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IMPACT OF TREATED WASTEWATER AND FRESH WATER ON GROWTH AND YIELD OF TOMATO (*LYCOPERSICON ESCULENTUM*) AT DISTRICT-JALGAON, MAHARASTRA

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Abstract–A study was carried out in Maharashtra's Jalgaon District to investigate the effects of two water sources on the growth and yield of tomatoes (*Lycopersicon esculentum*). The irrigation water came from two sources: treated wastewater and freshwater. For three months, the quality of these sources was monitored (2018). Samples from both sources were collected and sent to the laboratory for analysis. For three months, each water source was used to irrigate tomatoes planted in the field using a Split Plot Design (SPD) as the experimental design. The treatments consisted of three replications of treated wastewater and freshwater. Plant height, number of branches, number of leaves, number of flowers, and number of fruits were all measured during this time period. The results show that treated wastewater was also used for irrigation and yielded 01-05% less than freshwater yield. As a result, wastewater containing appropriate plant protection measures was found to be suitable for the irrigation of tomato crops.

INTRODUCTION

Over the last few decades, rapid urban growth has resulted in increased demand for potable water. As a result of this growth and associated industrialization, near-urban surface water resources are typically depleted or of poor quality. Certain areas of high water usage for agricultural purposes may deplete local water supplies to meet further increasing demand, necessitating an integrated approach to water resource management that includes wastewater reclamation and reuse. The use of treated wastewater for irrigation of plants and crops is becoming more common around the world. With the increasing scarcity of freshwater resources in arid and semi-arid regions, but the ever-increasing demand for more efficient food production to feed the world's growing population, wastewater is becoming a much more widely recognised resource.

Water reuse is one solution to insufficient agricultural water supplies that has become increasingly popular in the last decade. Reusing treated wastewater reduces effluent discharges into receiving waters while also providing a consistent water supply for applications that do not require high-quality water, freeing up limited potable water resources. Wastewater reuse is advantageous for a variety of reasons, including water scarcity in arid and semi-arid areas, the high energy cost of advanced wastewater treatments, and the previously mentioned surface water pollution caused by wastewater effluent direct discharge.

Tomato *(Lycopersicon esculentum)* is a member of the family Solanaceae. It is grown all over the country. The fact that wastewater contains high levels of nutrients reduces the need for and cost of fertilisation. Tomatoes can grow in a variety of soils and climates. They dislike high temperatures and high humidity. Well-drained soils with a high organic content are required. Traditional farmers' contribution to tomato production is not optimal, according to Qasem and Judah (1985), because most of them cannot afford modern technology and expensive chemical inputs. It has rarely been possible to identify the best source of water for irrigating tomatoes in order to increase yield. This study is part of a larger study on the use of two

types of water for tomato irrigation. The goal of this study is to determine the effect of treated wastewater and fresh water on tomato growth and yield (*Lycopersicon esculentum*).

MATERIALS AND METHODS

The study area: The experiment was carried out at Jain Valley, Jain Irrigation Systems Ltd., and Jalgaon (Maharashtra). The Jain Valley is located at 21° 05' N latitude, 75° 40'E longitude, and 209 m above mean sea level. The climate in the area is semi-arid, with an annual rainfall of 690 mm. The laboratory test and field evaluation were carried out in the Jain Valley.

Experimental design: The Split Plot Design (SPD) was used on tomatoes for two water treatments: treated wastewater and freshwater under a drip irrigation system. The experimental unit was 6x3 m in size, with three replications. Each plot had 80 plants, for a total plant population of 4320. The plants were 30x60 cm apart. For data collection, four plants from each plot were sampled and tagged.

Land preparation: In December 2017, the land was cleared and ploughed. In January 2018, harrowing was performed to remove any unwanted weeds and to level the land for good seedling establishment.

Planting materials: The variety of tomatoes used was *Syngenta 1389*.

Nursing and Transplanting: In January 2018, tomato seeds were planted in raised beds. In the third week, the seedlings were transplanted to the experimental field.

Weeding: Weeds were kept at bay by hand weeding with hoes and cutlasses on a regular basis.

Data collection: The plant growth and yield data were taken on the sampled tagged plants monthly for a single trial. The following plant growth and yield parameters were measured:

- Plant height is measured with a tape measure from the plant's base to the tip.
- When the tomato began to bear leaves, the number of leaves per plant was counted.
- When the tomato plant began to bear branches, the number of branches per plant was counted.
- When the plants began to bear flowers, the number of flowers per plant was counted.
- When the plants began to fruit, the number of fruits per plant was counted.
- Fruit weight: The fruit weight of tomatoes were determined using a weighing balance after 45, 60, and 90 DAS.

Irrigation scheduling: The irrigation interval was one day, from the day of transplanting to the day of harvesting.

Method of analysis: Analysis of Variance (ANOVA) was conducted on the data.

Treatments: The treatments comprised irrigating with the following: 1. Treated wastewater (W1) 2. Freshwater (W2)

Table of nine treatment

Treated wastewater (W1)	Freshwater (W2)
T1 – A30 B30	T2 – A30 B40
T3 – A30 B50	T1 – A30 B30
T2 – A30 B40	T4 – A40B30
T5 – A40 B40	T3 – A30 B50
T4 – A40B30	T6 – A40 B50
T7 – A50 B30	T5 – A40 B40
T8 – A50 B40	T9 – A50 B50
T9 – A50 B50	T 7 – A50 B30
T6 – A40 B50	T8 – A50 B40

There are nine treatments based on Split Plot Design (SPD) were used on tomatoes for two water treatments: T1- treated wastewater and T2- freshwater with two types of lateral line 1. Jain turbo excel (A), 2. Jain turbo line (B) with three emitters spacing 30, 40, and 50 under a drip irrigation system. Where Jain turbo excel is shown by the A alphabet and the Jain turbo line is shown by the B alphabet. Treatments were randomized with three replications of both main treatments.

RESULTS AND DISCUSSION

Plant height: Mean plant height of the 15,30,60 and 90 DAS is shown in Fig. 1; the maximum height was obtained at 34, 72, 112, and 110 cm from tomatoes irrigated with Fresh water in 15,30, 60, and 90 DAS. Tomato irrigated with treated wastewater on the

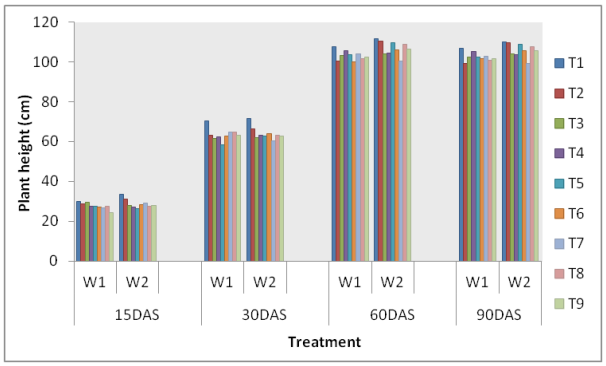

Fig. 1. Plant height in cm

same days resulted in minimum plant height is 24,58,100 and 99 cm. There were, however, slightly differences between the mean plant heights in both sources of water.

Number of leaves per plant: Plants irrigated with T1 recorded a higher mean number of leaves in each DAS of both water sources. The least mean number of leaves was obtained from plants irrigated with T7, and T8. The mean number of leaves obtained by plants irrigated with W2 was slightly higher than the plants irrigated with W1 (Fig. 2).

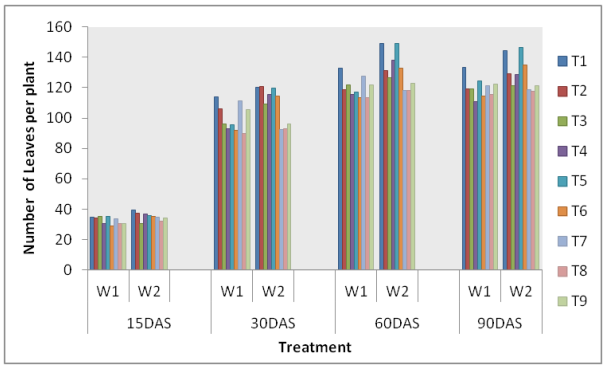

Fig. 2. Number of leaves per plant

Number of branches per plant: Plants irrigated with W2 recorded a higher mean number of branches than the plants irrigated with W1. The least mean number of the branch was obtained from plants irrigated with W1T3 in 30 DAS. The mean number of branches obtained by plants irrigated with W1 and W2 shows the highest value is 11 and 12 in 90 DAS (Fig. 3).

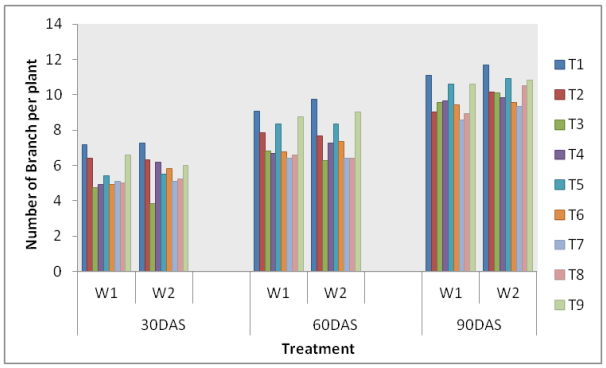

Fig. 3. Number of branches per plant

Number of flowers: The least mean number of flowers was obtained from plants irrigated with W1T5 in 30 DAS and the maximum number of flowers was obtained with W2T1 in 60 DAS. The mean number of flowers obtained by plants irrigated with W2 was slightly different from the plants irrigated with W1 with all sub treatments (Fig. 4).

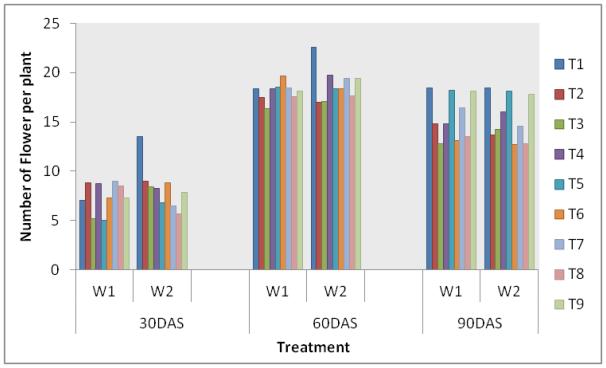

Fig. 4. Number of flowers per plant

Number of fruits: Plants irrigated with T1 recorded the highest mean number of fruits in both water sources of W1 and W2 in 30, 60and 90 DAS. The maximum mean number was found 14 and the least number of fruits was 2.

Fruit weight: The mean fruit weight was obtained from plants irrigated with both water sources T1. T5 plants registered the least mean fruit weight in all

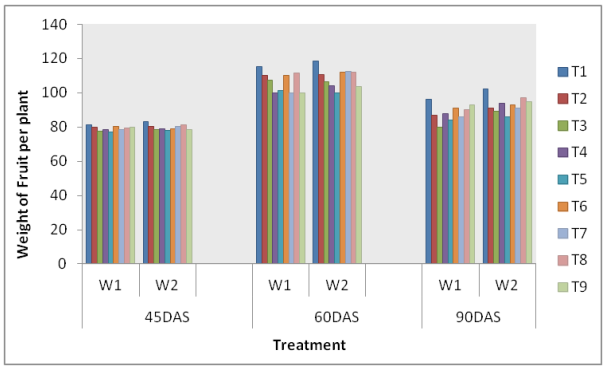

Fig. 5. Number of fruits per plant

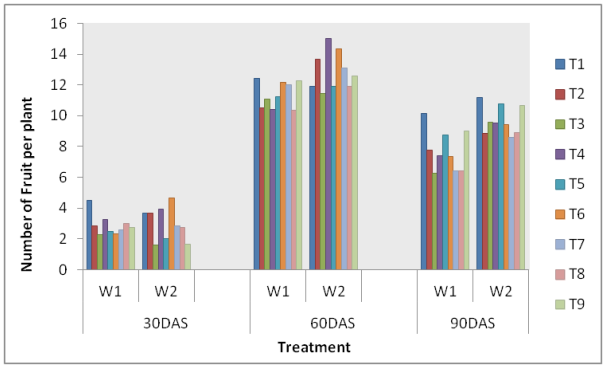

Fig. 6. Weight of fruits per plant

DAS with a both water sources. The mean weights were slightly different.

CONCLUSION

There were no significant differences in plant height, leaf number per plant, fruit number per plant, branch number per plant, flower number per plant, or fruit weight per plant. Among the T1 treatments that use both treated wastewater and freshwater, tomatoes irrigated with both sources of water yields the best results in all DAS. It was determined that using treated wastewater in conjunction with recommended plant protection measures is the best option for growing tomatoes in areas where freshwater is scarce.

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