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Influence of genotype and truss position on reproductive traits in tomato (*Solanum lycopersicum* L.) under open-field conditions

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Summary: This study investigated the reproductive performance of seven tomato genotypes grown under open-field conditions during the 2024 season at the Institute of Field and Vegetable Crops, Novi Sad, Serbia. The experimental material consisted of four indeterminate genotypes (Novosadski jabučar, Pegaz, Dunavski rubin, and breeding line V14) and three determinate genotypes (Alparac, Bačka, and Knjaz) selected from the Institute's breeding collection. Plants were established in a randomized block design with five replications, using 30 plants per variant. Reproductive traits: flower number, fruit number, fruit-set percentage, average fruit weight and average fruit yield per truss, were recorded across the first four flowering trusses. Fruit number and fruit set declined consistently toward higher trusses across all genotypes, indicating physiological limitations associated with assimilate allocation. Truss position accounted for the majority of variation in fruit number (82.2 %) and fruit set (87.0 %), whereas genotype was the primary determinant of average fruit weight (82.7 %). Significant genotype × truss interactions were observed for all traits, highlighting differential genotypic responses along the plant axis. The results demonstrate that fruit quantity is strongly influenced by intra-plant positional and environmental factors, whereas fruit size is largely under genetic control. These findings emphasize the importance of integrating truss-level physiological considerations with genotypic selection in tomato breeding programs. The study provides practical guidance for selecting genotypes with stable reproductive performance and improved yield potential under variable field conditions.

Key words: flowering patterns, reproductive performance, crop physiology, truss-level variation, genotypes, tomato, truss position

Introduction

Tomato (*Solanum lycopersicum* L.) is one of the world's leading horticultural crops, owing to its widespread consumption, high nutritional value, and versatile utilization for both fresh-market consumption and processing (Seymour and Rose, 2022). Yet, achieving stable and high yields under open-field production remains a challenge, particularly because yield is determined not only by the genetic makeup of the cultivar, but also by complex interactions between plant architecture, source-sink dynamics, and environmental factors. In particular, variation in reproductive success among successive flowering trusses, hereafter "truss-level variation", can substantially influence final yield components, but remains under-investigated in open-field tomato breeding and agronomy.

On the genetic side, recent advances demonstrate the potential for substantial improvement in yield-related traits. For example, a large-scale genomic-selection study reported high phenotypic variability for fruit traits (fruit weight, width, height, pericarp thickness, and Brix) across a wide germplasm collection, underscoring the power of genetic selection for yield and quality traits in cultivated tomato (Yeon et al. 2024). Similarly, further evidence indicates that key regulatory genes modulating inflorescence architecture, such as the CONSTANS-LIKE protein SlCOL1, which represses inflorescence gene expression, can significantly influence flower number and fruit yield (Cui et al. 2022). These findings confirm that genetic potential for yield components (especially fruit weight and fruit number) remains high and exploitable.

However, genetic potential does not guarantee yield stability under variable field conditions. Intra-plant allocation of assimilates, light interception, micro-environmental gradients, nutrient availability, and plant density can all modulate how yield potential translates into actual fruit set, number, and size. Studies under controlled or protected cultivation illustrate this well: for instance, Paponov et al. (2023) found that branching (one- vs. two-shoot plants) and light management interact to strongly affect fruit size and chemical quality, indicating that architectural and environmental variables can override genetic potential under certain conditions. Similarly, Karpe, Marcelis and Heuvelink (2024) demonstrated that dynamic spacing in tomato (adjusting plant density during cultivation rather than maintaining a constant high density) can retain high yield per area while avoiding reductions in fruit quality typically associated with dense plantings. These results highlight how agronomic management and distribution of assimilates among trusses influence yield formation beyond genetic predisposition.

Moreover, variability in fruit development within a truss, influenced by fruit set timing and intra-truss fruit position, has long been recognized as a determinant of final fruit size. Early classic work demonstrated that the sequence of fruit set within a truss strongly affects assimilate import and thus final fruit weight (Bangerth and Ho, 1984). More recent empirical data suggest that the timing of fruit set alone may account for nearly all variation in fruit diameter within a truss, while positional effects within the truss have minimal influence when developmental timing is properly considered (Tijskens et al., 2020). Taken together, these studies underline that even within a single genotype, significant heterogeneity in fruit size and number may arise, not from genetic differences, but from developmental dynamics and resource-allocation constraints.

Despite this evidence, relatively few studies under open-field conditions have systematically dissected the joint effects of genotype, truss order (i.e., position along the plant axis), and their interaction on a comprehensive set of reproductive traits (flower number, fruit number, fruit-set percentage, average fruit weight). This gap is critical: for breeding programs aiming to select genotypes with stable yield performance across variable environments, it is necessary to understand not only genetic potential, but also how that potential is modulated by architectural and positional constraints under realistic cultivation.

Accordingly, this study aims to evaluate the relative contributions of genotype, truss position, and genotype × truss interaction to key reproductive traits (flower number, fruit number, fruit-set percentage, average fruit weight) across the first four flowering trusses in a set of both determinate and indeterminate tomato genotypes, under open-field conditions in Vojvodina Province (Serbia). By adopting this approach, we seek to provide insight into how genetic potential and intra-plant physiological/architectural dynamics jointly determine reproductive performance and yield stability, information critically needed for designing robust breeding and agronomic strategies.

Material and methods

Experimental site and growing conditions

The experiment was conducted in 2024 at the research fields of the Institute of Field and Vegetable Crops, Novi Sad, Vojvodina Province (Serbia), located at Rimski Šančevi (E45°19'52.2"N, 19°50'10.4"E). The soil was prepared by winter plowing to a depth of 35 cm, considering the sandy soil conditions at the experimental site, followed by two passes with a seedbed cultivator at 25-day intervals. In early October, NPK 8:16:24 fertilizer was applied at 400 kg ha^{-1} before plowing. In early April, the field was again cultivated and fertilized with NPK 15:15:15 (200 kg ha^{-1}), followed by another cultivation prior to transplanting. Additional fertilization was performed four weeks after transplanting using ammonium nitrate (200 kg ha^{-1}). Seeds were sown in late March in wooden trays filled with Potgrond H substrate inside a greenhouse. Transplanting to the open field was conducted in mid-May. The field experiment followed a randomized complete block design, with five replications, each containing 30 plants per genotype. Since seven genotypes were included in the study, each replication comprised a total of 210 plants. The spacing was 70 cm between rows and 50 cm between plants within the row. Standardized horticultural protocols were followed during all measurements. In addition to crop rotation and timely implementation of agronomic practices such as inter-row cultivation and hoeing, irrigation was applied as needed. Crop protection was carried out in accordance with integrated pest management (IPM) principles, including pest and disease monitoring, application of registered plant protection products only when necessary, and adherence to manufacturers' recommendations. Chemical treatments were applied as follows: Decis 2.5 EC (deltamethrin 25 g L^{-1}) at 5 mL 10 L^{-1} for aphid control (25.05.); Ridomil Gold MZ 68 WG (mancozeb + metalaxyl-M, 640 + 40 g kg^{-1}) at 25 g 10 L^{-1} combined with Volley 20 SP (acetamiprid 200 g kg^{-1}) at 4 g 10 L^{-1} for control of downy mildew and aphids (10.06.); Cuproxat (tribasic copper sulfate 190 g L^{-1}) at 60 mL 10 L^{-1} for downy mildew control (24.06.); and Fuzija Plus (propamocarb hydrochloride + fluazinam, 470 + 100 g L^{-1}) at 45 mL 10 L^{-1} for control of Alternaria spp. (05.07.).

Plant material

Seven tomato genotypes from the breeding collection of the Institute Field and Vegetable Crops were included. Novosadski jabučar is a medium-early tomato genotype with an indeterminate growth habit. The fruits are round, smooth, and intensely red in color. This genotype is characterized by a favorable sugar-to-acid ratio and a high dry matter content. Pegaz is a medium-early genotype exhibiting an indeterminate growth habit. The fruits are large, round, and orange in color. They are characterized by a high carotene content. Dunavski rubin is a medium-late genotype with an indeterminate growth habit. It produces very large, round, smooth, and firm fruits of intense red color. The fruits are resistant to cracking and are suitable for both fresh consumption and tomato juice production. V 14 is a medium-late breeding line with an indeterminate growth habit. The fruits are large, round, smooth, firm, red in color, and resistant to cracking. Alparac is an early-maturing genotype with a determinate growth habit. The fruits are slightly elongated, smooth, and red in color. This genotype produces a high number of fruits per plant and is intended for industrial processing. Bačka is a medium-late cultivar with a determinate growth habit. The fruits are large, red, and very firm. Owing to their firmness, they are well suited for transportation. In addition, the cultivar is characterized by uniform fruit weight across successive trusses. Knjaz is a medium-early genotype with a determinate growth habit. The fruits are large, round, and red in color. They possess a pleasant flavor resulting from a balanced sugar-to-acid ratio.

Measured traits

Observations were recorded per plant, considering the first four flowering trusses. The following parameters were assessed:

1. Number of flowers per plant;
2. Number of fruits per plant;
3. Fruit-set percentage (%):

$$Fruit - set\ percentage = \left(\frac{number\ of\ fruits}{number\ of\ flowers}\right) \times 100$$

4. Average fruit weight (g)
5. Average fruit yield per truss (g)

Statistical analysis

To examine differences in the specified traits among genotypes, flowering trusses, and their interactions, the statistical InfoStat software (Version 2024, Grupo InfoStat, Universidad Nacional de Córdoba, Argentina), was used. The obtained results were processed using appropriate statistical methods, specifically analysis of variance (ANOVA; $\alpha = 0.01$). A two-way factorial ANOVA was applied with genotype and truss position as fixed factors. The data were presented both graphically and in tabular form, and served as the basis for drawing conclusions regarding the research topic.

Meteorological data

Meteorological conditions during the 2024 field trial diverged markedly from the long-term average (1991-2020). August recorded the highest mean temperature (27.5 °C), exceeding the multi-year average by 5.5 °C (Figure 1). The lowest mean temperature occurred in May (19 °C), yet even this value was 1.8 °C above the corresponding long-term mean. Precipitation patterns likewise showed substantial departures from expected norms: September exhibited the greatest monthly rainfall (130.1 mm), representing an increase of 73 mm relative to the long-term average, whereas August experienced the lowest precipitation (1.2 mm), reflecting a deficit of 54.2 mm compared with historical values.

Results and discussion

The heatmap representation of the data (Figure 2) revealed clear and visually distinctive differences among the evaluated genotypes across the four truss levels for all measured reproductive traits.

Fruit number and flower number consistently decreased from the first to the fourth truss across all genotypes, a trend that corresponds with well-documented positional gradients in assimilate allocation and sink strength within indeterminate tomato canopies. Lower trusses are generally assumed to benefit from stronger phloem influx, higher carbohydrate availability, and more favorable microclimatic conditions, whereas upper trusses often experience progressive assimilate limitation as vegetative organs compete for resources, thereby reducing reproductive sink activity. Such position-dependent compensatory trade-offs between fruit number and average fruit weight have been clearly demonstrated in field-grown indeterminate landraces, where yield components showed both plant-level and cluster-level compensation mechanisms (Donoso and Salazar, 2023). Furthermore, field studies manipulating plant architecture and total truss load confirmed that limiting the number of fruit trusses per plant markedly alters the distribution of assimilates, affecting both fruit set and final yield components (Tran et al., 2020). Environmental and physiological factors also modulate these patterns: in controlled-environment experiments, branching intensity and light regime were shown to exert additive effects on fruit number and fruit size, indicating that resource partitioning between vegetative and reproductive sinks is highly sensitive to shoot architecture and local gradients in light availability (Paponov et al., 2023). At the developmental scale, variation in fruit-set timing, rather than truss position per se, has been identified as a major determinant of final fruit size, underscoring the role of intra-truss developmental asynchrony in shaping reproductive output (Tijskens et al., 2020).

Within this framework, the behavior of individual genotypes in our study becomes more interpretable. Genotypes such as Bačka, Alparac, and Novosadski jabučar maintained relatively stable flower production across trusses but exhibited pronounced reductions in fruit set and final fruit number on upper trusses, suggesting that reproductive failure likely arose from post-anthesis limitations rather than pre-anthesis floral constraints, a pattern consistent with resource-limited sink development described in cluster-level analyses of indeterminate varieties (Tran et al., 2020; Donoso & Salazar, 2023). In contrast, Pagaz and Knjaz showed a more gradual decline in both flower number and fruit number, indicating better maintenance of reproductive sink strength along the plant axis. Meanwhile, Dunavski Rubin produced large fruits but experienced sharp reductions in fruit set on upper trusses, a phenomenon that aligns with developmental studies identifying a trade-off between early fruit growth dominance and subsequent truss productivity, driven by assimilate competition between early-developing fruits and later-formed trusses (Tijskens et al., 2020). Overall, the combined evidence highlights that truss-level reproductive performance arises from an interaction of genetic predisposition, architectural constraints, and source-sink dynamics, with upper-truss reductions reflecting an inherent physiological limitation that is variably expressed across genotypes.

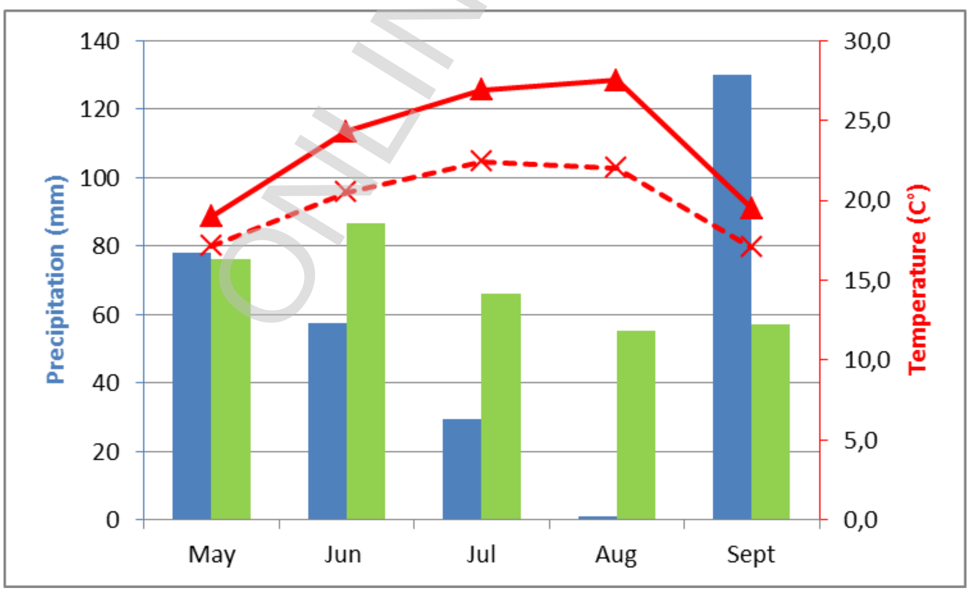

Figure 1. Meteorological conditions recorded during the field experiment (May-September 2024) (http://www.hidmet.gov.rs/) (2025)

*Blue bars depict the monthly precipitation measured in 2024, whereas green bars represent the corresponding long-term averages for 1991-2020. The solid red line illustrates the progression of mean daily temperatures during the 2024 growing season, while the dashed red line denotes the long-term mean daily temperatures based on the 1991-2020 reference period.

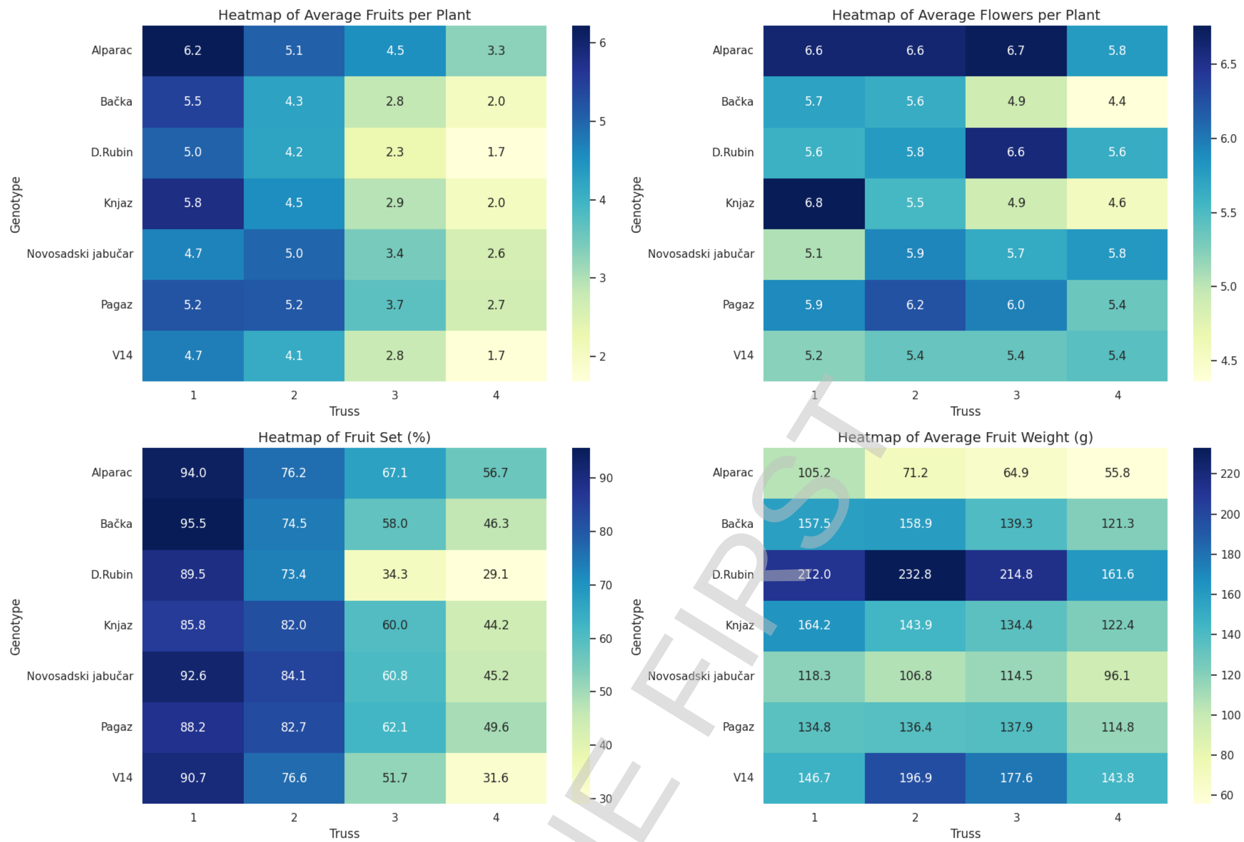

Figure 2. Heatmap of mean reproductive trait values in seven tomato genotypes from the Institute of Field and Vegetable Crops

Indeterminate genotypes generally maintained higher fruit set percentages and a more gradual decline in fruit number across successive trusses, while also expressing larger average fruit mass, particularly in genotypes such as Dunavski Rubin and V14. In contrast, determinate genotypes were characterized by higher initial numbers of flowers and fruits per plant but exhibited sharper reductions in fruit set and more pronounced decreases in reproductive performance at higher truss levels, indicating earlier saturation of reproductive capacity.

Average fruit yield per truss, as one of the most important reproductive parameters, is visually represented in the heatmap (Figure 3), which demonstrates a marked decline in average fruit yield per truss, with increasing truss position across all tomato genotypes. However, the extent of this reduction differed substantially between indeterminate and determinate growth types. In indeterminate genotypes, the relative decrease in average fruit yield per truss, from the first to the fourth truss ranged approximately from 50% to 75%, with Dunavski Rubin exhibiting a reduction of 70-75%, Pegaz around 50-55%, Novosadski Jabučar approximately 60-65%, and breeding line V14 about 60-65%, indicating a moderated decline and a greater capacity to sustain yield across successive trusses. In contrast, determinate genotypes displayed a steeper proportional decline, with reductions from the first to the fourth truss generally ranging from 65-70% in Knjaz, 70-75% in Bačka, and around 72-75% in Alparac, reflecting a more rapid loss of productivity at higher truss positions. Stepwise analysis revealed that the largest proportional decrease in average fruit yield per truss occurred between the second and third trusses in both growth types, although this decline was consistently more pronounced in determinate genotypes, suggesting earlier source limitation and reduced assimilate allocation to later-developing fruits. Overall, the smaller proportional decrease in average fruit yield per truss observed in indeterminate genotypes confirms their superior capacity to maintain per-truss yield across successive trusses compared with determinate genotypes.

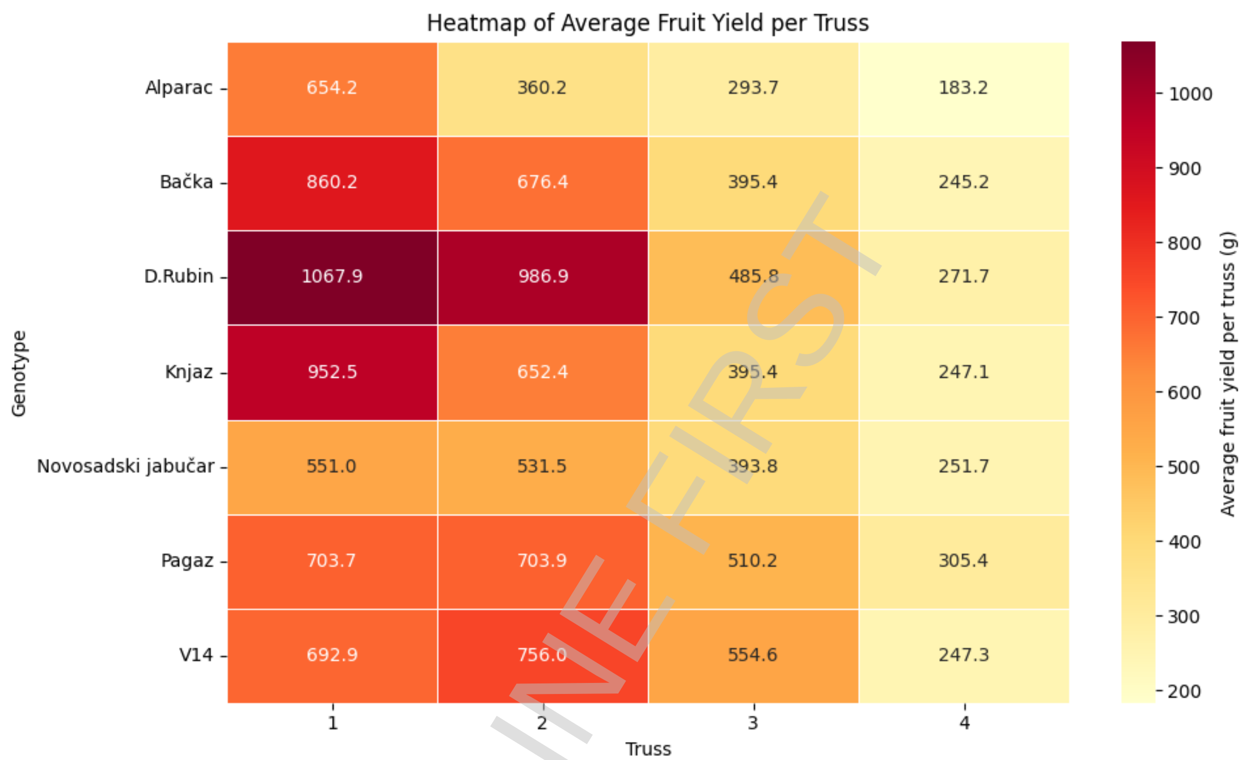

Figure 3. Heatmap of genotype × truss interaction for fruit yield per truss in seven tomato genotypes from the Institute of Field and Vegetable Crops

The analysis of variance revealed highly significant (p<0.01) effects of genotype (G), truss position (T), and their interaction (G × T) on all reproductive traits evaluated in tomato (Table 1). However, the magnitude of explained variability (SS%) differed substantially among traits, indicating distinct underlying genetic and physiological determinants.

For fruits per plant (FRP), truss position was the dominant source of variation (82.15% SS), while genotype contributed 13.24% and the G × T interaction 4.61%. This finding indicates that intra-plant positional factors, including light distribution, assimilate allocation, and micro-environmental gradients, play a major role in determining fruit number. Similar patterns have been documented where plant architecture and flowering trusses structure exert greater influence on fruit number than genetic differences alone (Arshad et al., 2024; Alomari-Mheidat et al., 2024). Furthermore, Zannat et al. (2023) also reported that fruit number is strongly influenced by morphological variability and resource distribution, even across diverse genotypes. Thus, while genetic effects are present, architectural optimization appears particularly relevant for enhancing FRP. Although variance partitioning does not imply causality, the relative contribution of genotype and truss position provides insight into the dominant sources of phenotypic variability under field conditions.

Table 1. The analysis of variance (ANOVA) of main effects and their interactions in relation to five reproductive traits in seven tomato genotypes from Institute of Field and vegetable Crops

Source of variation		Total	Genotype	Truss (T)	G × T	Error
Degrees of freedom		27	6	3	18	112
FRPǂ	MS	8.78	5.23**	64.90**	0.61**	0.05
	SS	237.01	31.38	194.70	10.93	5.82
	SS (%)#	100.00	**13.24**	**82.15**	**4.61**	-
FLP	MS	1.98	3.74**	2.69**	1.28**	0.12
	SS	53.46	22.43	8.07	22.96	13.30
	SS (%)	100.00	**41.96**	**15.10**	**42.95**	-
FSP	MS	2058.65	668.22**	16116.93**	179.09**	5.72
	SS	55583.62	4009.30	48350.78	3223.54	640.33
	SS (%)	100.00	**7.21**	**86.99**	**5.80**	-
AFW	MS	9256.45	34430.39**	8235.55**	1035.29**	10.06
	SS	249924.26	206582.35	24706.66	18635.25	1127.23
	SS (%)	100.00	**82.66**	**9.89**	**7.46**	-
AFY	MS	310007.16	223831.03**	1989313.82**	58848.09**	1858.71
	SS	8370193.29	1342986.20	5967941.45	1059265.64	208175.65
	SS (%)	100,00	**16.04**	**71.30**	**12.66**	-

** ($p<0.01$) # Variability explained as percentage of sum of squares (SS %); Mean square (MS) ǂ Fruits per plant (FRP); Flowers per plant (FLP); Fruit set percent (FSP); Average fruit weight (AFW); Average fruit yield per truss (AFY).

For flowers per plant (FLP), the contributions of genotype (41.96%) and truss position (42.95%) were nearly equal, with a substantial G × T interaction (15.10%). This indicates that floral productivity is jointly controlled by inherent genetic potential and positional effects within the flowering trusses. The significant interaction further suggests that genotypes differ in their plasticity across different truss positions. Comparable results were reported by Rasheed et al. (2023), who highlighted strong genotypic variability in flowering-related traits, and by Arshad et al. (2024), who demonstrated that resource conditions within greenhouses substantially modify flower number and overall reproductive output. These findings collectively suggest that both breeding and optimized flowering trusses or nutrient management are necessary to achieve stable improvements in floral productivity.

The fruit set percentage (FSP) exhibited a distinct pattern: truss position overwhelmingly dominated the variation (86.99%), while genotype and G × T accounted for only 7.21% and 5.80%, respectively. The strong positional effect likely reflects differences in assimilate availability, hormone gradients, and microclimatic conditions across truss levels. Similar conclusions were drawn by Graci and Barone (2024), who emphasized that abiotic stresses affecting reproductive physiology, particularly heat, primarily influence fruit set regardless of genotype. Likewise, environmental and stress-related disturbances were shown to markedly reduce fruit set and alter metabolic responses (Umićević et al., 2024). These findings, together with the present results, underscore that fruit set is highly environment- and position-sensitive, suggesting that management strategies targeting stress mitigation (e.g., microclimate modification, optimized irrigation) may be more effective than genotypic selection alone. In contrast, average fruit weight (AFW) was largely governed by genetic factors, with genotype explaining 82.66% of total variance, followed by truss position (9.89%) and G × T interaction (7.46%).

This strong genotypic control aligns with modern genomic studies identifying major QTLs regulating fruit size. For example, Ning et al. (2023) fine-mapped *fw6.3*, a major-effect locus for fruit weight, while Zhang et al. (2025) identified *qFw-3* using *Solanum pimpinellifolium* introgression lines. These genetic findings are consistent with the stability of AFW across truss positions observed here. Nevertheless, agronomic interventions can still modulate fruit weight to some extent Disciglio, Tarantino and Frabboni (2024) and Alomari-Mheidat et al. (2024) demonstrated that nutrient supply, water availability, and fertilization strategy significantly influence fruit biomass accumulation. Likewise, intelligent fertigation, combining precise irrigation and nutrient delivery, has recently been shown to enhance fruit weight and quality in greenhouse tomato systems (Wang et al., 2024).

Overall, the contrasting patterns among traits suggest that different improvement strategies are warranted: (i) genetically driven traits such as AFW benefit most from molecular breeding and QTL-based selection (Ning et al., 2023; Zhang et al., 2025), while (ii) traits strongly influenced by positional or environmental factors (FRP and FSP) require targeted flowering trusses management, resource optimization, and stress reduction (Graci and Barone, 2024; Umićević et al., 2024; Ouonkap et al., 2024).

ANOVA results confirmed that the vast majority of variation in AFY was attributable to truss effects (71.30%) and genotype (16.04%), with significant G × T interaction (12.66%), reflecting differential fruit set and assimilate partitioning among genotypes. These outcomes align with recent findings that genetic differences strongly influence key yield components such as fruit number and weight, which in turn drive overall yield in *Solanum lycopersicum* (Mawasid et al., 2024). The 2024 meteorological conditions, characterized by anomalously high August mean temperatures (27.5 °C, +5.5 °C anomaly) and irregular precipitation patterns (e.g., extreme rainfall in September and drought in August), likely exacerbated stress during critical fruit-set and fill periods, favouring genotypes with extended flowering and fruiting windows typical of indeterminates and thus contributing to their higher AFY under stressful thermal and moisture regimes. This genotype × environment interaction underlines the necessity of integrating climatic data in yield component analysis, as other recent work highlights environment sensitivity in tomato yield traits (Kumar et al., 2024; Espinosa-Antón et al., 2025). Overall, indeterminate genotypes demonstrated greater per-truss productivity and adaptability under the 2024 field conditions compared to determinate types, consistent with literature emphasizing the role of genetic background in maximizing yield components under variable environments.

Future research should integrate genetic analyses with detailed physiological and spatial characterization of truss-dependent variability to better understand how genotype × environment × position interactions shape overall reproductive success in tomato. Such integration may improve the selection of genotypes with stable performance across flowering trusses and varying environmental conditions.

Conclusion

This study demonstrated that reproductive efficiency in tomato is jointly shaped by genotype-specific characteristics and the positional hierarchy of flowering trusses. A consistent decline in key reproductive parameters toward higher truss levels was observed across all genotypes, indicating physiological constraints related to assimilate allocation. Truss position accounted for the greatest share of variability in fruit number and fruit set, while genotype exerted the strongest influence on fruit weight, underscoring the substantial genetic control of fruit size. The significant genotype × truss interaction further highlights the necessity of evaluating genotypes across multiple truss levels to fully capture their reproductive performance. These findings are consistent with recent research and emphasize the importance of breeding strategies that integrate both genetic potential and truss-level physiological responses. Overall, the results offer practical guidance for identifying tomato genotypes with stable reproductive performance and enhanced yield potential under open-field conditions.

Authors' Contribution: Conceptualization: V.P., S.V., S.Z. and A.T.; Methodology: V.P., S.V., S.Z. and A.T.; Project administration: V.P.; Software: V.P.; Validation: V.P., S.V., S.Z. and A.T.; Formal Analysis: V.P., S.V., S.Z. and A.T.; Investigation: V.P., S.V., S.Z. and A.T.; Resources: V.P., S.V., S.Z. and A.T.; Data Curation: V.P., S.V., S.Z. and A.T.; Writing – Original Draft Preparation: V.P., S.V., S.Z. and A.T.; Writing – Review & Editing: V.P., S.V., S.Z. and A.T.; Visualization: V.P., S.V., S.Z. and A.T.; Validation: V.P., S.V., S.Z. and A.T.; Supervision: V.P. and A.T.; Funding Acquisition: V.P., S.V., S.Z. and A.T.

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Data availability statement: All data generated during this study are included in this article.

Ethical issues statement: This research did not involve human or animal subjects. Ethical approval was therefore not required. All experimental procedures adhered to institutional and scientific guidelines for plant research. AI based tools (Chat GPT, Open AI, GPT-4.1) were used to assist in improving grammar. The authors carefully reviewed all content after the use of the AI-based tool to ensure accuracy and accept full responsibility for the final manuscript.

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Uticaj genotipa i položaja etaže cvasti na reproduktivna svojstva paradajza (*Solanum lycopersicum* L.) u uslovima gajenja na otvorenom polju

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Sažetak: Ovo istraživanje ispitivalo je reproduktivne osobine sedam genotipova paradajza gajenih u uslovima otvorenog polja tokom vegetacione sezone 2024. godine na Institutu za ratarstvo i povrtarstvo, Novi Sad, Srbija. Eksperimentalni materijal obuhvatao je četiri indeterminantna genotipa (Novosadski jabučar, Pegaz, Dunavski rubin i oplemenjivačku liniju V14) i tri determinantna genotipa (Alparac, Bačka i Knjaz), odabrana iz oplemenjivačke kolekcije Instituta. Ogled je postavljen po slučajnom blok sistemu sa pet ponavljanja, pri čemu je po varijanti gajeno 30 biljaka. Reproduktivna svojstva: broj cvetova, broj plodova, procenat zametanja plodova, prosečna masa ploda i prosečan prinos plodova po etaži, praćena su na prve četiri cvetne etaže. Broj plodova i procenat zametanja opadali su dosledno ka višim etažama kod svih genotipova, što ukazuje na fiziološka ograničenja povezana sa raspodelom asimilata. Položaj etaže objašnjavao je najveći deo varijabilnosti broja plodova (82,2 %) i procenta zametanja (87,0 %), dok je genotip bio glavni faktor koji je određivao prosečnu masu ploda (82,7 %). Značajne interakcije genotip × etaža utvrđene su za sva ispitivana svojstva, što ukazuje na diferencirane reakcije genotipova duž biljne ose. Rezultati pokazuju da je količina plodova snažno uslovljena unutarbiljnim položajem i faktorima sredine, dok je veličina ploda u najvećoj meri pod genetičkom kontrolom. Ovi nalazi naglašavaju značaj integrisanja fizioloških aspekata na nivou etaže sa selekcijom genotipova u programima oplemenjivanja paradajza. Istraživanje pruža praktične smernice za izbor genotipova sa stabilnim reproduktivnim performansama i unapređenim potencijalom prinosa u promenljivim poljskim uslovima.

Ključne reči: obrasci cvetanja, reproduktivne performanse, fiziologija useva, varijabilnost na nivou etaža, genotip, paradajz, položaj etaže cvasti