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## Performance of Different Tomato Cultivars Under the Climatic Conditions of Northern Areas (GILGIT)

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**Abstract:** Twelve tomato varieties were sown at Agriculture Research Institute for Northern Areas (ARINA) Juglote, to study the various growth productivity and quality characters for evaluating under agro climatic conditions of the area and to compare performance of the local variety with other commercial varieties. Data on days to flower initiation, number of clusters/plant, days to first fruit picking, weight of individual fruit, weight of total fruit/plant/number of fruits /plantweight of fruits/plot, length and diameter of fruits and yield (kg/ha) were recorded. The number of clusters/plant were maximum in variety Roma (13.5) and minimum in variety Chico. Chico bore the highest number of fruits/plant (52.50) while F M B9 and local check had the lowest number of of fruits/plant (24.75 and 26.0). Fruit size was maximum in Tanja (6.90 cm) and minimum in local check (3.08). Savio and Roma took the minimum time (100 and 102 days), while Festen and Red top took the maximum time (125 days) from transplanting of seedlings to ripening of first fruit. Festen and local check were early maturing varieties, while Roma and Marglobe had long fruiting period. Tanja and Marglobe were late in maturity as compared to other varieties. Roma and Marglobe produced the highest Yield 9218.75 and 9140.75 kg/ha, respectively than the other varieties and local check proved to be the lowest yielder with (3596.25 kg/ha).

**Key words:** Tomato (*Lycopersicon esculentum* Mill), Northern Areas ARINA, Cultivar

### Introduction

Tomato (*Lycopersicon-esculentum* Mill) belongs to the family Solanaceae. Tomato is native of the West coast of South America (Mexico and Peru) and was cultivated by the Indians about 500 B.C. long before the arrival of Spaniards. Tomato is an important vegetable crop in Pakistan and was grown over an area of 28,880 hectares which produced 3,13072 metric tons of tomato during 1997-98 (FAO). Tomato is rich in vitamin (A, B and C), minerals iron lime and Phosphorous. The introduction of promising cultivars their acclimatization and evaluation in a particular environment plays an important role in crop improvement. The environment substantially affects the performance of tomato genotypes (Ortiz and Izquierdo, 1994). Many of the cultivars are capable of adoption in certain areas as such while others provide a valuable source of variability for the breeding programmes. Scientists and farmers have intense interest in increasing tomato production. This interest encouraged continuous conducting of many field trials. Results of these trials have generally indicated varietal differences in yield and some fruit characters Nassar (1986). Under the varied Physio graphy and the accompanying micro-climate, it becomes imperative to test cultivars for each area and season as a basis for recommendation. The lack of good cultivar available to the farmers in a particular season is one of the production constraints (Chibasa, 1977).

Tomato is also an important crop of the Northern Areas. Tomato production and supply in Northern Areas is limited because of the seasonal variations and small land holdings, so the requirement of the people of the area is met through NWFP. The Northern Areas (27188 sqmiles) consisting of Gilgit, Diamer Ghizar, Skardu and Ganchi Districts are situated between longitude 62-76 and latitude 34-36.60 degree North. The total area under cultivation is 50,000 hacteres. The climate in the area is cold in winter and hot in summer at the lower elevation (Diamer and lower parts of Gilgit). The annual rainfall varies from 5 inches in the Northern parts to 11 inches in the Southern parts. The agricultural sector in Northern area is based on traditional methods which leads to low yield and not capable of promoting modern developments in agriculture sector. No efforts for the improvement of tomato in the area have so far been made, with the result that not a single commercial variety exists in the whole area. The growers has to depend upon the seed available in the market. The tomato varieties cultivated by the vegetable growers in the area are very low in yield having poor quality and don't compete with the cultivars grown in the potential parts of the country. No emphasis was given for the

improvement of this vegetable, it is therefore inevitable to pursue intensive and extensive cultivation of this important crop to meet the domestic need of the inhabitants of the area. Therefore this experiment was carried out to test and evaluate 12 exotic tomato cultivars of diverse origin for various growth and productivity characters to select the best suited cultivar under the climatic conditions prevailing in the area and to recommend the promising varieties for commercial cultivation.

### Materials and Methods

The experiment was conducted at the Agriculture Research Institute for Northern Areas (ARINA) Juglote Gilgit. The soil of the experiment site was sandy, low in organic matter, calcareous and having low water holding capacity.

**Raising of Nursery:** Seeds of 11 exotic diverse origin tomato Cultivars (Tanja, Chico, F.M-9, Eva, Roma, Riogrande, Savio, Lima, Festen, Marglobe, Red top) and one as local check were sown in nursery beds. The nursery beds were thoroughly prepared and were raised 5cm from soil surface to provide good drainage for the removal of surplus irrigation water. The seed was sown in rows of 5 cm apart, lightly covered with fine well rotten farm yard manure and was irrigated with sprinkler. The beds received sprinkler irrigation on alternate day till germination of the seedlings and later on open flood irrigation was given at weekly intervals. Thinning was done when the seedlings were 3 cm tall keeping 3 cm space with in the rows to get healthy and strong plants.

**Preparation of land and Transplanting of seedlings:** The experimental plot was ploughed and disked several times before transplanting the seedlings. A uniform fertilizer dose of 180-80-60-kg of N-P-K were applied respectively. The DAP, Potash and half Nitrogen were applied in the soil at the time of seed bed preparation, while the remaining half Nitrogen was applied in two split doses after 3 to 4 weeks of transplanting at flowering and fruiting stages of the crop. The seedlings were transplanted from the nursery beds to the field when the height of the seedlings was 9-12 cm with 5-7 compound leaves. Seedlings were transplanted on one side of the ridge and were spaced 1 m between rows and 40 cm with in plants. The experiment was laid down in randomized Complete Block Design with four replications. A total of 12 plants per row were planted and the data were recorded from the 10 inner plants of each row.

## Results

### Days from Transplanting to flower Initiation and first fruit picking:

The period between transplanting and first flower initiation ranged between 68 and 52 days (Table 1). Among the different varieties under study the Lima and Roma being at par were earliest but Roma and Eva were statistically similar with each other in flower initiation. On the other hand Tanja, Marglobe, F.M-9, and Riogrande being statistically similar were late in maturity as compared to all the varieties. The late maturing varieties F.M-9 and Riogrande exhibited similar response for flower initiation with Savio and Red top. The remaining varieties fell in between these extremes. The period between transplanting and picking of first mature fruit ranged between 100 to 125 days. The varieties Savio, Roma, Riogrande were the earliest and Festen and Red top were late in maturity as compared to all other varieties in this experiment. Among the different varieties under study the Savio, Roma, Riogrande and Lima being at par were the earliest but on the other hand, the varieties Red top, Festen, Eva, Chico and Tanja being statistically similar in first fruit picking of and were late in maturity while the local check was at par with the varieties Eva, Chico, Tanja, F.M-9, Marglobe and Lima.

**Number of clusters and fruits per plant:** It is evident from the table that the range of clusters per plant were 5.0-13.5 (Table 1). Most of the varieties had 5 to 9 clusters, but 10 to 13.5 clusters/plant were observed in Eva, Red top, Lima and Roma. The variety Roma had the maximum clusters (13.5) while the minimum clusters (5.0) were recorded in variety Chico. Similarly the number of fruits/plant in various varieties ranged from 24.75 to 52.50 fruits/plant. The varieties Chico and Roma bore similar and the maximum number of fruits but variety Roma was at par with Tanja while Tanja and Red top were similar in number of fruits/plant. The variety F.M-9 produced the lowest number of fruits (24.75)/plant. The difference was non significant among varieties F.M-9, Savio, and local check. The variety Red top exhibited statistically non significant difference with the Marglobe, Lima, and Eva while the variety Festen was similar in number of fruits per plant with Marglobe, Lima, Riogrande, and Eva.

**Fruit size (Length and diameter of fruit):** The diameter of the fruit ranged from 2.03 to 5.65 cm (Table 1). The variety Eva produced the fruit of maximum diameter (5.65cm) while Local check produced the fruit of minimum diameter (2.03 cm). The varieties F.M-9, Riogrande, Savio, Lima, and Marglobe were similar in diameter of fruit, while the variety Roma was at par with F.M-9, Riogrande, Savio, Lima and Marglobe. The last four varieties were also statistically similar in fruit diameter with Chico. Red top was statistically at par with Chico and Tanja, Festen and Tanja exhibited similar and showed very poor response for fruit diameter.

**Weight of Individual Fruit:** Among the Varieties Marglobe produced the highest individual fruit weight 52.25 gm, while the local check produced the minimum fruit weight 27.75 gm (Table 2). The varieties Festen, Red top, Lima, Savio, and Riogrande were statistically similar and produced medium fruit weight. These varieties were also at par with F.M-9. The tomato varieties local check, Tanja and Chico produced similar and minimum individual fruit weight while the variety Eva was at par with Tanja and Chico in fruit weight. Also the variety Roma and Eva were similar in individual fruit weight.

**Weight of total fruits/plant:** The weight of fruits/plant ranged from 719 gm to 1844 gm (Table 2). The varieties Roma and Marglobe produced the maximum fruit and were at par with Chico and Red top, while Red top and Chico were similar to Savio and Festen in fruit weight. On the other hand, the Variety Red top was similar in fruit weight to Savio and Festen. The varieties Tanja and Lima were similar in fruit weight with each other and were also at par with Riogrande, Savio and Festen. The variety F.M-9 and Eva were similar and showed poor performance in total fruit weight. The local check Produced minimum fruit weight and was significantly different in total fruit weight as compared to all other varieties in this experiment.

**Total fruit weight/plot:** The variety Roma produced the maximum fruit yield /plot 8.85 kg, while the variety local check produced minimum fruit weight 3.45 kg (Table 2). The varieties Roma, Marglobe and Chico produced similar but maximum fruit yield as compared to all other varieties. The variety Chico was at par with Riogrande, Savio, Festen and Red top in total fruit weight per plot while the varieties Riogrande, Savio and Festen were similar in total fruit weight to Tanja and Lima. The varieties F.M-9 and Eva exhibited similar and poor response for total fruit weight. The local check produced minimum and significantly different in fruit weight as compared to rest of the varieties included in the trial.

**Yield/plot:** The yield /plot ranged from 3596.25 to 9218.75 kg/ha (Table 2). The variety Roma had the maximum fruit yield while minimum yield was observed in local check. The varieties Roma, Marglobe Chico, Riogrande, Savio and Festen yielded statistically identical weight of fruit per plot. Similarly yield differences were non significant among varieties Tanja, Chico, Riogrande, Savio, Lima and Festen. The variety Red top was also at par in yield with Tanja, Eva, Riogrande, Savio, Lima and Festen while the F.M-9 was poor but at par with Eva in fruit yield/plot.

## Discussion

In these studies Several of the fruit characteristics evaluated showed significant differences among varieties, for the period between transplanting the seedlings and ripening of first fruit. Lima, Roma, Eva, Festen and Local check were early maturing varieties while Chico, Red top, Savio, Riogrande, F.M-9, Tanja and Marglobe were a bit late maturity. The early varieties took 100 to 110 days and the late maturing varieties took 113 to 125 days from transplanting to picking of first mature fruit. Mack *et al.* (1956) observed that tomato varieties generally require 80-90 days from transplanting to harvest. Ashraf (1966) observed that generally tomato varieties require 78 to 95 days from transplanting to harvest. Stated that Marglobe, Stokesdale and Pritchard were early varieties but here in this experiment Marglobe was medium in maturity. This variation may attribute to differences in soil fertility, temperature, moisture contents and altitude, latitude and other agroecological conditions. Knott (1958) labelled Valiant in early group and Marglobe in the intermediate group but here in this trial, Marglobe proved to be a mid season variety in maturity. Although Varieties Marglobe, Roma, Chico, Riogrande, Savio and Festen were early to medium in maturity and also better in fruit yield. Therefore, these varieties have a preference due to their long availability period, better fruit size and fruit yields. The medium to large fruited varieties Eva, Lima and Roma produced maximum number of fruits per cluster as compared to other varieties as also reported. There is a good relation in number of fruits per clusters and the fruit yield per plant. Mostly the varieties, which have higher number of fruits per cluster also, yield high. The only exception in the varieties under investigation is Chico which had minimum number of clusters per plant but produced maximum yield. The varieties Roma, Marglobe, Chico, Savio, Festen and Riogrande produced heavy crop while Lima, Tanja, Red top, Eva, F.M-9 and local check were low in yield. The significant and maximum polar length was recorded in Tanja, while it was minimum in local check. The varieties Chico, F.M-9, Eva, Roma, Riogrande, savio, Lima, Festen, Marglobe and Red top were statistically similar to each other and produced fruits of medium length. The variety Eva produced the fruit of maximum diameter, while Local check produced the fruit of minimum diameter. The varieties F.M-9, Riogrande, Savio, Lima and Marglobe were similar in diameter of fruit, while the variety Roma was at par with F.M-9, Riogrande, Savio, Lima and Marglobe. The last four varieties were also statistically similar in fruit diameter with Chico. Red top was statistically at par with Chico and Tanja. Festen and Tanja exhibited similar and showed very poor response for fruit diameter. The variation in this respect is certainly due to difference

Rehman *et al.*: Tomato (*Lycopersium-esculentum* Mill), northern areas, ARINA, Cultivar.

Table 1: Performance of different cultivars for various plant characters under the climatic Conditions of Northern Areas.

Name of variety plant	Days to flower initiation	Days to first fruit picking	Number of clusters/ clusters/plant	Number of fruits/plant	Length of fruit (cm)	Diameter of fruit (cm)
Tanja	67.75	115.00	6.00	45.00	6.90	4.13
Chico	60.00	116.00	5.00	52.50	5.65	4.60
F.M-9	65.00	113.00	8.00	24.75	5.63	5.58
Eva	58.00	116.00	10.00	35.75	5.40	5.65
Roma	54.00	102.50	13.00	47.25	5.45	4.90
Riogrande	63.75	108.00	9.00	32.75	5.33	5.30
Savio	62.00	100.00	6.00	26.50	5.55	4.95
Lima	52.00	110.00	11.00	35.75	5.55	5.20
Festen	59.00	125.00	7.00	32.25	5.28	3.45
Marglobe	67.50	116.00	8.00	35.75	5.00	5.50
Red Top	61.25	125.00	10.00	40.00	5.10	4.40
Local	59.25	120.00	9.00	26.50	3.08	2.03

Table 2: Performance of different cultivars for various yield characters under the climatic Conditions of Northern Areas .

Name of variety	Weight of indiv fruit/plant (gms)	Weight of total fruit/plant (gms)	Total weight of fruit/plot (kgs)	Yield kg/ha
Tanja	33.12	1469	7.05	7343.50
Chico	32.88	1719	8.25	8593.50
F.M-9	40.50	1048	5.05	5260.25
Eva	33.88	1206	5.83	6067.75
Roma	39.13	1844	8.85	9218.75
Riogrande	41.50	1548	7.45	7760.50
Savio	44.88	1579	7.58	7890.50
Lima	42.63	1506	7.23	7526.00
Festen	46.75	1575	7.55	7864.50
Marglobe	52.25	1825	8.78	9140.75
Red Top	42.25	1694	8.13	6963.50
Local	27.75	718	3.45	3596.25

genotypes which normally behave differently under different environmental conditions. Singh and Sikka (1945) maintained that foreign introduction is generally good performers. Campbell (1967) observed that there exists a lot of variation in tomato varieties for yield and quality of fruit. The different varieties exhibited a great variation in the shape of fruit. It might be perfect globe, round flattened, round or heart shape. The shape of fruit has a great bearing on the market value of the fruit. Work (1952) was of the view that tomato varieties should be round to oblong in shape. It has been observed in Pakistan that the customers give preference to round varieties. Marglobe had maximum fruit weight while minimum fruit weight was recorded in local check. Out of medium maturity varieties Marglobe was good in yield, had attractive color and shape. Riogrande, Roma, and Savio were early heavy yielding varieties. Lima was also early variety, but was poor yielder. Roma was high yielding early season variety having long fruiting period. This variety also had good shape and color Lima was found to be a good yielding mid season variety having good shape and deep red color.

Tomatoes are usually grown for four purposes viz. Local markets, far away markets, kitchen gardening and for canning purposes. The varieties best suited for kitchen gardening should yield heavily over long periods even though the fruit size may be small. The varieties Festen, Red top, Lima, Savio, and Riogrande produced fruits of medium weight. Roma and Eva were similar in individual fruit weight. It is therefore, advisable to grow varieties mentioned above including the Local check for kitchen gardening and for local market. Variety Roma is recommended for planting for processing and distant market even on the rough roads of the northern areas.

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