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SOIL SCIENCE

Effect of Different Organic and Inorganic Fertilizer on Vegetative, Yield and Post-harvest Characteristics of selected Varieties of Tomato (*Solanum lycopersicum* L.) Under Protected Condition in Himalayan Region of Nepal

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ABSTRACT

The research was conducted in the Department of Horticulture's field, Ilam, Nepal from 17th February to June 15, 2018, to study the effect of different organic and inorganic fertilizers on vegetative, yield, and post-harvest characteristics of selected varieties of tomato var. Srijana and All-rounder. There were 5 treatments and 6 replications laid out in Factorial Design. Treatments applied were NPK (Urea 75 g + DAP 67.5 g and MOP30 g) per plot/ (T1), (FYM (11.25 kg)/plot + Cow urine (10% or 100 ml per liter of water))/ (T2), vermicompost (7.5 kg/plot) per plot)/ (T3), Nasabike (600 g/plot)/ (T4) and (Micronutrient (5.625 g/plot) + FYM (11.25 kg/plot))/ (T5). These were applied as the basal application of fertilizer in this experiment. The result revealed that there were significant differences in increment in height, flower initiation, yield per cluster and average weight of fruit, TSS content, weight loss (%). The maximum increment in height (8 cm/week) was found on All-rounder variety treated with NPK1, earliness in days for first flowering from transplanting was observed on All Rounder treated with vermicompost, the highest number of fruits per cluster, and the average weight was found on All Rounder as compared to Srijana, the highest TSS content was found on Srijana (5.1 °Brix) treated with FYM + Cow Urine, which was higher than All-rounder (3.5 °Brix) and other fertilizer treatments, and weight loss percentage was found highest on Srijana (7.8%) than All Rounder (6.9%) treated with NPK.

HIGHLIGHTS

- Significant differences in increment in height, flower initiation, yield per cluster and average weight of fruit, TSS content, weight loss (%).

Keywords: Organic, Inorganic, FYM, Tomato, Protected condition

Tomato is considered a member of the family *Solanaceae*. The botanical name of tomato is *Solanum lycopersicum* L. (Waiba and Sharma 2020; Waiba *et al*. 2020a). The fruit is a true berry. It is one of the most consumed vegetables in the world and is the second most important vegetable crop after potato (Chen 2010). Depending upon the growth habit, tomato plants have been categorized into two type's that is determinate and indeterminate types. The determinate varieties can be harvested in 2-3 harvests while the fruiting period of the indeterminate type is prolonged. Being a day-

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neutral plant, it can be grown throughout the year under a suitable climate (Bhandari and Singh 2015).

In today's Era, high doses of chemical fertilizers and pesticides are being used by farmers to get a high yield. Because of the adverse effect of chemical fertilizer, interest has been motivated for the use of organic manure (Follet *et al*. 1981; Adrian *et al*. 2016). To increase the yield and quality of the product, it is necessary to pay attention to the optimum balanced use of nutrients through fertilizer application. Plants require mineral elements for normal growth and development (Renuka and Sankar 2001).

To obtain a high-quality product, there is a need to cultivate tomatoes under protected conditions such as a greenhouse, poly house, and net house, etc. (Waiba *et al*. 2020a; Waiba *et al*. 2020b) Growth, development, productivity, and post-harvest quality parameters of tomato crops largely depend on the interaction between the genetic constitution of the plants and the environmental conditions under which they are grown (Sharma 2004). The growing environment can be modified to suit crops by the use of a protected structure for cultivation. Protected cultivation involves the protection of crops at various production stages from adverse environmental conditions such as extreme temperature, hail storms, scorching sun, and heavy rain. The optimum temperature for most varieties lies between 18 to 24 °C. The plant tissues are damaged below 10 °C and above 38 °C (Waiba and Sharma 2020; Waiba *et al*. 2020b).

Keeping all the facts in view, a field experiment entitled "Effect of different organic and inorganic fertilizers on vegetative, yield and quality of tomato under protected condition" was designed and it could be an initiative for promoting tomato cultivation inside the plastic house with appropriate fertilizer management. The finding of this study is expected to help the farmers, researchers, and extension workers to some extent.

MATERIALS AND METHODS

An experiment was carried out in a Department of Horticulture, MRMC, Ilam. The experimental farm is located at an elevation of 1220 m above mean sea level with 26°54'29N latitude and 87°55'14E longitude with East-West orientation of poly-house which represents the mid-hill zone of Himalayas, Nepal. The experimental area was situated in the humid subtropical zone characterized by four distinct seasons, the rainy or monsoon, the winter, the spring, and the summer season. Plastic house inside, where the average temperature ranges from 22 °C to 30°. The experimental design was laid out in factorial design, where there were two factors one is variety and another is different fertilizers. The whole experiment was divided into six replications. There was the two-hybrid variety of tomato, All -Rounder, and Srijana was taken for the research as it is a highly demanded tomato variety by Nepalese farmers.

The nursery bed was solarized. The seeds were soaked in the water for 24 hours and are shown in the line by line and row to row method, fascinating a spacing of 7×3 cm. The experimental field was plough twice and brought into fine tilth. Then twenty plots of equal-sized were prepared and treatments were selected on a randomized basis. Each plot of (1.5 m × 2.5 m) in size was made. The spacing between the plots was maintained as 50 cm and between the replication as 1 m distance. The seedlings of 27 days old were transplanted in different plots. The spacing between row to row and plant to plant was maintained as 50 × 50 cm. While transplanting seedlings one seedling was used for one hole. In each plot, there were 15 plants. The size of the plot was 3.75 m^2. Transplanting of the seedlings was done on 20 plots and it was located inside two different plastic houses. Each plastic house contained 10 plots. The thickness of the plastic used for plastic house preparation was 120 gauzes. Transplanting was done in the evening time and watering with a rose can be done immediately after transplantation. Irrigation was maintained as per the requirement of the crop.

There were different five types of fertilizers were used viz. Organic as FYM + cattle urine, vermicompost, Nasabike manure, and FYM + micronutrients and inorganic were applied in the form of NPK. These all nutrients were applied on their respective plots at the time of field preparation and while transplanting.

The required amounts of fertilizer were weighted by digital balance separately. Then manures were applied on the field and mixed with the soil and then the plot was leveled. This operation was performed before the transplanting of the seedlings.

Table 1: Treatment details

Treatments	Manure used
T_1	Urea (75 g/plot), DAP (67.5 g/plot) and MOP (30 g/plot)
T_2	FYM (11.25 kg/plot) + Cow urine (10% or 100 ml per liter of water)
T_3	Vermicompost (7.5 kg/plot)
T_4	Nasabike (600 g/plot) (Nasabike contains organic carbon 11.6%, organic matter 20.04%, nitrogen 4.1%, phosphorus 2.54% and potash 4%).
T_5	Micronutrient (5.625 g/plot) + FYM (11.25 kg/plot) (Micronutrients contain Zinc (8.00%), Boron (1%), Iron (1%), and Copper (1%). Manganese (0.5%), Molybdenum (0.03%). Magnesium (1%) and Sulphur (10%).

Table 2: Effect of different fertilizers showing vegetative characteristics

	Height increment (cm)	Leaf formation/ week	Flower initiation (DAS)	Number of fruits per cluster	Yield per cluster (gm)	Average Weight of Fruit (gm)
SI	5.3 ^{c}	2.5 ^{a}	27.8 ^{a}	9.0 ^{a}	423.2 ^{ab}	47.0^{b}
SV	6.7 ^{ab}	3.0 ^{a}	28.3 ^{a}	8.6 ^{ab}	401.1 ^{b}	46.6^{b}
SCU	7.2 ^{b}	2.6 ^{a}	26.7 ^{a}	9.3 ^{ab}	425.9 ^{ab}	45.8^{b}
SNB	7.5 ^{b}	2.4 ^{ab}	29.0 ^{a}	9.9 ^{a}	495.6 ^{a}	50.0^{ab}
SM	7.2 ^{b}	3.4 ^{a}	27.2 ^{a}	9.4 ^{ab}	469.4 ^{ab}	49.9^{b}
AI	8.0 ^{a}	2.7 ^{a}	25.4 ^{b}	8.6 ^{ab}	471.0 ^{ab}	54.8^{a}
AV	7.6 ^{b}	2.8 ^{a}	25.2 ^{b}	9.9 ^{a}	512.5 ^{a}	51.8^{a}
ACU	4.0 ^{c}	1.5 ^{b}	27.4 ^{a}	9.1 ^{ab}	457.0 ^{ab}	50.2^{ab}
ANB	6.6 ^{ab}	3.2 ^{a}	26.3 ^{b}	8.2 ^{ab}	431.8 ^{ab}	52.7^{a}
AM	7.2 ^{b}	2.6 ^{a}	27.9 ^{a}	6.9 ^{c}	369.0 ^{b}	53.5^{a}

**Treatments: SI- Srijana Inorganic; SV- Srijana Vermicompost; SCU- Srijana Cow Urine; SNB- Srijana Nasabike; SM- Srijana Micronutrient; AI- AllRounder Inorganic; AV- All Rounder Vermicompost; ACU- All Rounder Cow Urine; ANB- All Rounder Nasabike; AM- All Rounder Micronutrient. Mean of 6 replication. In the columns means followed by the same letter are not significantly different ($p \leq 0.05$) by Tukey pairwise..*

The intercultural operations such as; irrigation, fertigation, hoeing, earthing up, weeding, training, cutting, pruning, and staking were carried out following recommended package of practices to ensure a healthy crop development. Irrigation was done through a drip irrigation system three-four times a week as per the crop condition. For the data recording, five plants of each hybrid were randomly tagged in each replication and the parameters studied during the evaluation *viz.*, Height increment (cm), Leaf formation/week, Flower initiation (days), Number of fruits per cluster, Yield per cluster (Grams), Average Weight of Fruit (gm), TSS content and weight loss (%).

The data collected in the spreadsheet were recorded in the Microsoft Excel program, 2007 in the suitable format. Minitab-16 was used to analyze data and find out ANOVAs and comparative analysis is done by using Tukey pairwise test. The statistical graph is obtained from Microsoft Excel, 2007 program. Comparison of Means is compared test at $p \leq 0.05$, as in agriculture sector 0.05 is found to be standard.

RESULTS

Effect of Different fertilizer on vegetative and yield characteristics of selected varieties of tomato

Vegetative and reproductive growth of plants plays an important role in realizing the potential yield of the crop. Sub-optimal growth may result in an adverse effect on yield attributes. On other hand, excessive growth may also harm yield attributes.

(A) Height increment

The data related to plant height as influenced by various organic manures is depicted in Table 2. Application of different fertilizers exhibited a highly significant influence on the height increment of tomatoes. Compare to the different fertilizers

on two varies of tomato Srijana and All Rounder, the height increment on All Rounder treated with inorganic fertilizer was found as highly significant as compared to Srijana. Among fertilizer used in All Rounder, cow urine shows lower significance in height incrementthe results show graphically (Fig. 1).

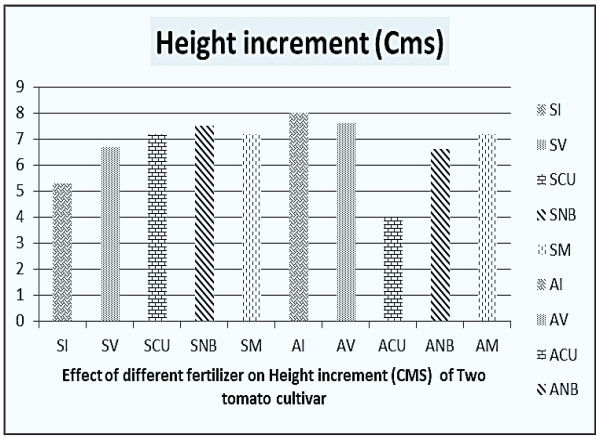

Fig. 1: Effect of different fertilizer on Height increment (CMS) of Two tomato cultivar

(b) Leaf Formation per Week

The number of leaves formation per week is not significantly different between treatments. Among the treatments applied cow urine in the "All-Rounder" variety shows significantly lower leaf formation as compared to other treatments. Srijana treated with micronutrients shows the highest leaf formation per week, but statically not significantly better than vermicompost fertilizer increment the results show graphically (Fig. 2).

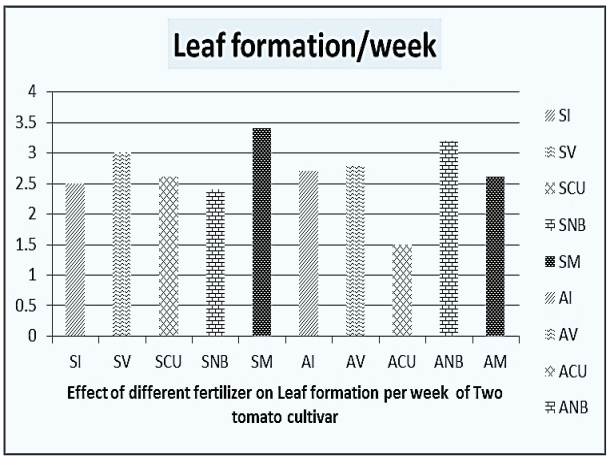

Fig. 2: Effect of different fertilizer on Leaf formation per week of Two tomato cultivar

(c) Flower Initiation

The mean number of days from transplanting to first flowering on Srijana and All Rounder varieties was significantly affected by different fertilizers was depicted in Table 2. All Rounder variety treated with vermicompost fertilizer resulted in early flowering than other treatments and the results show graphically (Fig. 3).

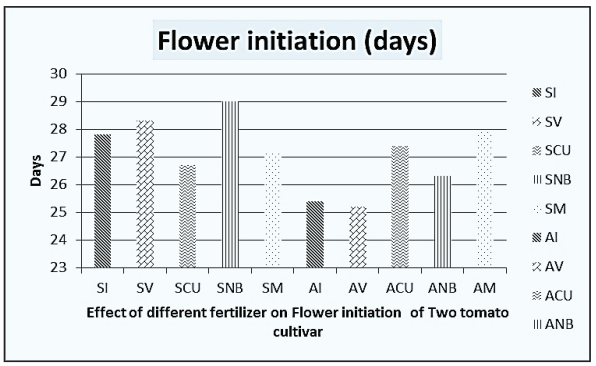

Fig. 3: Effect of different fertilizer on Flower initiation of Two tomato cultivar

(d) Number of Fruits per Cluster

The number of fruits per cluster on both varieties of tomato was not affected significantly by different fertilizers. But in the case of the All-Rounder variety, the micronutrient fertilizer treated plot shows a lower significance than others (Fig. 4).

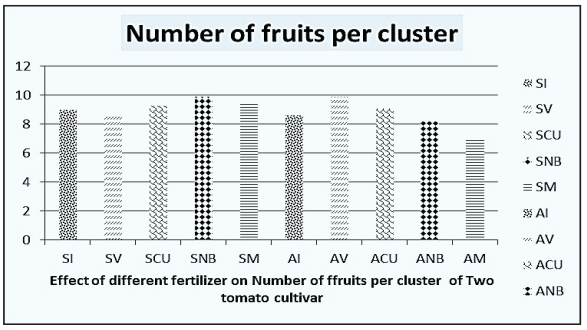

Fig. 4: Effect of different fertilizer on Number of fruits per cluster of Two tomato cultivar

(e) Yield per Cluster

The tomato yield per cluster on both varieties Srijana and All Rounder had no significant difference by different fertilizer. All Rounder treated with vermicompost fertilizer had higher yield per cluster and lower yield per cluster was observed on plot treated with micronutrient than other treatments (Fig. 5).

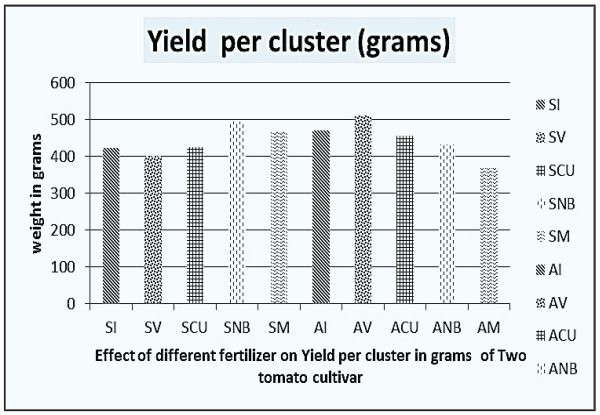

Fig. 5: Effect of different fertilizer on Yield per cluster in grams of Two tomato cultivar

(f) Average Weight of Fruit

The average weight of fruit in the case of All Rounder has significantly higher as compared to Srijana among the treatments. All Rounder treated with inorganic fertilizer produced the highest average weight of fruit, although it was not significantly higher than cow urine and the results show graphically (Fig. 6).

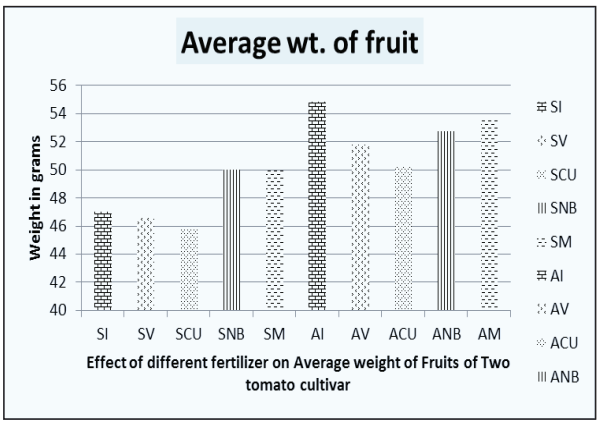

Fig. 6: Effect of different fertilizer on Average weight of Fruits of Two tomato cultivar

Effect of different fertilizer on post-harvest characteristics of Srijana variety of tomato

(i) Total Soluble Solids (TSS) Degree Brix

Total soluble solid observed on all the treatments found as significantly higher with respective days as 0 days, 7 days, and 14 days of data recording depicted in Table 2. Srijana treated with cow urine has a significantly higher TSS value on 14 days than other treatments (Fig. 7).

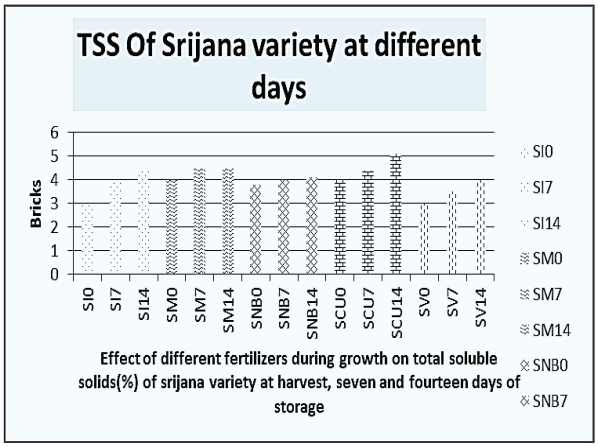

Fig. 7: Effect of different fertilizers during growth on total soluble solids (%) of srijana variety at harvest, seven and fourteen days of storage

(ii) pH

The pH value of Srijana tomato treated with cow urine has significantly lower as compared to other treatments and the pH value found is significantly higher with respective days as 0 days, 7 days, and 14 days of data recording in all treatments (Fig. 8).

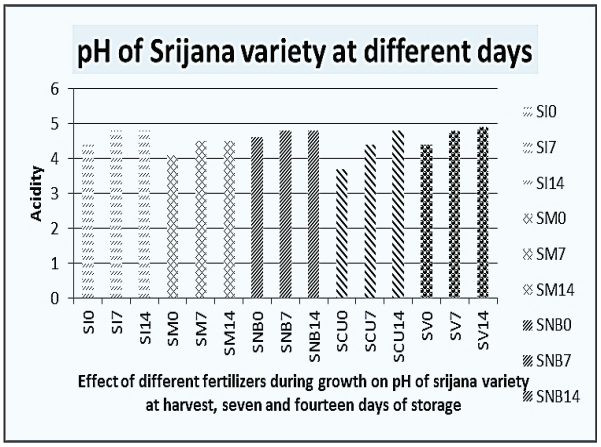

Fig. 8: Effect of different fertilizers during growth on pH of srijana variety at harvest, seven and fourteen days of storage

(iii) Weight Loss %

Srijana tomato treated with inorganic fertilizer shows a significantly higher value in case of weight loss as compared to organic fertilizer. Weight loss value was found as significantly higher concerning days as 7 days and 14 days of data recording in all treatments (Fig. 9).

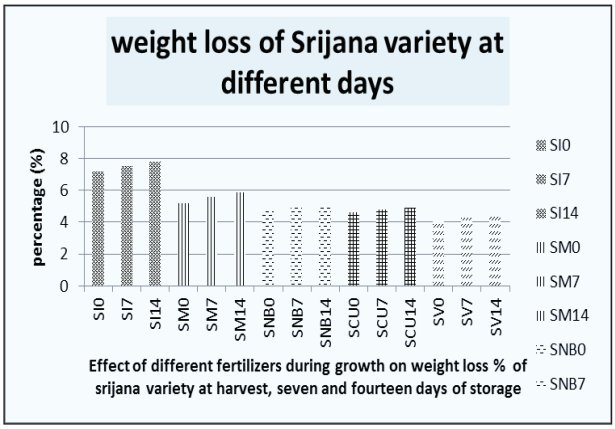

Fig. 9: Effect of different fertilizers during growth on weight loss % of srijana variety at harvest, seven and fourteen days of storage

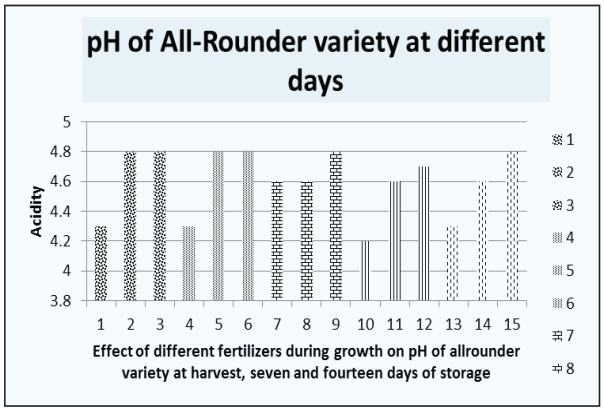

Fig. 11: Effect of different fertilizers during growth on pH of allrounder variety at harvest, seven and fourteen days of storage

Effect of different fertilizer on post-harvest characteristics of All Rounder variety of tomato

(1) Total Soluble Solids(TSS)

The total soluble solid of the All-Rounder tomato is significantly affected by inorganic fertilizer. There was no significant difference in total soluble solids during the initial days but it was increased during days of storage the results show graphically (Fig. 10).

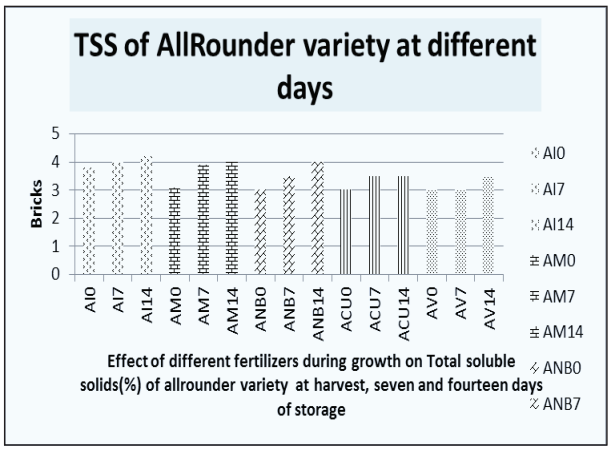

Fig. 10: Effect of different fertilizers during growth on Total soluble solids(%) of allrounder variety at harvest, seven and fourteen days of storage

(2) pH

Tomato pH value was not significantly affected by different fertilizers. But in the case of cow urine,a lower pH value was found than other treatments results show graphically (Fig. 11).

(3) Wight Loss(%)

Weight loss (%) of All Rounder treated with inorganic fertilizer was significantly higher than that of organic fertilizer. Weight loss (%) was found as significantly higher concerning days as 0 days (7.2%), 7 days (7.5%), and 14 days (7.8) of data recording in all treatments which is depicted in (Table 3). And the results show graphically (Fig. 12).

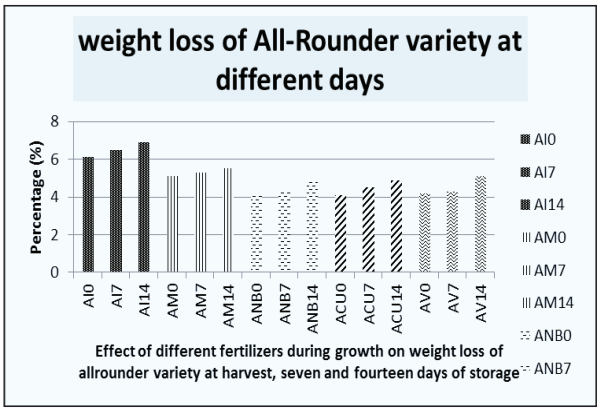

Fig. 12: Effect of different fertilizers during growth on weight loss of all-rounder variety at harvest, seven and fourteen days of storage

DISCUSSION

In this study it is data related to plant height as influenced by various organic manures is depicted in result show (Table 1). Application of different fertilizers exhibited a highly significant influence on the height increment of tomatoes. Compare to the different fertilizers on two varies of tomato Srijana and All Rounder, the height increment on All Rounder treated with inorganic fertilizer

Table 3: Effect of different fertilizers during growth on total soluble solids (%), pH, weight loss (%) of two tomato cultivars at harvest and after seven and fourteen days of storage

Variety × Factor	Total soluble solids (TSS)	pH	Weight loss (%)	Variety × Factor	Total soluble solids (TSS)	pH	Weight loss (%)
SI0	3.0 b	4.4 ab	7.2 a	AI0	3.8 a	4.3 ab	6.1 a
SI7	4.0 ab	4.8 a	7.5 a	AI7	4.0 a	4.8 a	6.5 a
SI14	4.4 a	4.8 a	7.8 a	AI14	4.2 a	4.8 a	6.9 a
SM0	4.0 ab	4.1 ab	5.2 b	AM0	3.1 b	4.3 b	5.1 b
SM7	4.5 a	4.5 ab	5.6 b	AM7	3.9 a	4.8 a	5.3 b
SM14	4.5 a	4.5 ab	5.9 b	AM14	4.0 a	4.8 a	5.5 a
SNB0	3.8 ab	4.6 a	4.8 b	ANB0	3.0 b	4.6 ab	4.2 b
SNB7	4.0 ab	4.8 a	4.9 b	ANB7	3.5 ab	4.6 ab	4.3 b
SNB14	4.1 ab	4.8 a	5.1 b	ANB14	4.0 a	4.8 a	4.8 a
SCU0	4.0 ab	3.7 b	4.6 b	ACU0	3.0 b	4.2 b	4.1 b
SCU7	4.4 a	4.4 ab	4.8 b	ACU7	3.5 ab	4.6 ab	4.5 b
SCU14	5.1 a	4.8 a	4.9 b	ACU14	3.5 ab	4.7 a	4.9 a
SV0	3.0 b	4.4 ab	4.1 b	AV0	3.0 b	4.3 b	4.2 b
SV7	3.5 ab	4.8 a	4.3 b	AV7	3.0 b	4.6 ab	4.3 b
SV14	4.0 ab	4.9 a	4.5 b	AV14	3.5 ab	4.8 a	5.1 a

Treatments: SI- Srijana Inorganic; SV- Srijana Vermicompost; SCU- Srijana Cow Urine; SNB- Srijana Nasabike; SM- Srijana Micronutrient; AI- AllRounder Inorganic; AV- All Rounder Vermicompost; ACU- All Rounder Cow Urine; ANB- All Rounder Nasabike; AM- All Rounder Micronutrient. Mean of 6 replication. In the columns means followed by the same letter are not significantly different (p≤0.05) by Tukey pairwise.

was found as highly significant as compared to Srijana. The findings of the present investigation confirm with the reports of (Manoj Kumar 2013) as reported in tomato that the highest plant height, higher yield, and yield attributing characters were recorded with the application of 180 kg N/ha along with 80 kg P/ha and 75 kg K/ha than control. This result also similar to (Goutam 2010) found that only organic fertilizer treated tomato plants T_3 (Farm Yard Manure) and T_4 (Vermicompost) showed more branching than chemical fertilizer treated plants (T_2), but overall stem lengths were higher in chemically treated plants T_2 (chemical fertilizer). The maximum increment in height (8 cm) was found on All Rounder variety treated with T_1 (Inorganic fertilizer) and the lowest height increment (4cm) was found on treatment T_2 (Cow urine+ FYM). The higher height increment in inorganic fertilizer might be due to the readily available nitrogen present on the NPK and the lower increment on urine might be due to loss of nitrogen through volatilization from urine.

The number of leaves formation per week does not exhibit significant influence by different fertilizers. Among the treatments applied cow urine in the "All-Rounder" variety shows significantly lower leaf formation as compared to other treatments. Srijana treated with micronutrient shows highest leaf formation (3.4 leaf) per week, but not statically differ in leaf formation in vermicompost treated plot, this might be due to the enhancement in photosynthesis, deposition of photo assimilates, translocation of carbohydrates, improvement in physiological and other metabolic activity which led to an increase in various plant metabolites responsible for active cell division, cell elongation results from improvement in growth characters (Hatwar 2003). An increase in the number of the leaf also might be because applications of micronutrients provide adequate frequently available N along with other nutrients which are associated with high photosynthetic activity and vigorous vegetative growth.

The mean number of days from transplanting to first flowering on Srijana and All Rounder varieties was significantly affected by different fertilizers was depicted in (Table 2). Early flowering days (25.2 days) were observed on All Rounder variety treated with vermicompost fertilizer is similar with (Samawat, 2001) reported that vermicompost promotes early flowering in tomato (Tomar 1998). Also revealed the application of vermicompost on brinjal because of early flowering as compared

to control. The longest mean days (29 days) for flowering took Srijana treated with Nasabike fertilizer. The earlier flowering on all-rounder than Srijana might be caused by the varietal genetic difference effect. The flowering habit of any cultivar is influenced by the genotype itself and environmental factors under the specific growing region. In general, the number of days for flowering was more indeterminate types as compared to the determinate types. The numbers of flowering days of different cultivars have been reported to be ranged from 25.00 to 30.25 days after transplanting of the tomato crop by (Sharma, 2004; Waiba *et al*. 2020). The earliness in flowering could be attributed to the faster enhancement of vegetative growth and storing sufficient reserved food materials for differentiation of buds into flower buds whereas the delayed flowering by the inorganic fertilizer treatment might be due to the extended vegetative phase of the plant by the availability of inorganic nitrogen.

The number of fruits per cluster on both varieties of tomato was not affected significantly by different fertilizers. But in the case of the All-Rounder variety, the maximum number of fruits per cluster (9.9) was found on the vermicompost treated plot and the minimum number of fruits per cluster (6.9) was found on the micronutrient fertilizer treated plot depicted in (Table 2). Application of vermicompost might have improved soil fertility, greater uptake of nutrients and yield.

All Rounder variety, treated with vermicompost fertilizer had significantly higher yield per cluster and significantly lower yield per cluster was observed on plot treated with micronutrient than other treatments. An increase in yield treated with vermicompost due to alteration of the physico-chemical properties of soils and affects microbial populations within the soil, thus increase overall soil productivity (Sharma 2004; Adrian *et al*. 2016). Vermicompost contains most nutrients in plant-available forms such as phosphates, exchangeable calcium, soluble potassium, and other macronutrients with a huge quantity of beneficial microorganisms, vitamins, and hormones that influence the growth and yield of plants (Theunissen 2010). Vermicompost increases the soil porosity than in original soil (Marinari 2000; Ahirwar and Hussain 2015). The ability of vermicompost to perform alterations to soil physical properties increases the amount of plant-available air and water, further encouraging seedling emergence and root growth in plants. They can produce plant growth regulators (PGRs) such as auxins, gibberellins, cytokinin's, ethylene, and abscisic acid, which then affected positively the plant growth. It is assumed that other factors, such as the presence of beneficial microorganisms or biologically active plant growth influencing substances such as phytohormone are released by beneficial microorganisms present in the vermicompost-rich soil (Tomati and Galli 1995).

The average weight of fruit in the case of All Rounder has significantly higher as compared to Srijana among the treatments. This might be due to differences in the genetic makeup of the verities. (Sharma 2004; Waiba *et al*. 2020) reported that higher or lower fruit weight may also be ascribed to the varietal characteristics All Rounder treated with inorganic fertilizer produced the highest average weight of fruit, but it was not significantly better than cow urine (Choudhary 20117). The difference between these results might due to the variation in cultivar, soil type, and fertilizer.

Total soluble solid observed on all the treatments found as significantly higher with respective days as 0 days (4^{o}Brix), 7 days (4.4^{o}Brix), and 14 days (5.1^{o}Brix) of data recording which is depicted in (Table 2), Srijana treated with cow urine has significantly higher TSS (5.1^{o}Brix) value on 14 days among all treatments, this result is similar to (Salam 2011), who found that the highest TSS content (4.324.4^{o}Brix) was observed in fruits produced with 20 t/ha cow dung, whereas it was the lowest (4.024.4^{0}Brix) in without cow dung. This might be due to the change in chemical carbohydrate components i.e., starch into sugar. Total soluble solid of All Rounder tomatoes was not significantly affected by different organic and inorganic fertilizers and also there was no significant difference on total soluble solid during the initial day of data recording among the treatments. The was also no significant difference in total soluble solid values during storage days which is similar to the result of (Khanal 2010)

There was no significant difference in pH value between different treatments. But the pH value was

found as higher with respective days as 0 days (3.7), 7 days (4.4), and 14 days (4.8) of data recording in all treatments which is depicted in Table 3. This result is in contrast with the earlier result of (Khanal 2010). The increasing pH values with the storage days might be due to the change in chemical composition i.e., acid into sugar.

Srijana and All Rounder varieties of tomato treated with inorganic fertilizer show significantly higher value in case of weight loss as compared to organic fertilizer. Weight loss (%) was found as significantly higher concerning increasing days as 0 days (6.1%), 7 days (6.5%), and 14 days (6.9%) of data recording in all treatments which is depicted in Table 3. Comparatively weight loss of Srijana treated with inorganic fertilizer at 14 days (7.8%) is more than that of All Rounder (6.9%). other fertilizer application. While application of vermicompost shows lower weight loss (4.1%) this is due to the pericarp thickness (Elisabeth Garcia and Diane M. Barrett 2005), C:N ratio, and lycopene pigment (Sharma 2004; Waiba *et al*. 2020).

CONCLUSION

Based on analysis of the research performed, it was found that there were significant differences in height increment, flower initiation, yield per cluster, the average weight of fruits, TSS, and weight loss (%) concerning different organic fertilizers. It is found that all-rounder variety treated with NPK has higher height increment while both All-rounder and srijana treated with Vermicompost are seem to be highly vigorous. We found that the number of fruits is comparatively more on treated with micronutrients and FYM while the average weight of fruits and yield is found to be more on treatment treated with Vermicompost. On average concerning geographic factors, soil condition, and metrological data we can say that All-rounder variety treated with vermicompost (2 t/ha) is found beneficial.

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