Original Research Article

Assessment of Correlation Analysis for Yield and Yield Contributing Traits among Tomato (*Solanum lycopersicum* L.) Genotypes

Abstract

Tomato (*Solanum lycopersicum* L.) is one of the most economically valuable crops worldwide, making it imperative to understand the complex interplay of various factors influencing tomato yield. In this research article, we investigate Correlation analysis enhances our understanding of the relationships between the variables. We employ Pearson correlation coefficients to assess the strength and direction of linear associations. The results indicate strong positive correlations between morphological traits of diverse genotypes of tomato. This research article contributes to the existing body of knowledge by providing a comprehensive assessment of the path coefficients and correlations among key factors influencing tomato yield. Our findings have practical implications for tomato growers, enabling them to make informed decisions regarding selection of different tomato genotypes strategies to optimize yield.

Keywords: Tomato,Genotypic, Phenotypic, Yield, Correlation, Genotypes

1. Introduction

Tomato (*Solanum lycopersicum* L.) is one of the most economically and nutritionally significant vegetables worldwide, valued for its versatility in culinary applications and rich nutrient content. Tomatoes are not only a staple in various cuisines but also a vital source of vitamins, minerals, and antioxidants, such as lycopene, which has been linked to various health benefits (Giovannucci *et al.,* 2002). Given its wide-ranging importance, understanding the complex relationships between different tomato phenotypes is of paramount significance for breeders, growers, and consumers alike.

Correlation analysis, on the other hand, provides a powerful tool to quantify the strength and direction of associations between pairs of variables. It helps researchers identify whether there is a positive, negative, or no relationship between different tomato phenotypes (Pearson, 1896). This approach enables us to identify which traits tend to vary together, offering valuable information for breeding programs and crop management strategies.

Previous studies have explored the path coefficient and correlation among various tomato traits, such as fruit size, fruit weight, disease resistance, and nutrient content. Smith et al. (2020) conducted a comprehensive analysis of tomato trait relationships in a diverse germplasm collection, revealing key insights into trait interactions and their potential for genetic improvement. These findings underscore the importance of understanding both path coefficients and correlations to guide breeding programs and inform cultivation practices.

2. Materials and Methods

The present experiment was conducted during the Rabi season of the year 2021-2022 and 2022-2023 at Horticulture Research centre, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (Uttar Pradesh), India. University geographically situated at longitude 77°69'

East, latitude29°08' The climatic condition of Meerut is semi-arid with cool winters and hot summers. A randomized complete block design (RCBD) with three replicates was employed. The experimental materials for the present study consisted of 25 tomato genotypes namely, VRT 77, VRT 67, VRT 52, VRT 66, VRT 16, VRT 78, VRT 58, VRT 76, VRT 74, VRT 62, VRT 23, VRT 10, VRT 63, VRT 17, VRT 71, VRT 70, VRT 29, VRT 24-1, VRT 27, Pusa Rohini, Punjab Ratta, Punjab Gaurav, Pant T-3, Arka Rakshak, F_1, Arka Samrat F_1.

Collection of data and recording of observations

The random sampling technique was adopted to record the observations of various quantitative and qualitative characters of tomato. Five plants were selected randomly from each replication at the time of recording of data on various characters. Replication wise data of five plants were averaged and mean value was used for statistical analysis.

Statistical Analysis:

Correlation Analysis: We calculated Pearson's correlation coefficients among all the measured traits using the 'cor' function in R (R Core Team, 2021).

3. Results

Correlation and Path Coefficient Analysis

3.1 Correlation Coefficient Analysis

Understanding the genetic link between yield and other component qualities is useful for both planning and carrying out the breeding programme. For two reasons, breeders need to be aware of the nature, extent, and direction of selection pressure among various traits: first, to choose characters that are challenging to observe or whose genotypic values are influenced by environmental factors; and second, to provide knowledge about the nature, extent, and direction of selection pressure among various traits. Plant breeders may use quality yield and its component qualities to create commercial varieties or hybrids by learning how features like development, earliness, and so forth relate to one another. Both positive and negative relationships exist between several of these traits. The estimations of the genotypic and phenotypic correlation coefficients among the various characters are provided in Table 1, 2, 3 and 4 and are further explained as follows:

3.1.1 Genotypic Correlation Coefficients

Plant Height (cm)

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Plant Height (cm)has showed positive and significant correlation with Days to 50% flowering (0.611) followed by Number of primary branches (0.564), Days to first fruit set (0.530), Days to first fruit maturity (0.505) and Days to fruit harvesting (0.452). Rest of characters were showed the non-significant correlation with plant height.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Plant Height (cm)has showed positive and significant correlation with Days to 50% flowering (0.626) followed by Number of primary branches (0.574), Days to first fruit set (0.555), Days to first fruit maturity (0.519) and Days to fruit harvesting (0.473). Rest of characters were showed the non-significant correlation with plant height.

Number of Primary Branches

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Number of primary branches has showed the positive and significant correlation with plant height (0.564) and followed by Days to 50% flowering (0.304) and Specific gravity (0.255). It has also showed the negative but significant correlation with Fruit yield per hectare (-0.227) and Number of locules per fruit (-0.259). Rest of the characters have showed the non-significant correlation with Number of primary branches.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Number of primary branches has showed the positive and significant correlation with plant height (0.574) and followed by Days to 50% flowering (0.369), Days to first fruit set (0.286), Days to fruit harvesting (0.258) and Days to fruit maturity (0.253). It has also showed the negative but significant correlation with Number of locules per fruit (-0.282). Rest of the characters have showed the non-significant correlation with Number of primary branches.

Stem Thickness (mm)

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Stem thickness has showed the negative but significant correlation with Number of locules per fruit (-0.415). Rest of the characters has showed the non-significant correlation with stem thickness.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Stem thickness has showed the positive correlation with Ascorbic acid (0.302) and followed by Fruit yield per plant (0.248), Number of fruits per plant (0.242) and fruit yield per hectare (0.239). It has also showed the negative but significant correlation with Number of locules per fruit (-0.350). Rest of the characters has showed the non-significant correlation with stem thickness.

Days to 50% Flowering

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to 50% flowering thickness has showed the positive correlation with Days to first fruit set (0.950) and followed by Days to first fruit maturity (0.655), Plant height (0.611), Days to fruit harvesting (0.570), Pericarp thickness (0.465), Number of primary branches (0.304) and Ascorbic acid (0.284). Rest of the characters has showed the non-significant correlation with Days to 50% flowering.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to 50% flowering thickness has showed the positive correlation with Days to first fruit set (0.954) and followed by Days to first fruit maturity (0.684), Plant height (0.626), Days to fruit harvesting (0.623), Pericarp thickness (0.484) and Number of primary branches (0.369). It has also showed the negative but significant correlation with Specific gravity (-0.248). Rest of the characters has showed the non-significant correlation with Days to 50% flowering.

Days to First Fruit Set

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to first fruit set has showed the positive correlation with Days to 50% flowering (0.950) and followed by Days to first fruit maturity (0.702), Days to fruit harvesting (0.592),

Plant height (0.503), Pericarp thickness (0.408) and Ascorbic acid (0.308). It has also showed the negative but significant correlation with Total soluble solid (-0.258). Rest of the characters has showed the non-significant correlation with Days to first fruit set.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to first fruit set has showed the positive correlation with Days to 50% flowering (0.954) and followed by Days to first fruit maturity (0.703), Days to fruit harvesting (0.633), Plant height (0.555), Pericarp thickness (0.427) and Number of primary branches (0.286). It has also showed the negative but significant correlation with Specific gravity (-0.301). Rest of the characters has showed the non-significant correlation with Days to first fruit set.

Days to First Fruit Maturity

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to first fruit maturity has showed the positive correlation with Days to fruit harvesting (0.958) and followed by Days to fruit set (0.702), Days to 50% flowering (0.655), Plant height (0.505) and Pericarp thickness (0.294). Rest of the characters has showed the non-significant correlation with Days to first fruit maturity.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to first fruit maturity has showed the positive correlation with Days to fruit harvesting (0.947) and followed by Days to fruit set (0.730), Days to 50% flowering (0.684), Plant height (0.519), Pericarp thickness (0.327) and Number of primary branches (0.253). It has also showed the negative but significant correlation with Specific gravity (-0.236). Rest of the characters has showed the non-significant correlation with Days to first fruit maturity.

Days to Fruit Harvesting

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to fruit harvesting has showed the positive correlation with Days to fruit maturity (0.958), Days to first fruit set (0.592), Days to 50% flowering (0.570), Plant height (0.452) and Pericarp thickness (0.290). Rest of the characters has showed the non-significant correlation with Days to fruit harvesting.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to fruit harvesting has showed the positive correlation with Days to fruit maturity (0.947), Days to first fruit set (0.633), Days to 50% flowering (0.623), Plant height (0.473), Pericarp thickness (0.328) and Number of primary branches (0.258). It has also showed the negative but significant correlation with Specific gravity (-0.241). Rest of the characters has showed the non-significant correlation with Days to fruit harvesting.

Number of Locules per Fruit

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Number of locules per fruit has showed the positive correlation with Fruit weight (0.314) and Equatorial diameter (0.262). It has also showed the negative but significant correlation with Stem thickness (-0.415) and Number of primary branches (-0.259). Rest of the characters has showed the non-significant correlation with Number of locules per fruit.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Number of locules per fruit has showed the positive correlation with Fruit weight (0.319) and Equatorial diameter (0.258). It has also showed the negative but significant correlation with Stem thickness (-0.350), Number of primary branches (-0.282) and Ascorbic acid (-0.226). Rest of the characters has showed the non-significant correlation with Number of locules per fruit.

Pericarp Thickness (mm)

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Pericarp thickness has showed the positive correlation with Fruit weight (0.686), Equatorial diameter (0.602), Polar diameter (0.483), Fruit yield per plant (0.469), Days to 50% flowering (0.465), Fruit yield per hectare (0.454), Days to first fruit set (0.408), Days to first fruit maturity (0.294) and Days to fruit harvesting (0.290). Rest of the characters has showed the non-significant correlation with Pericarp thickness.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Pericarp thickness has showed the positive correlation with Fruit weight (0.677), Equatorial diameter (0.614), Fruit yield per hectare (0.487), Polar diameter (0.485), Days to 50% flowering (0.484), Fruit yield per plant (0.475), Days to first fruit set (0.427), Days to fruit harvesting (0.328) and Days to first fruit maturity (0.327). It has also showed the negative but significant correlation with Specific gravity (-0.472) and Ascorbic acid (-0.258). Rest of the characters has showed the non-significant correlation with Pericarp thickness.

Polar Diameter (mm)

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Polar diameter has showed the positive correlation with Fruit weight (0.748), Equatorial diameter (0.692), TSS (0.491), Pericarp thickness (0.483), Ascorbic acid (0.479), Fruit yield per hectare (0.263) and Fruit yield per plant (0.248). It has also showed the negative but significant correlation with Number of fruits per plant (-0.286). Rest of the characters has showed the non-significant correlation with Polar diameter.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Polar diameter has showed the positive correlation with Fruit weight (0.738), Equatorial diameter (0.680), Pericarp thickness (0.485), TSS (0.452), Fruit yield per plant (0.265) and Fruit yield per hectare (0.259). It has also showed the negative but significant correlation with Number of fruits per plant (-0.283). Rest of the characters has showed the non-significant correlation with Polar diameter.

Equatorial Diameter (mm)

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Equatorial diameter has showed the positive correlation with Fruit weight (0.878) and followed by Polar diameter (0.692), Pericarp thickness (0.602), Ascorbic acid (0.464), TSS (0.361), Fruit yield per hectare (0.274), Fruit yield per plant (0.273) and Number of locules per fruit (0.262). It has also showed the negative but significant correlation with Number of fruits per plant (-0.425). Rest of the characters has showed the non-significant correlation with Equatorial diameter.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Equatorial diameter has showed the positive correlation with Fruit weight (0.870) and followed by Polar diameter (0.680), Pericarp thickness (0.614), TSS (0.330), Fruit yield per plant (0.296), Fruit yield per hectare (0.288) and Number of locules per fruit (0.258). It has also showed the negative but significant correlation with Number of fruits per plant (-0.411) and Ascorbic acid (-0.260). Rest of the characters has showed the non-significant correlation with Equatorial diameter.

Specific Gravity

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Specific gravity has showed the positive correlation with Number of primary branches per plant (0.255) and It has also showed the negative but significant correlation with Total soluble solid (-0.258). Rest of the characters has showed the non-significant correlation with specific gravity.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Specific gravity has showed the negative correlation but significant with Number of locules per fruit (-0.472) and followed by Days to first fruit set (-0.301), Days to 50% flowering (-0.248), Days to fruit harvesting (-0.241) and Days to first fruit maturity (-0.236). Rest of the characters has showed the non-significant correlation with specific gravity.

Total Soluble Solid

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Total soluble solid has showed the positive correlation with Ascorbic acid (0.833) and followed by Polar diameter (0.491), Average fruit weight (0.401) and Equatorial diameter (0.361). It has also showed the negative correlation with Days to first fruit set (-0.258) and followed by Specific gravity (-0.258) and Number of fruits per plants. Rest of the characters has showed the non-significant correlation with Total soluble solid.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Total soluble solid has showed the positive correlation with Polar diameter (0.452) and followed by Average fruit weight (0.363) and Equatorial diameter (0.330). It has also showed the negative correlation but significant with Number of fruits per plant (-0.293) and Ascorbic acid (-0.228). Rest of the characters has showed the non-significant correlation with Total soluble solid.

Ascorbic Acid (mg/100g)

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Ascorbic acid has showed the positive correlation with Total soluble solid (0.833) and followed by Polar diameter (0.479), Equatorial diameter (0.464), Average fruit weight (0.432), Days to first fruit set (0.308) and Days to 50% flowering (0.284). None of the character has showed the negative significant correlation with ascorbic acid and therefore rest of the characters has showed the non-significant correlation with ascorbic acid.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Ascorbic acid has showed the positive correlation with Stem thickness

(0.302). It has also showed the negative correlation but significant with Average fruit weight (-0.280) and followed by Equatorial diameter (-0.260), Pericarp thickness (-0.258), Total soluble solid (-0.228) and Number of locules per fruit (-0.226). Rest of the characters has showed the non-significant correlation with ascorbic acid.

Number of Fruits per Plant

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Number of fruits per plant has showed the positive correlation with Fruit yield per hectare (0.535) and followed by Fruit yield per plant (0.528), and Average fruit weight (0.342). It has also showed the negative correlation but significant with Equatorial diameter (-0.425), Polar diameter (-0.286) and Total soluble solid (-0.244). Rest of the characters has showed the non-significant correlation with Number of fruits per plant.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Number of fruits per plant has showed the positive correlation with Fruit yield per hectare (0.538) and followed by Fruit yield per plant (0.535), Average fruit weight (0.330) and Stem thickness (0.242). It has also showed negative correlation but significant with Equatorial diameter (-0.411) and followed by Total soluble solid (-0.293) and Polar diameter (-0.293). Rest of the characters has showed the non-significant correlation with Number of fruits per plant.

Average Fruit Weight (g)

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Average fruit weight has showed the positive correlation with Equatorial diameter (0.878) and followed by Polar diameter (0.748), Pericarp thickness (0.686), Fruit yield per plant (0.478), Fruit yield per hectare (0.475), Ascorbic acid (0.432), Total soluble solid (0.401), Number fruits per plant (0.342) and Number of locules per fruit (0.314). None of the character has showed the negative significant correlation with ascorbic acid and therefore rest of the characters has showed the non-significant correlation with Average fruit weight.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Average fruit weight has showed the positive correlation with Equatorial diameter (0.870) and followed by Polar diameter (0.738), Pericarp thickness (0.677), Fruit yield per plant (0.495), Fruit yield per hectare (0.487), Total soluble solid (0.363), Number of fruits per plant (0.330) and Number of locules per fruit (0.319). It has also showed the negative correlation but significant with Ascorbic acid (-0.280). Rest of the characters has showed the non-significant correlation with Average fruit weight.

Fruit Yield per Plant (kg)

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Fruit yield per planthas showed the positive correlation with Fruit yield per hectare (0.999) and followed by Number fruit per plant (0.528), Average fruit weight (0.478), Pericarp thickness (0.469), Equatorial diameter (0.273) and Polar diameter (0.248). None of the character has showed the negative significant correlation with fruit yield per plant and therefore rest of the characters has showed the non-significant correlation withfruit yield per plant.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Fruit yield per planthas showed the positive correlation with Fruit yield per hectare (0.999) and followed by Number fruit per plant (0.535), Average fruit weight (0.495), Pericarp thickness (0.475), Equatorial diameter (0.296), Polar diameter (0.265) and Stem thickness (0.248). None of the character has showed the negative significant correlation with ascorbic acid and therefore rest of the characters has showed the non-significant correlation withfruit yield per plant.

Fruit Yield (q/ha)

Rabi Season (2021-2022): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Fruit yield per hectare has showed the positive correlation with Fruit yield per plant (0.999) and followed by Number of fruits per plant (0.535), Average fruit weight (0.475), Pericarp thickness (0.454), Equatorial diameter (0.274) and Polar diameter (0.263). It has also showed the negative correlation but significant with Number of primary branches (-0.227). Rest of the characters has showed the non-significant correlation withfruit yield per hectare.

Rabi Season (2022-2023): The genotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Fruit yield per hectare has showed the positive correlation with Fruit yield per plant (0.999) and followed by Number of fruits per plant (0.538), Average fruit weight (0.487), Pericarp thickness (0.487), Equatorial diameter (0.288), Polar diameter (0.259) and Number of primary branches (0.239). None of the character has showed the negative significant correlation with ascorbic acid and therefore rest of the characters has showed the non-significant correlation withfruit yield per hectare.

3.1.2 Phenotypic Correlation Coefficients

Plant Height

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Plant Height (cm)has showed positive and significant correlation with Days to 50% flowering (0.617) and followed by Number of primary branches (0.571), Days to first fruit set (0.536), Days to first fruit maturity (0.513), Days to fruit harvesting (0.456) and Stem thickness (0.229). None of the character has showed the negative significant correlation with plant height and therefore rest of the characters has showed the non-significant correlation with plant height.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Plant Height (cm)has showed positive and significant correlation with Days to 50% flowering (0.635) and followed by Number of primary branches (0.585), Days to first fruit set (0.565), Days to first fruit maturity (0.532) and Days to fruit harvesting (0.486). None of the character has showed the negative significant correlation with plant height and therefore rest of the characters has showed the non-significant correlation with plant height.

Number of Primary Branches per Plant

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Number of primary branches per planthas showed positive and significant correlation with Plant height (0.571) and followed by Stem thickness (0.325), Equatorial diameter (0.279), Days to first fruit set (0.244), Days to 50% flowering (0.236) and Days to first fruit maturity (0.233). It has also showed the negative correlation but significant with Days to fruit harvesting (-

0.237). Rest of the characters has showed the non-significant correlation with Number of primary branches per plant.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Number of primary branches per planthas showed positive and significant correlation with Plant height (0.585) and followed by Stem thickness (0.399), Days to 50% flowering (0.318), Days to first fruit maturity (0.308) and Days to first fruit set (0.299). It has also showed the negative correlation but significant with Days to fruit harvesting (-0.251). Rest of the characters has showed the non-significant correlation with Number of primary branches per plant.

Stem Thickness (mm)

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Stem thicknesshas showed positive and significant correlation with Number of primary branches (0.229). It has also showed the negative correlation but significant with Days to fruit harvesting (-0.378). Rest of the characters has showed the non-significant correlation with Stem thickness.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Stem thicknesshas showed positive and significant correlation with Average fruit weight (0.247) and followed by Ascorbic acid (0.244) and Fruit yield per plant (0.238). It has also showed the negative correlation but significant with Days to fruit harvesting (-0.301). Rest of the characters has showed the non-significant correlation with Stem thickness.

Days to 50% Flowering

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to 50% flowering (0.955)has showed positive and significant correlation with Days to first fruit set (0.666) and followed by Plant height (0.617), Days to first fruit maturity (0.578), Number of locules per fruit (0.470), Number of primary branches per plant (0.325) and Total soluble solid (0.303). None of the character has showed the negative significant correlation with stem Days to 50% flowering therefore, Rest of the characters has showed the non-significant correlation with Days to 50% flowering.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to 50% flowering (0.955)has showed positive and significant correlation with Days to first fruit set (0.699) and followed by Days to first fruit maturity (0.640), Plant height (0.635), Number of locules per fruit (0.493), Number of primary branches per plant (0.399) and Total soluble solid (0.227). None of the character has showed the negative significant correlation with stem Days to 50% flowering therefore, Rest of the characters has showed the non-significant correlation with Days to 50% flowering.

Days to First Fruit Set

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to first fruit set (0.710)has showed positive and significant correlation with Days to 50% flowering (0.951) and followed by Days to first fruit maturity (0.596), Plant height (0.536), Number of locules per fruit (0.414), Total soluble solid (0.324) and Number of primary branches per plant (0.236). It has also showed the negative correlation but significant with Specific

gravity (-0.244). Rest of the characters has showed the non-significant correlation with Days to first fruit set.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to first fruit set (0.740)has showed positive and significant correlation with Days to 50% flowering (0.955) and followed by Days to first fruit maturity (0.647), Plant height (0.565), Number of locules per fruit (0.437), Number of primary branches per plant (0.318) and Total soluble solid (0.229). It has also showed the negative correlation but significant with Equatorial diameter (-0.245). Rest of the characters has showed the non-significant correlation with Days to first fruit set.

Days to First Fruit Maturity

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to first fruit maturity (0.947)has showed positive and significant correlation with Days to first fruit set (0.710) and followed by Days to 50% flowering (0.666), Plant height (0.513), Number of locules per fruit (0.303) and Number of primary branches per plant (0.244). None of the character has showed the negative significant correlation with Days to first fruit maturity therefore, Rest of the characters has showed the non-significant correlation with Days to first fruit maturity.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to first fruit maturity (0.948)has showed positive and significant correlation with Days to first fruit set (0.740) and followed by Days to 50% flowering (0.699), Plant height (0.532), Number of locules per fruit (0.342) and Number of primary branches per plant (0.299). None of the character has showed the negative significant correlation with Days to first fruit maturity therefore, Rest of the characters has showed the non-significant correlation with Days to first fruit maturity.

Days to Fruit Harvesting

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to fruit harvesting has showed positive and significant correlation with Days to first fruit maturity (0.947) and followed by Days to first fruit set (0.596), Days to 50% flowering (0.578), Plant height (0.456), Number of locules per fruit (0.297) and Number of primary branches per plant (0.233). None of the character has showed the negative significant correlation with Days to fruit harvesting therefore, Rest of the characters has showed the non-significant correlation with Days to fruit harvesting.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Days to fruit harvesting has showed positive and significant correlation with Days to first fruit maturity (0.948) and followed by Days to first fruit set (0.647), Days to 50% flowering (0.640), Plant height (0.486), Number of locules per fruit (0.342) and Number of primary branches per plant (0.308). None of the character has showed the negative significant correlation with Days to fruit harvesting therefore, Rest of the characters has showed the non-significant correlation with Days to fruit harvesting.

Number of Locules per Fruit

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Number of locules per fruit has showed positive and significant correlation with Number of fruits per plant (0.294) and followed by Polar diameter (0.244). It has also showed the negative correlation but significant with Stem thickness (-0.378) and followed by Number of primary branches per plant (-0.237). Rest of the characters has showed the non-significant correlation with Number of locules per fruit.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Number of locules per fruit has showed positive and significant correlation with Number of fruits per plant (0.299) and followed by Polar diameter (0.241). It has also showed the negative correlation but significant with Stem thickness (-0.301) and followed by Number of primary branches per plant (-0.251). Rest of the characters has showed the non-significant correlation with Number of locules per fruit.

Pericarp Thickness (mm)

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Pericarp thickness (0.488) has showed positive and significant correlation with Number of fruits per plant (0.687) and followed by Polar diameter (0.606), Days to 50% flowering (0.470), Average fruit weight (0.465), Fruit yield per plant (0.453), Days to first fruit set (0.414), Days to first fruit maturity (0.303) and Days to fruit harvesting (0.297). None of the character has showed the negative significant correlation with pericarp thickness therefore, Rest of the characters has showed the non-significant correlation with Pericarp thickness.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Pericarp thickness (0.493) has showed positive and significant correlation with Number of fruits per plant (0.679) and followed by Polar diameter (0.620), Days to 50% flowering (0.493), Fruit yield per plant (0.488), Average fruit weight (0.476), Days to first fruit set (0.437), Days to first fruit maturity (0.342) and Days to fruit harvesting (0.342). It has also showed the negative correlation but significant with Equatorial diameter (-0.431) and followed by Total soluble solid (-0.228). Rest of the characters has showed the non-significant correlation with Pericarp thickness.

Polar Diameter (mm)

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Polar diameter (0.695) has showed positive and significant correlation with Number of fruits per plant (0.748) and followed by Pericarp thickness (0.488), Specific gravity (0.487), Total soluble solid (0.448), Fruit yield per plant (0.263) and Average fruit weight (0.243). It has also showed the negative correlation but significant with Ascorbic acid (-0.279). Rest of the characters has showed the non-significant correlation with Polar diameter.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Polar diameter (0.688) has showed positive and significant correlation with Number of fruits per plant (0.736) and followed by Pericarp thickness (0.493), Specific gravity (0.472), Average fruit weight (0.268) and Fruit yield per plant (0.262). It has also showed the negative correlation but significant with Ascorbic acid (-0.271). Rest of the characters has showed the non-significant correlation with Polar diameter.

Equatorial Diameter (mm)

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Equatorial diameter has showed positive and significant correlation with Number of fruits per plant (0.877) and followed by Polar dimeter (0.695), Pericarp thickness (0.606), Total soluble solid (0.436), Specific gravity (0.360), Fruit yield per plant (0.274), Average fruit weight (0.269) and Number of locules per fruit (0.244). It has also showed the negative correlation but significant with Ascorbic acid (-0.418). Rest of the characters has showed the non-significant correlation with Equatorial diameter.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Equatorial diameter has showed positive and significant correlation with Number of fruits per plant (0.868) and followed by Polar dimeter (0.688), Pericarp thickness (0.620), Specific gravity (0.352), Average fruit weight (0.299), Fruit yield per plant (0.290) and Number of locules per fruit (0.241). It has also showed the negative correlation but significant with Ascorbic acid (-0.418). Rest of the characters has showed the non-significant correlation with Equatorial diameter.

Specific Gravity

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Specific gravity (-0.240) has showed positive and significant correlation with Number of primary branches per plant (0.279). None of the character has showed the negative significant correlation therefore, Rest of the characters has showed the non-significant correlation with Specific gravity.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Specific gravity has showed negative and significant correlation with Pericarp thickness (-0.431) and followed by Days to first fruit set (-0.245). None of the character has showed the positive significant correlation therefore, Rest of the characters has showed the non-significant correlation with Specific gravity.

Total Soluble Solid (^{o}brix)

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Total soluble solid (0.798) has showed positive and significant correlation with Polar diameter (0.487) and followed by Number of fruits per plant (0.396) and Equatorial diameter (0.360). It has also showed the negative correlation but significant with Days to first fruit set (-0.244) and followed by Specific gravity (-0.240) and Ascorbic acid (-0.238). Rest of the characters has showed the non-significant correlation with Total soluble solid.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Total soluble solid has showed positive and significant correlation with Polar diameter (0.472) and followed by Number of fruits per plant (0.367) and Equatorial diameter (0.352). It has also showed the negative correlation but significant with Ascorbic acid (-0.275). Rest of the characters has showed the non-significant correlation with Total soluble solid.

Ascorbic Acid (mg/100g)

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Ascorbic acid has showed positive and significant correlation with Total

soluble solid (0.798) and followed by Polar diameter (0.448), Equatorial diameter (0.436), Number of fruits per plant (0.418), Days to first fruit set (0.324) and Days to 50% flowering (0.303). None of the character has showed the negative significant correlation with Ascorbic acid therefore, Rest of the characters has showed the non-significant correlation with Ascorbic acid.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Ascorbic acid has showed positive and significant correlation with Days to first fruit set (0.229) and followed by Days to 50% flowering (0.227). It has also showed the negative correlation but significant with Number of fruits per plant (-0.260) and followed by Pericarp thickness (-0.228). Rest of the characters has showed the non-significant correlation with Ascorbic acid.

Number of Fruits per Plant

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Number of fruits per plant (0.340) has showed positive and significant correlation with Fruit yield per plant (0.534) and followed by Average fruit weight (0.526). It has also showed the negative correlation but significant with Equatorial diameter (-0.418) and followed by Pola diameter (-0.279) and Total soluble solid (-0.238). Rest of the characters has showed the non-significant correlation with Number of fruits per plant.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Number of fruits per plant (0.326) has showed positive and significant correlation with Fruit yield per plant (0.539) and followed by Average fruit weight (0.536) and Stem thickness (0.244). It has also showed the negative correlation but significant with Equatorial diameter (-0.399) and followed by Polar diameter (-0.271) and Total soluble solid (-0.275). Rest of the characters has showed the non-significant correlation with Number of fruits per plant.

Average Fruit Weight (g)

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Average fruit weight (0.475) has showed positive and significant correlation with Equatorial diameter (0.877) and followed by Polar diameter (0.748), Pericarp thickness (0.687), Fruit yield per plant (0.475), Ascorbic acid (0.418), Total soluble solid (0.396), Number of fruits per plant (0.340) and Number of locules per fruit (0.294). None of the character has showed the negative significant correlation with Average fruit weight therefore, Rest of the characters has showed the non-significant correlation with Average fruit weight.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Average fruit weight (0.497) has showed positive and significant correlation with Equatorial diameter (0.868) and followed by Polar diameter (0.736), Pericarp thickness (0.679), Fruit yield per plant (0.488), Total soluble solid (0.367), Number of fruits per plant (0.326) and Number of locules per fruit (0.299). It has also showed the negative correlation but significant with Ascorbic acid (-0.260). Rest of the characters has showed the non-significant correlation with Average fruit weight.

Fruit Yield per Plant (kg)

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Fruit yield per plant (0.998) has showed positive and significant correlation

with Number of fruits per plant (0.526) and followed by Average fruit weight (0.475), Pericarp thickness (0.465), Equatorial diameter (0.269) and Polar diameter (0.243). None of the character has showed the negative significant correlation with Fruit yield per plant therefore, Rest of the characters has showed the non-significant correlation with Fruit yield per plant.

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Fruit yield per plant (0.999) has showed positive and significant correlation with Number of fruits per plant (0.536) and followed by Average fruit weight (0.497), Pericarp thickness (0.476), Equatorial diameter (0.299), Polar diameter (0.208) and Stem thickness (0.247). None of the character has showed the negative significant correlation with Fruit yield per plant therefore, Rest of the characters has showed the non-significant correlation with Fruit yield per plant.

Fruit yield (q/ha)

Rabi Season (2021-2022): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Fruit yield per plant has showed positive and significant correlation with Fruit yield per plant (0.998) and followed by Number of fruits per plant (0.534), Average fruit weight (0.475), Pericarp thickness (0.453), Equatorial diameter (0.274) and Polar diameter (0.263). None of the character has showed the negative significant correlation with Fruit yield (q/ha) therefore, Rest of the characters has showed the non-significant correlation with Fruit yield (q/ha).

Rabi Season (2022-2023): The phenotypic correlation coefficient among different traits exhibited that the most principal trait i.e. Fruit yield per plant has showed positive and significant correlation with Fruit yield per plant (0.999) and followed by Number of fruits per plant (0.539), Average fruit weight (0.488), Pericarp thickness (0.488), Equatorial diameter (0.290), Polar diameter (0.262) and Stem thickness (0.238). None of the character has showed the negative significant correlation with Fruit yield (q/ha) therefore, Rest of the characters has showed the non-significant correlation with Fruit yield (q/ha).

4. Discussions

The yield is influenced by a number of variables. As a result, the study of the correlation coefficient quantifies how close the component features are to one another. Given that yield is a key characteristic with which all other characteristics are positively or negatively correlated.The correlation analyses how closely two characters are related to one another, how they differ from one another, and whether relationships exist between any two of these characters. Yield is a complicated trait that is heavily impacted by environmental changes and is primarily controlled by a large number of genes. The plant breeder may be able to gauge the degree of association between yield and the contributing traits by being aware of the correlation between them.

In the current study, correlation coefficients between the fruit yield and its component features have been calculated at both the genotypic and phenotypic levels. In general, the genotypic correlation coefficient values were greater than the phenotypic values. This suggested that significant intrinsic correlations were largely obscured at the phenotypic level by environmental influences.

4.1 Genotypic correlation

The present investigation revealed that for rabi season 2021-2022, the Fruit yield per plant exhibited positive and highly significant genotypic correlations with Fruit yield per hectare and followed by

Number fruit per plant, Average fruit weight, Pericarp thickness, Equatorial diameter and Polar diameter. None of the character has showed the negative significant correlation with fruit yield per plant and therefore rest of the characters has showed the non-significant correlation withfruit yield per plant. While for rabi season 2022-2023, the Fruit yield per plant exhibited positive and highly significant correlations with Fruit yield per hectare and followed by Number fruit per plant, Average fruit weight, Pericarp thickness, Equatorial diameter, Polar diameter and Stem thickness. None of the character has showed the negative significant correlation with ascorbic acid and therefore rest of the characters has showed the non-significant correlation withfruit yield per plant. Earlier researchers also indicated significant and positive relation of yield per plant with average fruit weight **(Khapte and Jansirani 2014, Prasad and Rai. 1999, Mohanty. 2002a and 2002b and Harer et al. 2003 and Islam et al. 2010),** number of fruits per plant **(Khapte and Jansirani. 2014).**

4.2 Phenotypic Correlation

The present investigation revealed that for rabi season 2021-2022, the Fruit yield per plant exhibited positive and highly significant phenotypic correlations with Number of fruits per plant and followed by Average fruit weight, Pericarp thickness, Equatorial diameter and Polar diameter. None of the character has showed the negative significant correlation with Fruit yield per plant therefore, Rest of the characters has showed the non-significant correlation with Fruit yield per plant. While for rabi season 2022-2023, the Fruit yield per plant exhibited positive and highly significant correlations with Number of fruits per plant and followed by Average fruit weight, Pericarp thickness, Equatorial diameter, Polar diameter and Stem thickness. None of the character has showed the negative significant correlation with Fruit yield per plant therefore, Rest of the characters has showed the non-significant correlation with Fruit yield per plant. Earlier researchers also indicated significant and positive relation of yield per plant with average fruit weight **(Khapte and Jansirani. 2014, Prasad and Rai. 1999, Mohanty. 2002a and 2002b and Harer et al. 2003 and Islam et al. 2010),** number of fruits per plant **(Khapte and Jansirani. 2014),** Pericarp thickness **(Khapte and Jansirani. 2014).**

Conclusion

In conclusion, the study revealed thatthe genotypic and phenotypic correlations between various characteristics and fruit yield per plant for a particular study, both in the past and for the upcoming rabi season of 2022-2023. It appears that there is a strong positive correlation among most of the characteristics under investigation, with fruit yield per plant showing significant positive associations with fruit yield per hectare, number of fruits per plant, average fruit weight, pericarp thickness, equatorial diameter, polar diameter, and stem thickness. Notably, none of the examined characteristics exhibited a negative significant correlation with fruit yield per plant, suggesting a generally favorable relationship among these traits. These findings provide valuable insights for researchers and practitioners in agriculture, indicating which traits are most closely linked to fruit yield per plant, thereby aiding in the development of strategies to improve crop yields.

References

1. Giovannucci, E., Rimm, E. B., Liu, Y., Stampfer, M. J., & Willett, W. C. (2002). A prospective study of tomato products, lycopene, and prostate cancer risk. Journal of the National Cancer Institute, 94(5), 391-398.

2. Harer, P. N., Lad, D. B., &Bhor, T. J. (2003). Correlation and path analysis studies in tomato. Journal of Maharashtra Agricultural Universities, 27(3), 302-303.
3. Islam, B. M. R., Ivy, N. A., Rasul, M. G., & Zakaria, M. (2010). Character Association and Path Analysis of Exotic Tomato (Solanum lycopersicum L.) Genotypes. Bangladesh Journal of Plant Breeding and Genetics, 23(1), 13-18.
4. Khapte, P. S., &Jansirani, P. (2014). Correlation and path coefficient analysis in tomato (Solanum lycopersicum L.). Electronic Journal of Plant Breeding, 5(2), 300-304.
5. Mohanty, B. K. (2002a). Studies on variability, heritability, interrelationship and path analysis in tomato. Annals of Agricultural Research, 23, 65-69.
6. Mohanty, B. K. (2002b). Variability, heritability, correlation and path coefficient studies in tomato. Haryana Journal of Horticultural Sciences, 31, 230-233.
7. Prasad, V. S. R., & Rai, M. (1999). Genetic variability, components association and direct and indirect selection in some exotic tomato germplasm. Indian Journal of Horticulture, 56(3), 262-266.
8. R Core Team. (2021). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing.
9. Revelle, W. (2021). Procedures for Psychological, Psychometric, and Personality Research (Version 2.0.12).
10. Smith, J. R., et al. (2020). Exploring Trait Relationships in Tomato Using Path Coefficient and Correlation Analysis. Journal of Agricultural Science, 40(3), 295-312.
11. Wright, S. (1921). Correlation and causation. Journal of Agricultural Research, 20(7), 557-585.

Table 1 Genotypic Correlations 2021-2022

Chrs	Plant Height	No. of Primary Branches	Stem Thickness	Days to 50% Flowering	Days to First Fruit Set	Days to First Fruit Maturity	Days to Fruit Harvesting	Number of Locules in Fruit	Pericarp Thickness	Polar Diameter	Equatorial Diameter	Specific Gravity	TSS	Ascorbic Acid	No. of Fruits Per Plant	Average Fruit Weight	Fruit Yield/ Plant	Fruit Yield per Hectare
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1.000	0.564**	0.224	0.611**	0.530**	0.505**	0.452**	-0.157	0.030	-0.070	-0.109	-0.044	0.032	0.081	-0.055	-0.005	-0.099	-0.113
2			-0.020	0.304**	0.216	0.216	0.194	-0.259*	-0.092	-0.078	-0.031	0.255*	0.058	-0.056	-0.094	-0.083	-0.222	-0.227*
3				0.008	-0.015	-0.130	-0.113	-0.415**	0.024	0.067	-0.170	0.124	0.067	-0.175	0.059	-0.166	-0.089	-0.084
4					0.950**	0.655**	0.570**	-0.016	0.465**	-0.082	0.022	-0.013	-0.205	0.284*	-0.157	0.066	0.054	0.030
5						0.702**	0.592**	-0.138	0.408**	-0.074	-0.055	-0.062	-0.258*	0.308**	-0.149	0.001	0.064	0.043
6							0.958**	0.037	0.294**	-0.136	-0.081	-0.072	-0.088	-0.010	0.033	0.051	0.166	0.146
7								-0.010	0.290*	-0.144	-0.073	-0.139	-0.054	-0.052	0.104	0.009	0.166	0.151
8									0.214	-0.105	0.262*	0.118	0.085	-0.093	-0.099	0.314**	0.133	0.119
9										0.483**	0.602**	-0.010	0.179	-0.098	-0.224	0.686**	0.469**	0.454**
10											0.692**	0.086	0.491**	-0.479**	-0.286*	0.748**	0.248*	0.263*
11												0.033	0.361**	-0.464**	-0.425**	0.878**	0.273*	0.274*
12													-0.258*	0.037	0.119	0.118	0.160	0.166
13														-0.833**	-0.244*	0.401**	-0.004	0.009
14															0.182	-0.432**	-0.062	-0.083
15																-0.342**	0.528**	0.535**
16																	0.478**	0.475**
17																		0.999**
18																		1.000

***, ** significant at 5% and 1% level, respectively**

Table 2 Genotypic Correlations 2022-2023

Chrs	Plant Height	No. of Primary Branches	Stem Thickness	Days to 50% Flowering	Days to First Fruit Set	Days to First Fruit Maturity	Days to Fruit Harvesting	Number of Locules in Fruit	Pericarp Thickness	Polar Diameter	Equatorial Diameter	Specific Gravity	TSS	Ascorbic Acid	No. of Fruits Per Plant	Average Fruit Weight	Fruit Yield/ Plant	Fruit Yield per Hectare
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1.000	0.574**	0.088	0.626**	0.555**	0.519**	0.473**	-0.170	0.050	-0.071	-0.112	-0.038	0.063	0.176	-0.056	-0.013	-0.088	-0.072
2			-0.179	0.369**	0.286*	0.253*	0.258*	-0.282*	-0.035	-0.083	-0.028	0.173	0.048	0.126	-0.098	-0.096	-0.194	-0.188
3				-0.023	0.012	-0.021	-0.004	-0.350**	0.147	0.104	-0.047	-0.110	0.078	-0.302**	0.242*	-0.022	0.248*	0.239*
4					0.954**	0.684**	0.623**	-0.034	0.484**	-0.059	0.047	-0.248*	-0.160	0.192	-0.133	0.060	0.063	0.091
5						0.730**	0.633**	-0.153	0.427**	-0.053	-0.030	-0.301**	-0.206	0.198	-0.128	-0.002	0.070	0.097
6							0.947**	0.008	0.327**	-0.147	-0.076	-0.236*	-0.087	-0.029	0.033	0.040	0.172	0.200
7								-0.039	0.328**	-0.137	-0.060	-0.241*	-0.023	-0.001	0.099	-0.013	0.146	0.178
8									0.210	-0.123	0.258*	0.180	0.063	-0.226*	-0.111	0.319**	0.120	0.132
9										0.485**	0.614**	-0.472**	0.156	-0.258*	-0.194	0.677**	0.475**	0.487**
10											0.680**	-0.187	0.452**	-0.183	-0.283*	0.738**	0.265*	0.259*
11												-0.194	0.330**	-0.260*	-0.411**	0.870**	0.296**	0.288*
12													0.111	0.126	0.040	-0.149	-0.123	-0.130
13														-0.228*	-0.293**	0.363**	-0.061	-0.055
14															0.053	-0.280*	-0.194	-0.183
15																-0.330**	0.535**	0.538**
16																	0.495**	0.487**
17																		0.999**
18																		1.000

***, ** significant at 5% and 1% level, respectively**

Table 3 Phenotypic Correlations Rabi Season 2021-2022

Chrs	Plant Height (cm)	No. of Primary Branches	Stem Thickness	Days to 50% Flowering	Days to First Fruit Set	Days to First Fruit Maturity	Days to Fruit Harvesting	Number of Locules in Fruit	Pericarp Thickness	Polar Diameter	Equatorial Diameter	Specific Gravity	TSS	Ascorbic Acid	No. of Fruits Per Plant	Average Fruit Weight	Fruit Yield/ Plant	Fruit Yield per Hectare
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1.000	0.571**	0.229*	0.617**	0.536**	0.513**	0.456**	-0.145	0.038	-0.057	-0.097	-0.026	0.037	0.097	-0.051	0.000	-0.100	-0.111
2			0.005	0.325**	0.236*	0.244*	0.233*	-0.237*	-0.074	-0.054	-0.011	0.279*	0.069	-0.022	-0.085	-0.073	-0.222	-0.221
3				0.028	0.003	-0.100	-0.071	-0.378**	0.032	0.079	-0.151	0.141	0.095	-0.144	0.063	-0.157	-0.086	-0.080
4					0.951**	0.666**	0.578**	-0.013	0.470**	-0.062	0.038	0.014	-0.191	0.303**	-0.149	0.072	0.050	0.032
5						0.710**	0.596**	-0.127	0.414**	-0.056	-0.039	-0.037	-0.244*	0.324**	-0.143	0.007	0.061	0.044
6							0.947**	0.036	0.303**	-0.110	-0.058	-0.037	-0.074	0.023	0.039	0.059	0.158	0.145
7								-0.007	0.297**	-0.103	-0.038	-0.083	-0.033	0.000	0.109	0.021	0.152	0.147
8									0.200	-0.097	0.244*	0.108	0.090	-0.087	-0.094	0.294**	0.127	0.110
9										0.488**	0.606**	0.004	0.179	-0.083	-0.220	0.687**	0.465**	0.453**
10											0.695**	0.104	0.487**	-0.448**	-0.279*	0.748**	0.243*	0.263*
11												0.050	0.360**	-0.436**	-0.418**	0.877**	0.269*	0.274*
12													-0.240*	0.065	0.123	0.124	0.155	0.166
13														-0.798**	-0.238*	0.396**	-0.002	0.010
14															0.186	-0.418**	-0.065	-0.079
15																-0.340**	0.526**	0.534**
16																	0.475**	0.475**
17																		0.998**
18																		1.000

***, ** significant at 5% and 1% level, respectively**

Table 4 Phenotypic Correlations Rabi Season 2022-2023

Chrs	Plant Height (cm)	No. of Primary Branches	Stem Thickness	Days to 50% Flowering	Days to First Fruit Set	Days to First Fruit Maturity	Days to Fruit Harvesting	Number of Locules in Fruit	Pericarp Thickness	Polar Diameter	Equatorial Diameter	Specific Gravity	TSS	Ascorbic Acid	No. of Fruits Per Plant	Fruit Weight	Fruit Yield/ Plant	Fruit Yield per Hectare
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1.000	0.585**	0.124	0.635**	0.565**	0.532**	0.486**	-0.154	0.064	-0.047	-0.089	-0.006	0.091	0.199	-0.049	-0.005	-0.082	-0.065
2			-0.090	0.399**	0.318**	0.299**	0.308**	-0.251*	-0.008	-0.039	0.009	0.219	0.099	0.171	-0.084	-0.078	-0.178	-0.173
3				0.041	0.068	0.060	0.084	-0.301**	0.171	0.149	0.001	-0.030	0.142	-0.214	0.244*	-0.003	0.247*	0.238*
4					0.955**	0.699**	0.640**	-0.024	0.493**	-0.023	0.076	-0.189	-0.107	0.227*	-0.121	0.071	0.070	0.097
5						0.740**	0.647**	-0.133	0.437**	-0.020	-0.002	-0.245*	-0.156	0.229*	-0.117	0.009	0.076	0.103
6							0.948**	0.016	0.342**	-0.097	-0.035	-0.162	-0.025	0.028	0.044	0.054	0.176	0.204
7								-0.044	0.342**	-0.081	-0.014	-0.158	0.043	0.060	0.107	0.005	0.150	0.181
8									0.200	-0.110	0.241*	0.169	0.064	-0.200	-0.100	0.299**	0.116	0.128
9										0.493**	0.620**	-0.431**	0.175	-0.228*	-0.188	0.679**	0.476**	0.488**
10											0.688**	-0.140	0.472**	-0.140	-0.271*	0.736**	0.268*	0.262*
11												-0.152	0.352**	-0.219	-0.399**	0.868**	0.299**	0.290*
12													0.157	0.169	0.049	-0.130	-0.110	-0.117
13														-0.170	-0.275*	0.367**	-0.050	-0.044
14															0.062	-0.260*	-0.180	-0.170
15																-0.326**	0.536**	0.539**
16																	0.497**	0.488**
17																		0.999**
18																		1.000

***, ** significant at 5% and 1% level, respectively**