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RESEARCH ARTICLE

BARI Tomato-19 as a Promising Cultivar: A Comparative Study of Growth, Quality, and Yield Attributes

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ABSTRACT

Tomatoes constitute a significant vegetable in Bangladesh, widely produced during winter. Though hybrid cultivars yield more than open-pollinated cultivars developed by the Bangladesh Agricultural Research Institute (BARI), growers cannot preserve hybrid seeds and have to buy new seeds every year. Considering the given situation, this study tested that BARI-released tomato varieties differ significantly in growth and yield under the agro-ecological conditions of central Bangladesh. Seven tomato varieties, *viz*. BARI Tomato-15, BARI Tomato-16, BARI Tomato-17, BARI Tomato-19, BARI Tomato-20, BARI Tomato-21, and BARI Tomato-2 were evaluated to identify high yielding and early mature cultivars. The experiment was conducted during the rabi season of 2022–23 using a Randomized Complete Block Design, and data were collected on major phenological, morphological, and yield contributing traits. Findings revealed that BARI Tomato-19 flowered earliest (26.18 days), fruited earliest (35.43 days), and provided the earliest harvest, whereas BARI Tomato-20 produced the tallest plants and the highest brix content. BARI Tomato-17 produced the heaviest individual fruits, while BARI Tomato-20 had the most fruits per plant. Yield varied widely, with BARI Tomato-19 producing the highest yield (85.03 t ha^{-1}) and BARI Tomato-2 the lowest. Correlation analysis indicated that fruit length, diameter, and flesh thickness positively influenced yield, whereas higher Brix was associated with lower productivity. Overall, the findings confirm that BARI Tomato-19 is the most productive and earliest-maturing variety, making it highly suitable for commercial cultivation in Bangladesh.

Keywords: *BARI tomato, Gazipur, Yield, Correlation, Bangladesh*

INTRODUCTION

One of the most significant vegetable fruits in the world is the tomato (*Solanum lycopersicum*). The crop was cultivated in Mexico after coming from the Andean region of South America, which includes modern-day Bolivia, Chile, Colombia, Ecuador, and Peru. After the discovery of the New World, tomatoes were introduced to Europe and gradually spread across the globe, eventually becoming one of the most widely cultivated vegetables (Saavedra *et al*., 2017). Today, tomato is the third most significant vegetable crop globally and

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is produced in more than 170 countries, with China and India leading in production (FAOSTAT, 2025). In Bangladesh, tomatoes occupy an important position due to their nutritional richness and versatile use in fresh and processed forms, contributing over 469,000 metric tons annually (YAS, 2024).

Botanically, tomatoes are self-pollinated annual plants belonging to the Solanaceae family, with a chromosome number of 2n = 24. Recent phylogenetic revisions have reinstated the former genus *Lycopersicon* into *Solanum*. Nutritionally, tomatoes provide essential vitamins, minerals, carotenoids, and antioxidants, such as lycopene, which has been linked to reduced risks of prostate and gastrointestinal cancers (Willcox *et al.,* 2003; Lester, 2006; Jannat *et al.,* 2023).

Tomato cultivation in Bangladesh traditionally takes place during the cool, dry months from November to February, although summer cultivation has recently expanded. The crop thrives under moderate temperatures, prefers deep, well-drained sandy loam soils, and performs best within a temperature range of 21°C-24°C, with specific thermal requirements for germination, seedling growth, and fruit set (Sharma et al., 2019). In response to rising demand and diverse growing conditions, the Bangladesh Agricultural Research Institute (BARI) has developed several high-yielding, winter- and heat-tolerant tomato varieties (Chowhan *et al.,* 2024; Chowhan *et al.,* 2023) to fit in the cropping patterns (Chowhan *et al.,* 2020). However, comprehensive evaluations comparing the growth and yield performance of these varieties remain limited.

Against this backdrop, the present study was undertaken to compare the growth characteristics and yield performance of seven tomato varieties developed by BARI. The investigation aimed to identify varieties that perform better under local agro-ecological conditions by evaluating their vegetative traits, fruiting behavior, and overall productivity.

MATERIALS AND METHODS

Experimental site

From November 2022 to March 2023, the experiment was conducted in the field and the lab of the Department of Horticulture, Gazipur Agricultural University (GAU), Salna, Gazipur. It is situated 8.5 meters above sea level, around 40 kilometers north of Dhaka, and in the middle of the Madhupur tract between latitudes 24.90°N and 90.26°E. Once a *sal* woodland, it was cleared and improved for scientific purposes (Roni *et al.,* 2017).

Soil and climate

The experimental site's soil is part of the Shallow Red Brown Terrace soil series in the Madhupur tract. With a pH of 6.3, the soil had a clay loam texture and was nearly neutral. The experimental location is in a subtropical climate zone, characterized by substantial rainfall throughout the rest of the year and little rainfall from November to April. The temperature ranged from 24.2 to 33.6 degrees Celsius. During the Rabi season, the air temperature ranges from 12 to 31 degrees Celsius, with relative humidity above 90% at the maximum and 30 to 70% at the minimum. March through May are the hottest months, and winter is brief and chilly. The majority of the yearly rainfall, which averages 210 cm, falls between June and October. The GAU meteorological station provided the distribution of average monthly maximum and minimum temperatures, relative humidity, and rainfall during the crop-growing season (Chowhan *et al.,* 2016)

Table 1. List of tomato varieties used in the experiment

Variety	Origin	Source
BARI Tomato-15 (V1)	Bangladesh	BARI
BARI Tomato-16 (V2)	Bangladesh	BARI
BARI Tomato-17 (V3)	Bangladesh	BARI
BARI Tomato-19 (V4)	Bangladesh	BARI
BARI Tomato-20 (V5)	Bangladesh	BARI
BARI Tomato-21 (V6)	Bangladesh	BARI
BARI Tomato-2 (V7)	Bangladesh	BARI

Planting materials

The study included seven tomato varieties collected from the Horticulture Research Center (HRC) of Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur. The detailed list of the studied varieties is presented in Table 1.

Land preparation and seeding

A tractor was used to plough the experimental plot, followed by several harrows to crush the soil. To achieve the desired tillage, the field was cleared of weeds and clods. On November 1, 2022, seeds of the seven tomato varieties were planted. Soil and decomposed cow dung were used in a 1:1 ratio to create the seedbed. The beds were covered with newspaper after the seeds were sown. The seeds germinated completely in seven days.

Design and layout of the experimental field

The field experiment was carried out in a Randomized Complete Block Design (RCBD) with three replicates, where the unit plot size was 2.4 m × 1.2 m and plots and blocks were separated by 0.5 m. Treatments were allotted plots randomly. The spacing was 60 cm × 60 cm. Eight tomato seedlings were planted in each plot.

Manure and fertilizer application

About 10 metric tons of cow dung and chemical fertilizers were applied at a rate of 550 kg urea, 450 kg TSP, 250 kg MP, 120 kg gypsum, and 2 kg boron per acre. During the last stage of land preparation, half of the cow dung and all of the TSP, gypsum, and boron were applied. A week before planting, the pits were ready. MP and the leftover cow dung were added to the hole. Three equal urea top dressings were used at 10, 25, and 40 days post-transplant.

Transplanting

36-day-old seedlings were transplanted in the experimental field on December 06, 2022, in the afternoon, followed by light irrigation.

Intercultural operation

Stalking

Supports were provided for the growing plants using bamboo sticks to keep them upright. One stick was used per plant.

Weeding and mulching

Every time it was deemed necessary to keep the plants free of weeds and to crush the soil, weeding and mulching were carried out.

Irrigation

The plants were initially irrigated with a watering cane, and as they grew older, flood irrigation was provided whenever required.

Pest and disease control

To prevent damping-off damage during the seedling stage, captan (fungicide) was used. Some deformed tomatoes were caused by low temperature.

Harvesting

Fruits were harvested at 3-day intervals beginning on 20 February, 2023, to 19 March, 2023.

Data collection

Data were collected from each unit plot on a range of growth, flowering, fruiting, and yield parameters. At the time of final harvest, plant height was measured from the soil's surface to the tip of the tallest branch. Flowering traits included days to first flower and days to 50% flowering, recorded from transplanting to the respective flowering stages. Flower clusters per plant and flowers per cluster were determined by counting and averaging cluster numbers and flowers in selected clusters. Days to first fruit set were recorded similarly. Fruiting traits, including fruits per cluster, fruit color (visual observation), and fruit shape (IPGRI, 1996), were documented. Fruit length, diameter, and flesh thickness were measured using digital slide calipers on randomly selected fruits, while total soluble solids (Brix %) were obtained using a hand refractometer. Individual fruit weight was calculated from ten randomly selected fruits, and total fruits per plant were counted across all harvests. Days to first harvest, picking duration (from first to last harvest), and harvesting frequency were also recorded. Yield parameters included fruit yield per plant (kg) and yield per hectare, estimated from plot-level yield data.

Statistical analysis

The recorded data were organized in Microsoft Excel and analyzed using Minitab 19 along with Excel's statistical tools. Analysis of Variance (ANOVA) under a Randomized Complete Block Design (RCBD) was performed to assess the significance of the measured parameters (Rahman *et al.,* 2022).

RESULTS AND DISCUSSION

Morphological and flowering traits of seven tomato varieties

Plant height varied widely

among the tomato varieties, with BARI Tomato-20 (V_5) producing the tallest plants (159.50 cm) and BARI Tomato-21 (V_6) the shortest (72.63 cm). In contrast, several varieties showed heights that were statistically similar (Table 2). Significant differences were also recorded in floral traits. Days to first flowering ranged from 26.18 days in BARI Tomato-19 (V_4) to 41.76 days in BARI Tomato-21 (V_6), whereas flower clusters per plant differed markedly, from 7.81 in BARI Tomato-15 (V_1) to 13.95 in BARI Tomato-20 (V_5). Flowers per cluster showed no significant variation among varieties, ranging from 7.38 to 11.45. Days to first fruit set varied significantly from 35.43 days in BARI Tomato-19 (V_4) to 47.15 days in BARI Tomato-21 (V_6) (Table 2).

The tomato types differed significantly in plant height and blooming characteristics, with BARI Tomato-20 yielding the tallest plants and BARI Tomato-21 the shortest, in accordance with Hossain's stated ranges (Hossain *et al.,* 2025). Days to initial flowering and days to 50% blooming were often larger than the ranges reported by Sinha *et al.* (2019), suggesting potential genetic or environmental impacts on flowering behavior. While flowers per cluster stayed within a similar range to those seen by Alam *et al.* (2010), the number of flower clusters per plant exceeded the values recorded by Shaheen *et al.* (2015). Days to initial fruit set were likewise longer than Sinha's stated range of 25.7 to 38.3 days (Sinha *et al.,* 2019), indicating environmental or varietal influences.

Fruit features of the tomato varieties

Fruit color varied among the seven tomato varieties and was categorized into four groups: dark red, red, light red, and dark yellow (Table 3; Fig. 1). Dark red fruits were observed in BARI Tomato-19 and BARI Tomato-2, while BARI Tomato-15 and BARI Tomato-21 produced light red fruits. BARI Tomato-20 produced dark yellow fruits, while the remaining varieties produced red fruits. Fruit shape also varied among the varieties (Table 3). BARI Tomato-17 produced flattened fruits, BARI Tomato-19, BARI Tomato-20, and BARI Tomato-21 showed highly round fruits, and BARI Tomato-15 exhibited a heart-shaped fruit. The remaining varieties produced round fruits.

Fruit length varied significantly among the varieties (Table 4). BARI Tomato-19 (V_4) produced the longest fruits (5.72 cm), followed by BARI Tomato-15 (5.17 cm) (V_1) and BARI Tomato-21 (5.02 cm) (V_6), while BARI Tomato-2 (V_7) had the shortest fruits (3.62 cm). Fruit diameter also showed significant variation, with BARI Tomato-17 (V_3) producing the widest fruits (6.67 cm) and BARI Tomato-20 (V_5) the narrowest (3.32 cm). BARI Tomato-15 (V_1), BARI Tomato-16 (V_2), and BARI Tomato-21 (V_6) were statistically similar. Fruit flesh

Table 2. Variation in plant growth and flowering characteristics among different tomato varieties

Variety	Plant height (cm)	Days to 1st Flower	Days to 50% flowering	Flower clusters plant^{-1}	Flowers cluster^{-1}	Days to first fruit set
V_1	84.18±1.72 b	29.04±0.91 b	33.43±1.12 b	7.81±0.73 d	10.22±0.89 ab	36.94±0.28 b
V_2	81.30±1.62 bc	30.46±1.69 b	35.25±0.87 b	9.23±0.56 cd	10.11±0.38 ab	37.80±1.18 b
V_3	75.20±1.46 cd	28.69±0.85 b	34.82±0.66 b	13.59±0.92 ab	7.39±0.58 c	38.45±0.52 b
V_4	82.77±1.27 bc	26.18±0.84 b	32.84±0.33 b	9.85±0.86 bcd	9.48±0.02 ab	35.43±0.0.53 b
V_5	159.50±2.93 a	38.20±0.38 a	43.11±0.39 a	13.95±0.16 a	11.45±1.16 a	45.61±0.20 a
V_6	72.63±1.56 d	41.76±0.93 a	44.02±1.30 a	12.42±0.64 abc	7.78±0.72 b	47.15±1.21 a
V_7	75.00±1.44 cd	30.66±0.65 b	36.21±0.82 b	11.45±1.17 a-d	7.76±1.81 b	36.43±0.59 b
CV%	32.69	17.22	12.14	22.03	22.03	11.54

Means that do not share a letter are significantly different at the 5% level of significance. V_1, BARI Tomato-15; V_2, BARI Tomato-16; V_3, BARI Tomato-17; V_4, BARI Tomato-19; V_5, BARI Tomato-20; V_6, BARI Tomato-21; V_7, BARI Tomato-2.

Table 3. Fruit color and fruit shape of seven tomato varieties

Variety	Fruit Color	Fruit Shape
BARI Tomato-15 (V_1)	Light Red	Heart Shaped
BARI Tomato-16 (V_2)	Red	Round
BARI Tomato-17 (V_3)	Red	Flattened
BARI Tomato-19 (V_4)	Dark Red	Highly Round
BARI Tomato-20 (V_5)	Dark Yellow	Highly Round
BARI Tomato-21 (V_6)	Light Red	Highly Round
BARI Tomato-2 (V_7)	Dark Red	Round

BARI Tomato-15 (V_1)

BARI Tomato-16 (V_2)

BARI Tomato-17 (V_3)

BARI Tomato-19 (V_4)

BARI Tomato-20 (V_5)

BARI Tomato-21 (V_6)

BARI Tomato-2 (V_7)

Figure 1. Fruit characteristics of seven tomato varieties

thickness differed significantly among varieties (Table 4), with BARI Tomato-21 (V_6) having the thickest flesh (6.17 mm), statistically similar to all varieties except BARI Tomato-2 (V_7), which produced the thinnest flesh (3.59 mm). Brix percentage also varied significantly, ranging from 6.50% in BARI Tomato-16 (V_2) to 8.73% in BARI Tomato-20 (V_5).

The fruit properties of the several types clearly differed from one another. Due to varietal effects, fruit color fell into four categories, ranging from red to medium-red hues, as described by Hossain *et al.* (2025). Fruit morphologies ranged from substantially spherical and heart-shaped to flattened, consistent with the genetically regulated variety reported by Islam *et al.* (2012). Perhaps as a result of ideal winter growing conditions, fruit diameter and length also varied considerably, remaining within or above the ranges reported by Quamruzzaman *et al.* (2023) and Alam *et al.* (2010), respectively. Brix levels were within the range reported by Garcia *et al.* (1995), but flesh thickness varied noticeably, with BARI Tomato-21 having the thickest flesh and BARI Tomato-2 having the thinnest.

Fruit set, yield components, and harvest traits of tomato varieties

The number of fruits per cluster varied significantly among the varieties (Table 5). BARI Tomato-16 (V_2) produced the highest number of fruits per cluster (7.29), statistically identical to all varieties except BARI Tomato-17 (V_3), which recorded the lowest (4.33). The number of fruits per plant also varied widely (Table 5), with BARI Tomato-20 (V_5) producing the highest number (68.76) and BARI Tomato-17 (V_3) the lowest (16.21). Several varieties, including BARI Tomato-15 (V_1), BARI Tomato-19 (V_4), BARI Tomato-21 (V_6), and BARI Tomato-2 (V_7), were statistically similar.

Individual fruit weight showed considerable variation (Figure 2A), ranging from 29.05 g in BARI Tomato-20 (V_5) to 172.22 g in BARI Tomato-17 (V_3). Days to first fruit harvest also differed significantly (Table 5). BARI Tomato-19 (V_4) was the earliest to mature (81.71 days), while BARI Tomato-21 (V_6) required the most extended period (95.30 days). Fruit yield per plant (Figure 2B) and fruit yield ton ha^{-1} (Figure 3) varied markedly as well; with BARI Tomato-19 (V_4) producing the highest yield (3.06 kg), statistically similar to BARI Tomato-15 (V_1), BARI Tomato-16 (V_2), and BARI Tomato-17 (V_3), whereas BARI Tomato-2 (V_7) yielded the lowest (1.31 kg) (Figure 2B).

There were significant differences in yield-related variables between tomato types. The number of fruits per cluster and per plant is frequently above the ranges reported by Alam *et al.* (2010) and Nahar *et al.* (2021), indicating superior varietal performance under current conditions. Strong genotype–environment interactions were indicated by the considerable variation in individual fruit weight, including values well above the maximum limit (Alam *et al.,* 2010). Varieties varied in how long they took to mature; some matured in 48.67-84.67 days, while others took longer (Sinha *et al.,* 2019). Due to favourable growth conditions and strong varietal adaptation, yield per plant and yield per

Table 4. Fruit size and quality of the studied tomato varieties

Variety	Fruit Length (cm)	Fruit Diameter	Fruit flesh thickness (mm)	Brix percentage
V_1	5.17±0.30 ab	4.50±0.20 bc	4.83±0.44 ab	6.82±0.43 ab
V_2	4.75±0.28 abc	4.42±0.14 bc	5.67±0.60 ab	6.50±0.28 b
V_3	4.65±0.427abc	6.67±0.21 a	5.33±0.44 ab	6.93±0.80 ab
V_4	5.72±0.16 a	4.77±0.11 b	5.87±0.57 a	7.00±0.23 ab
V_5	3.98±0.15 bc	3.32±0.01 d	4.57±0.23 ab	8.73±0.28 a
V_6	5.02±0.36 ab	4.33±0.23 bc	6.17±0.44 a	6.92±0.36 ab
V_7	3.62±0.02 c	3.83±0.11 cd	3.59±0.32 b	7.50±0.32 ab
CV%	16.75	22.55	20.74	13.04

Means that do not share a letter are significantly different at the 5% level of significance. V_1, BARI Tomato-15; V_2, BARI Tomato-16; V_3, BARI Tomato-17; V_4, BARI Tomato-19; V_5, BARI Tomato-20; V_6, BARI Tomato-21; V_7, BARI Tomato-2.

Table 5. Fruit-bearing and harvesting attributes of the tomato varieties

Variety	Number of fruits cluster^{-1}	Number of fruit plant^{-1}	Days to 1st fruit harvest
BARI Tomato-15 (V_1)	6.40±0.49 ab	35.21±1.17 c	85.43±1.20 b
BARI Tomato-16 (V_2)	7.29±0.40 a	41.72±1.99 b	86.26±0.54 b
BARI Tomato-17 (V_3)	4.33±0.49 b	16.21±1.15 d	92.11±0.94 a
BARI Tomato-19 (V_4)	6.30±0.46 ab	37.78±1.43 bc	81.71±0.97 b
BARI Tomato-20 (V_5)	7.21±0.68 a	68.76±0.61 a	93.02±0.98 a
BARI Tomato-21 (V_6)	5.01±0.40 ab	35.60±0.90 c	95.30±1.29 a
BARI Tomato-2 (V_7)	4.81±0.88 ab	36.50±1.15 bc	84.71±0.97 b
CV%	23.67	38.23	5.69

Means that do not share a letter are significantly different at the 5% level of significance.

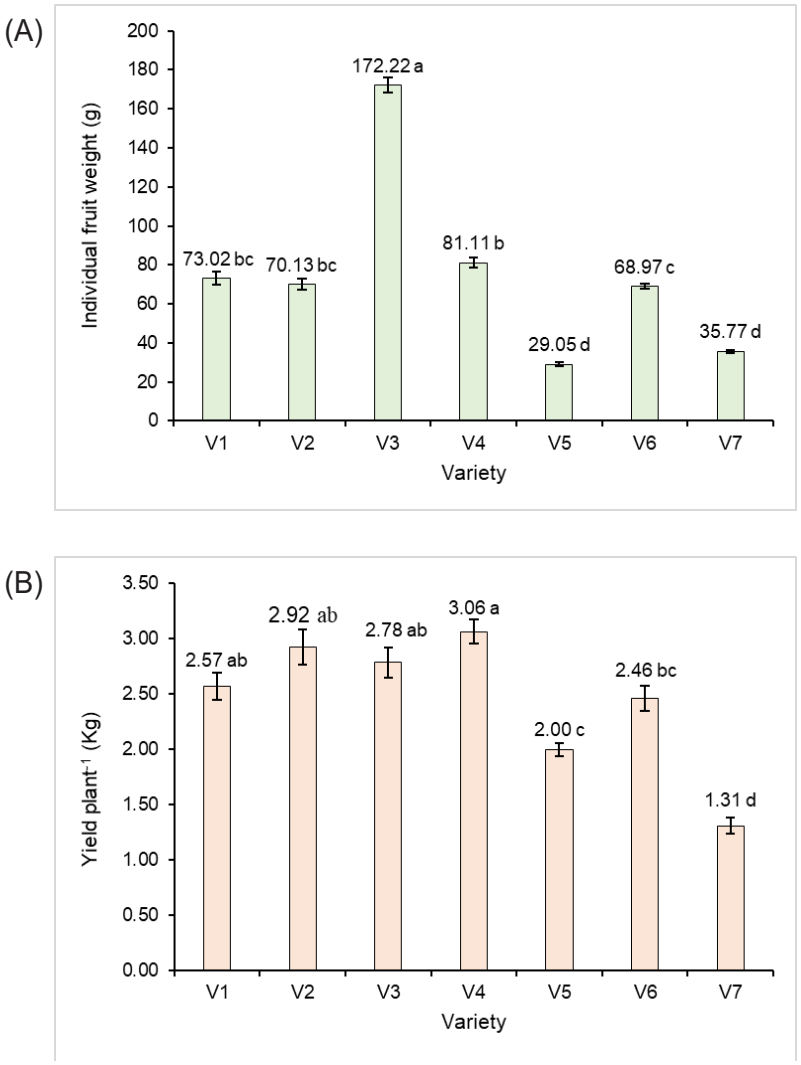

Figure 2. Fruit weight and yield of tomato varieties.
(A) Individual fruit weight, (B) Yield per plant of the seven tomato varieties. Here V_1, BARI Tomato-15; V_2, BARI Tomato-16; V_3, BARI Tomato-17; V_4, BARI Tomato-19; V_5, BARI Tomato-20; V_6, BARI Tomato-21 and V_7 present BARI Tomato-2

hectare were significantly higher than those previously reported by Alam *et al.* (2010).

Correlation among yield contributing traits

Correlation analysis showed significant relationships among key plant and fruit traits at the 5% level (P<0.05) (Figure 4 and Table 6). Plant height had a strong positive correlation with Brix (r = 0.675, P = 0.0008), indicating that taller plants tended to produce sweeter fruits. In contrast, plant height was negatively correlated with fruit diameter (r = −0.505, P = 0.0195) and individual fruit weight (r = −0.447, P = 0.0421), suggesting that taller plants often bore smaller and lighter fruits. Fruit length was strongly positively correlated with yield per plant (r = 0.792, P = 0.00002) and fruit flesh thickness (r = 0.757, P = 0.00007), underscoring its importance in yield formation. However, fruit length showed a significant negative correlation with Brix (r = −0.486, P = 0.0254), indicating a trade-off between fruit size and sweetness. Fruit diameter showed strong positive correlations with individual fruit weight (r = 0.973, P = 1.63E−13) and yield per plant (r = 0.557, P = 0.0087), highlighting its critical role in total yield. Fruit flesh thickness also positively influenced yield per plant (r = 0.752, P = 0.00008). Conversely, Brix was negatively correlated with both yield per plant (r = −0.451, P = 0.0404) and flesh thickness (r = −0.457, P = 0.0375), indicating that higher sweetness may come at the cost of reduced productivity. Yield per plant and yield per hectare were nearly perfectly correlated (r = 0.999, P = 0), reflecting a direct and proportional relationship. Overall, fruit length, fruit diameter, flesh thickness, Brix, and individual fruit weight were significant determinants of yield, emphasizing the need to balance productivity with quality traits during variety selection.

Essential correlations between qualities that contribute to yield were found through correlation analysis. The positive association between plant height and Brix indicated that taller plants produced sweeter fruits, whereas the negative relationships with fruit diameter and individual fruit weight indicated that taller plants tended to produce smaller, lighter fruits. Fruit length had a negative correlation with Brix, suggesting a trade-off between fruit size and sweetness, but it was positively correlated with yield per plant and fruit flesh thickness. Fruit diameter has a crucial impact on productivity, as evidenced by the substantial positive correlations observed with fruit weight and production per plant (Thakur and Kumar, 2024; Sanaullah *et al.,* 2024). Yield was also positively affected by flesh thickness. Brix, on the other hand, showed negative relationships with both flesh thickness and yield per plant, suggesting that increased sweetness may reduce output. Their direct

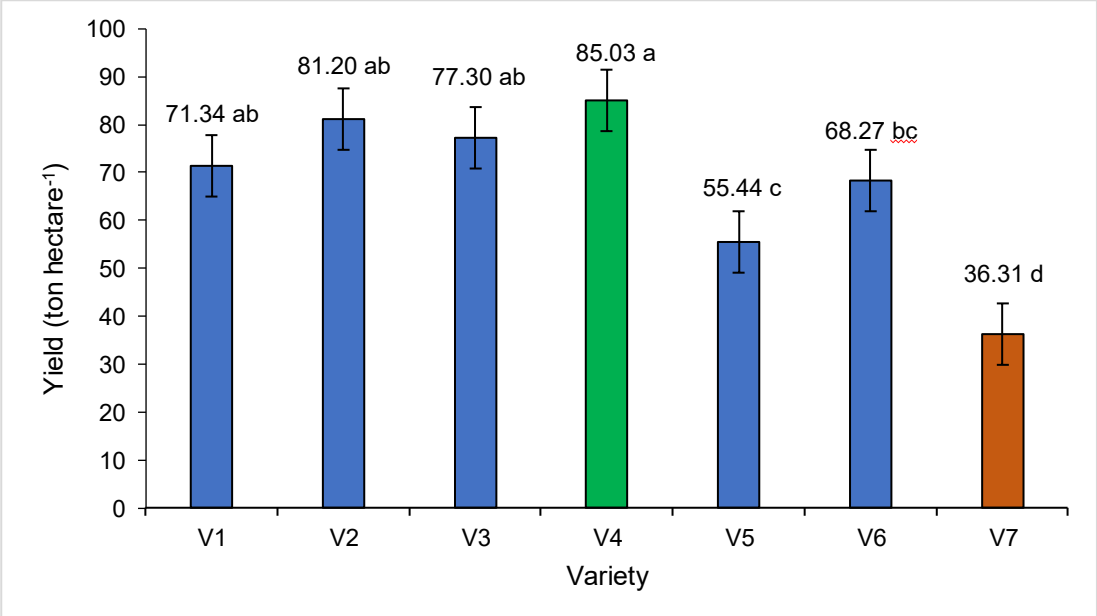

Figure 3. Fruit yield of seven tomato varieties.
Here V_1, BARI Tomato-15; V_2, BARI Tomato-16; V_3, BARI Tomato-17; V_4, BARI Tomato-19; V_5, BARI Tomato-20; V_6, BARI Tomato-21 and V_7 present BARI Tomato-2

Table 6. Correlation co-efficient of yield with yield contributing attributes

No.	Parameter	Parameter	Correlation	p-value
1	Plant height (cm)	Fruit length (cm)	-0.308	0.174986807
2	Plant height (cm)	Fruit diameter (cm)	-0.505	0.01951817
3	Fruit length (cm)	Fruit diameter (cm)	0.348	0.122684582
4	Plant height (cm)	Fruit flesh thickness (mm)	-0.203	0.376764517
5	Fruit length (cm)	Fruit flesh thickness (mm)	0.757	7.18E-05
6	Fruit diameter (cm)	Fruit flesh thickness (mm)	0.363	0.105396333
7	Plant height (cm)	Brix (%)	0.676	0.000776661
8	Fruit length (cm)	Brix (%)	-0.486	0.02540301
9	Fruit diameter (cm)	Brix (%)	-0.435	0.048798438
10	Fuit flesh thickness (mm)	Brix (%)	-0.457	0.03750535
11	Plant height (cm)	Individual fruit weight (g)	-0.447	0.042154119
12	Fruit length (cm)	Individual fruit weight (g)	0.310	0.171174153
13	Fruit diameter (cm)	Individual fruit weight (g)	0.973	1.63E-13
14	Fruit flesh Thickness (mm)	Individual fruit weight (g)	0.318	0.159853308
15	Brix (%)	Individual fruit weight (g)	-0.355	0.114517655
16	Plant height (cm)	Yield per plant (kg)	-0.234	0.30650993
17	Fruit length (cm)	Yield per plant (kg)	0.792	1.85E-05
18	Fruit diameter (cm)	Yield per plant (kg)	0.557	0.008683329
19	Fruit flesh thickness (mm)	Yield per plant (kg)	0.752	8.31E-05
20	Brix (%)	Yield per plant (kg)	-0.451	0.040383112
21	Individual fruit weight (g)	Yield per plant (kg)	0.559	0.008426776
22	Plant height (cm)	Yield per hectare (ton)	-0.234	0.306549715
23	Fruit length (cm)	Yield per hectare (ton)	0.792	1.85E-05
24	Fruit diameter (cm)	Yield per hectare (ton)	0.557	0.008694416
25	Fruit flesh Thickness (mm)	Yield per hectare (ton)	0.753	8.29E-05
26	Brix (%)	Yield per hectare (ton)	-0.451	0.040397615
27	Individual fruit weight (g)	Yield per hectare (ton)	0.559	0.008439621
28	Yield per plant (kg)	Yield per hectare (ton)	1.000	0
29	Plant height (cm)	Flower cluster per plant	0.382	0.087359701
30	Fruit length (cm)	Flower cluster per Plant	-0.363	0.106281543
31	Fruit diameter (cm)	Flower cluster per Plant	0.156	0.500266729
32	Fruit flesh thickness (mm)	Flower cluster per Plant	0.080	0.731917896
33	Brix (%)	Flower cluster per Plant	0.373	0.095471846
34	Individual fruit weight (g)	Flower cluster per Plant	0.142	0.539826946
35	Yield per plant (kg)	Flower cluster per Plant	-0.255	0.263914513
36	Yield per hectare (ton)	Flower cluster per Plant	-0.255	0.263892867

connection was evident in the near-perfect correlation between yield per hectare and yield per plant (Zannat *et al.,* 2023). In general, fruit size characteristics, sweetness, and flesh thickness were found to be variables affecting production, highlighting the need to balance fruit quality and yield potential when choosing a variety (Kumar *et al.,* 2025).

CONCLUSION

The Growth, fruit characteristics, and production varied considerably among the seven tomato cultivars, indicating a high potential for varietal selection. The most promising of them was BARI Tomato-19, which

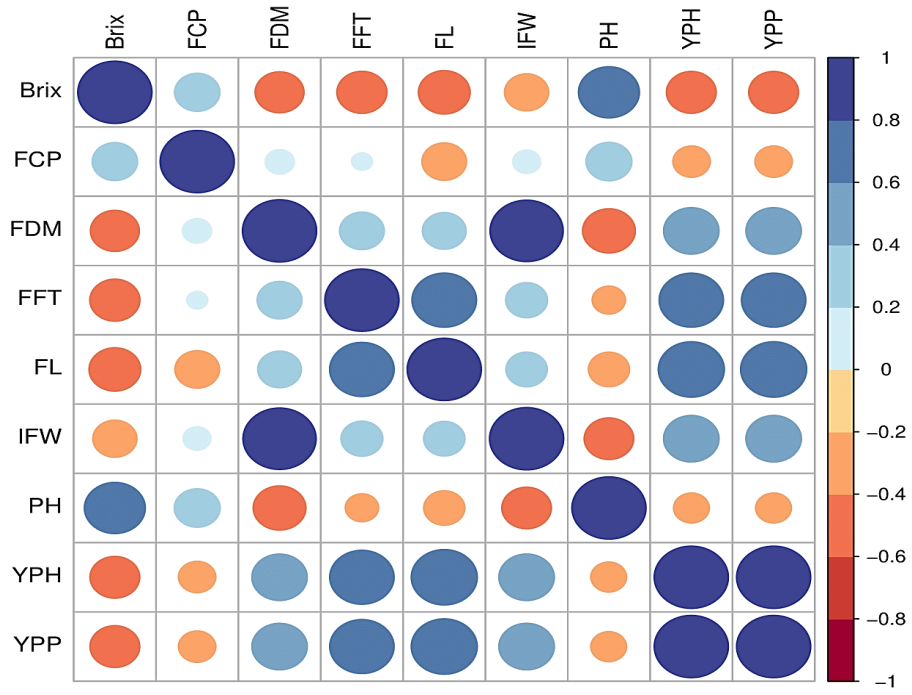

Figure 4. Correlation coefficient of yield contributing characters.
FCP, Flower cluster per plant; FDM, Fruit diameter; FFT, Fruit flesh thickness; FL, Fruit length; IFW, Individual fruit weight; PH, Plant height; YPH, Yield per hectare; YPP, Yield per plant

showed the earliest blooming and fruiting, the longest fruit, and the highest yield per plant and per hectare, making it ideal for commercial farming. While BARI Tomato-17 had the highest individual fruit weight, BARI Tomato-20 produced the tallest plants and the highest Brix content. Fruit length, diameter, and flesh thickness all significantly increase production, with fruit diameter and flesh thickness being particularly crucial for productivity, according to a correlation study, which also showed that taller plants typically produce sweeter fruits. BARI Tomato-19, BARI Tomato-15, and BARI Tomato-16 are also appropriate for early-season production due to their early maturity. All things considered, growers are advised to use BARI Tomato-19 as the best-performing variety.

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Ethical approval was not applicable for this research experiment as only plant materials were used.

Originality and Plagiarism:

Authors confirm that this manuscript is an original work. No parts of the manuscript have been previously published, and proper citations have been provided. There is no known plagiarism in any form in this article.

Consent for Publication*:*

All authors agree to the content of the article and its publication in this journal.

Competing Interests

:Authors have no potential conflicts of interest, financial or otherwise, that could affect the research or its interpretation.

Data Availability:

The data presented in this study are openly available in Zenodo https://doi.org/10.5281/zenodo.17863564

Author Contributions:

Conceptualization, AKAF, and MZ; methodology, AKAF and SA; software, SC; validation, AKAF; formal analysis, AKAF and SC; investigation, AKAF and SA; resources, MAH and MSR; data curation, AKAF and MSR; writing—original draft preparation, AKAF; writing—review and editing, SC; visualization, MSR; supervision, MZ and MSR; project administration, MZ, MAH, and MSR. All authors have read and agreed to the published version of the manuscript.

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