of province no. 3 in normal conditions from 23<sup>rd</sup> March to 10<sup>th</sup> June 2020. Planting time was varied and planted in 15 days intervals and data was taken at 10 days intervals.

### Agro-meteorological features

The experimental location has a zenithal temperature of 30°C and the rock-bottom temperature recorded was 21.3°C. On average relative humidity (RH) was 78% at the leading week followed by a gradual increase in relative humidity in upcoming weeks. At the end of the research duration, the maximum relative moistness of 88% was recorded. A hygrometer was used to note the temperature and relative humidity.

### Experimental setup

The experiment arrangement was arranged in an RCBD design with 4 treatments and three replications. A total of 12 treatments of the Srijana variety of tomato were studied (Table 1).

### Statistical analysis

All the collected data were tabulated according to categorical and continuous variables. Initially, the recorded data were entered using Microsoft Excel 2016 and the data were then processed using the graphs. All the figures and graphs were prepared in Microsoft Excel 2016. The manuscript was prepared by using Microsoft word 2016.

**Table 1.** Activities during the research period.

S.N.	Date	Activities done
1	23/03/2020	Tagging and data collection for 1 <sup>st</sup> transplanting
2	01/04/2020	Data collection and spraying malathion
3	06/04/2020	2 <sup>nd</sup> transplanting
4	11/04/2020	Tagging and Data collection
5	21/04/2020	3 <sup>rd</sup> transplanting Data collection & Irrigation
6	26/04/2020	Tagging and suckers clearing
7	01/05/2020	Data collection and spraying malathion
8	06/05/2020	4 <sup>th</sup> transplanting, Data collection & Irrigation
9	09/05/2020	Tagging and suckers clearing
10	11/05/2020	Data collection and spraying Dithane
11	15/05/2020	Suckers clearing and staking
12	21/05/2020	Data collection
13	25/05/2020	Suckers clearing and staking and Spraying Dithane
14	31/05/2020	Data collection
15	03/06/2020	Sucker clearing and staking
16	10/06/2020	Data collection and spraying Dithane for the blight of tomato
17	10/06/2020	Data collection

## RESULTS AND DISCUSSION

For the proper production, tomato cultivation requires good management strategies like proper irrigation where it determines the major water content in the fruits, balanced utilization of fertilizers and manure which helps in proper growth and development of a plant, proper utilization of pesticides, and fertilization for optimum production rate. Irrigation was given every day until the plant is established along with water-soluble fertilizer in it. For Improving the wide production rate certain range of management tactics as applying fertilizers intelligently, and incorporating irrigating with competent approaches can assist to optimize overall output (Tiwari *et al.*, 2020). After the establishment of the plant, NPK was added at the ratio of 200:250:250 kg/ha. Nitrogen was applied in three split doses i.e.: establishment phase, flower initiation phase, and flowering and fruit setting phase. Shah *et al.* (2021) demonstrated that a balanced ratio of fertilizers N:P:K helps in greater productivity of the plants. Tomato production has recently been declining owing to a variety of causes, including pests and disease, so proper management tactics should be made (Hogea, 2020). During the experiment whitefly, fruit fly, tomato fruit worm, aphid, mites, leafminer, thrips, leafhopper, and mealybug were seen in common. Fruit flies and aphids were the most devastating pest species in many crops, causing serious economic loss and rendering fruits unsuitable for consumption (Tripathi *et al.*, 2020). Therefore, proper pesticides and fungicides with proper doses are recommended in a different stage of production. Therefore, the overall management strategies are required for the proper growth and development of the plant, where proper management gives proper height to the plant, whose helps in establishing proper vegetative growth of plants, number of leaves helps in the photosynthesis, branches, flowers for a greater number of fruits, and fruits for more production rate.

### Plant height

The height of the plant goes on increasing for those varieties that are planted before the planting time. Late shown species show a detrimental effect on height. In 2007 Srivastava conveyed that time of transplanting had an abundant influence on the growth, regulation of relation of the plant including the height of the tomato (Srivastava, 2007). Among multiple periods of planting, the highest vegetative growth was noticed at an early stage of transplanting (Singh, 2005). The data shows the positive increment of height during the initial sowing date which gets decreased on late sowing dates (Figure 1).

### Number of leaves/plants

Some leaves go on increasing so that the plant can accomplish the activities like photosynthesis for the growth and development of the entire plant (Figure 2). However, after the removal of suckers, the leaf number is persistent. Hossain *et al.* (1986) from his study concluded the time of transplanting influences the total number of plant leaves. Hossain (1986) reported that the number of leaves gets increased during the initial period of cultivation but later after training and pruning the number remains constant.

### Number of branches/plants

Even though the number of branches is increased in all of the sowing dates of the tomato in the form of a sucker, it can be visualized that there is a considerate reduction in branches in the late sown plant than that of the early sown plant. For healthy branches early sown plants can be recommended. A tomato that is transplanted later than the normal transplanted plants show a gradual decrease in the branch's formation of the Tomato (Mira, 2011). The graph shows that the branches number goes on decreasing for late sown plants (Figure 3).

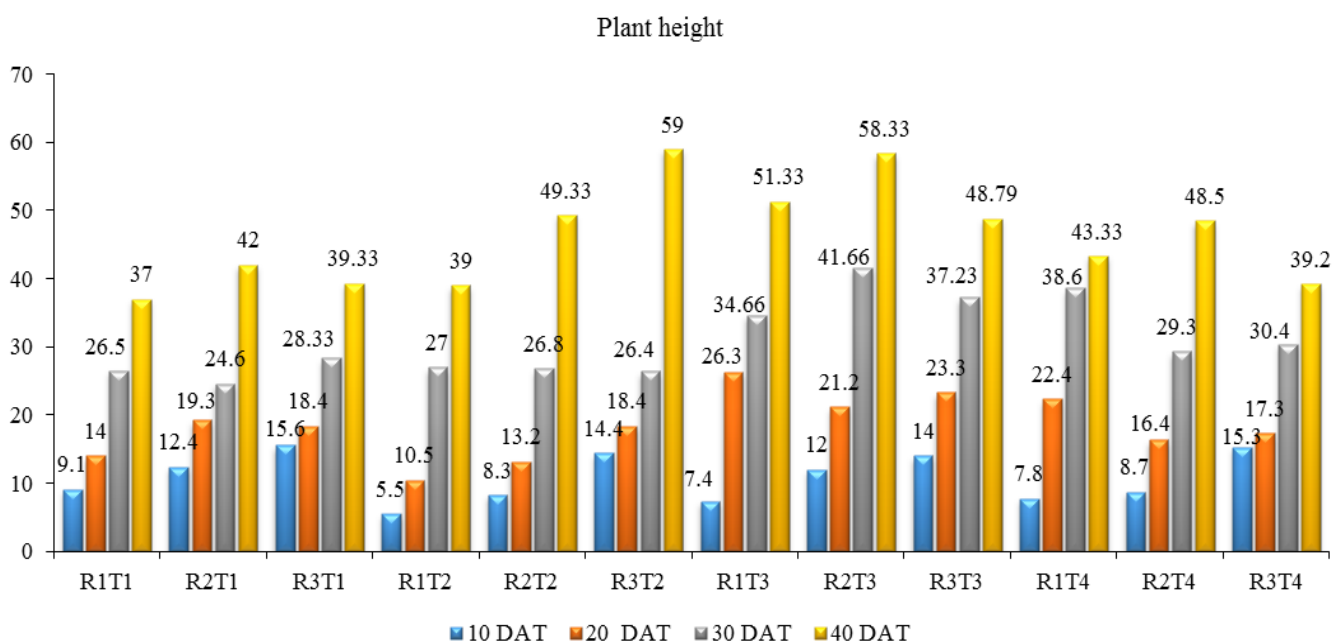


Figure 1. Showing height difference in tomato during the study.

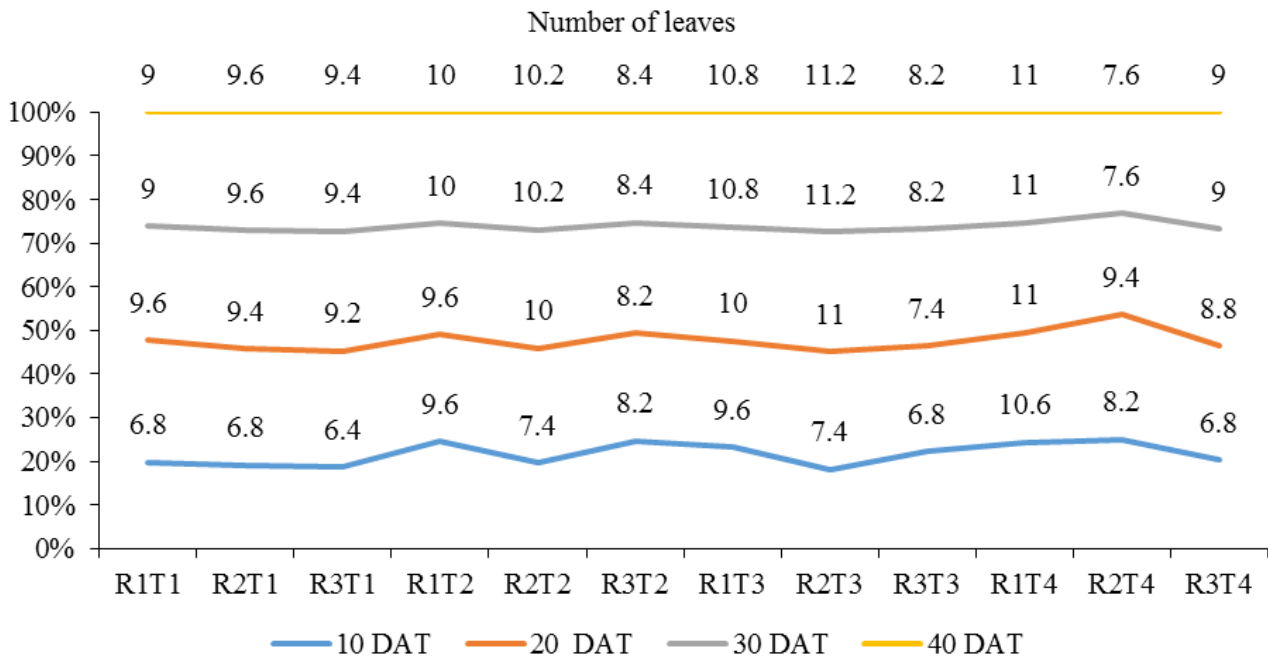


Figure 2. Showing no leaves in tomatoes in different planting duration.

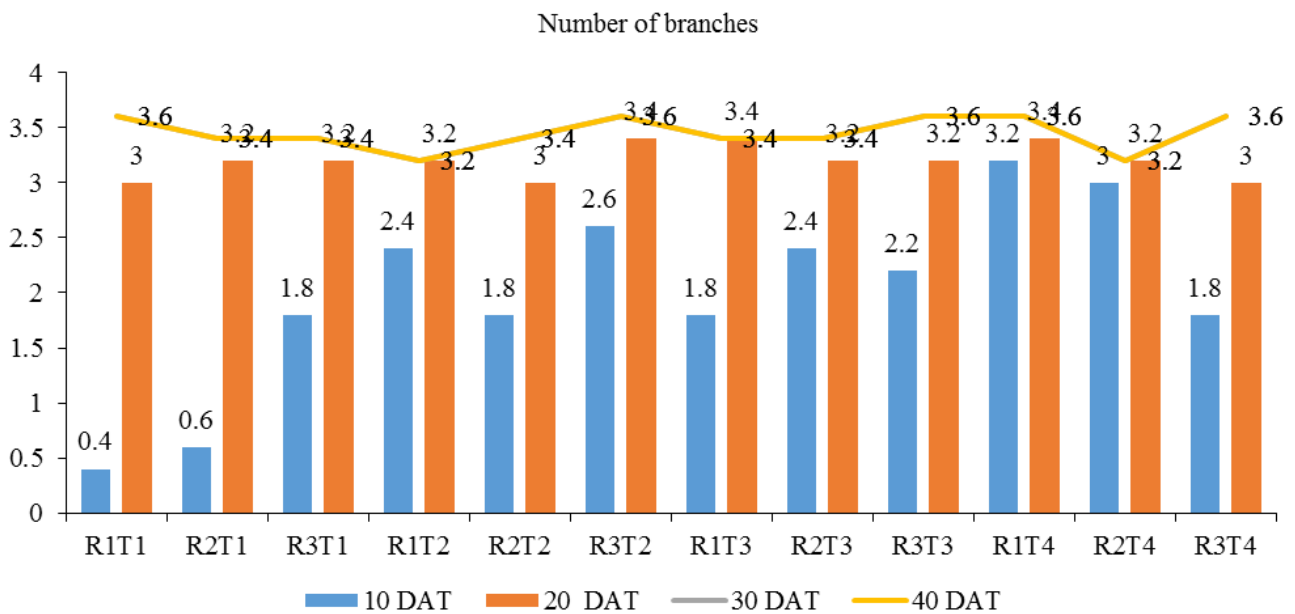


Figure 3. Showing the number of branches in tomatoes during the study.

**Number of flowers/plants**

Even though temperature during the initial time of sowing was minimum than the requirement, disease infestation was low increasing the flowering intensity sowing the positive indicator for enhancement of the productivity as compared to that of the late sown plant. Early sowing of tomatoes has also shown the influence of the total number of flowers in a plant. The tomato seedling that is transplanted before the normal time is not affected by disease and pests and produce more flower in comparison to that of the later transplanted tomato seedlings (Hossain, 1986). The plant is shown earlier and late plantation has a positive effect on flower initiation while normal sowing date doesn't show such a positive impact (Figure 4).

**Number of fruits/plants**

The tomato plant planted before normal sowing days has shown less detrimental effect by disease infestation resulting in higher flowering intensity, proceeding to a higher number of fruits and larger size of those fruits. Sowing the plant before that of the normal planting season has a considerable increment in the Yield of the tomato (Tongova, 1975). Drost and Price in 1991 reported the fruit number reducing that are transplanted late as compared to that of the early sowing plant (Drost, 1991). Similarly, Madhumathi and Sadarunnisa in 2013 also conducted research and identified the maximum length of fruit (Madhumathi, 2013). The study shows that fruit numbers have positive analysis for early and normally sown plants and it gets reduced for late sown plants (Figure 5).

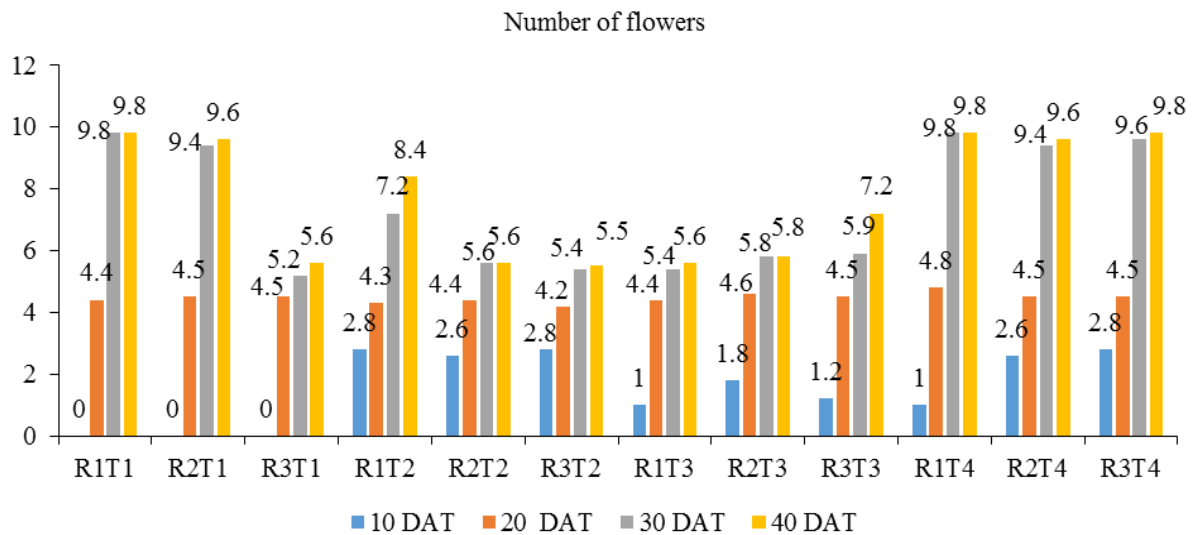


Figure 4. Showing number of flowers of tomato during the study.

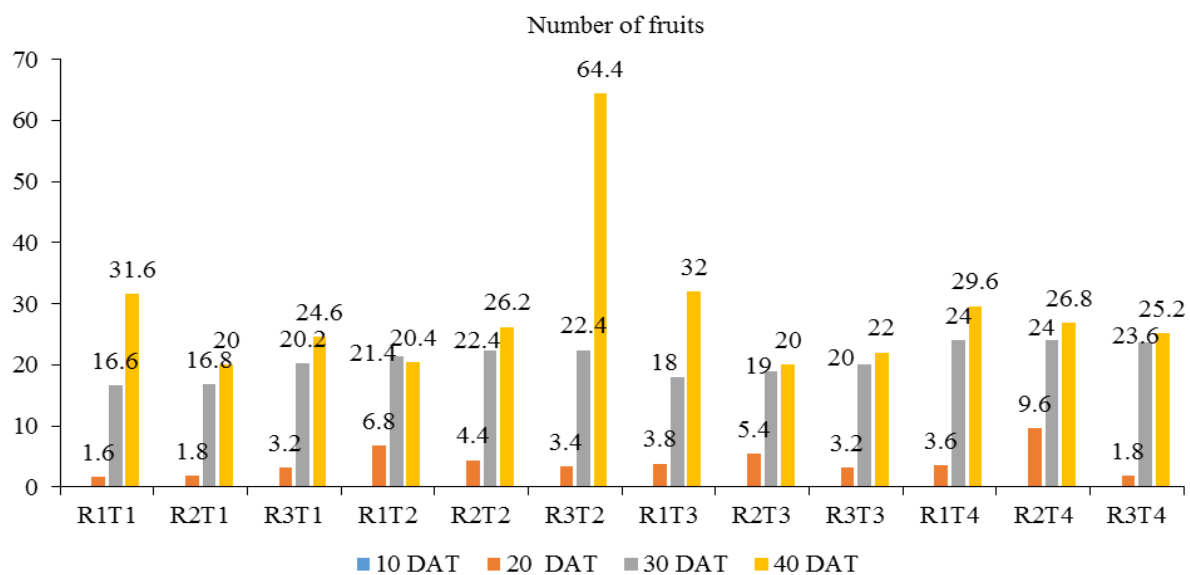


Figure 5. Showing some fruits of tomato during the study.

## Conclusion

The results concluded that tomato yield was considerably exaggerated by dissimilar sowing dates and transplanting dates for the Srijana variety of tomato. It can be visualized that it is beneficial to plant the tomato varieties before the main planting season to avoid the harsh environmental condition, infestation of disease and pests, and increase productivity as well. The attributing characters like plant height, branches show a positive indicator for early sowing dates and normal sowing dates than compared to late sown plants.

## Conflict of interest

The author of the research affirmed no encounter of attentiveness.

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