Plant Archives Vol. 26, No. 2, 2026 pp. 1717-1722 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.no.2.233

ASSESSMENT OF PRUNING EFFECT ON GROWTH PERFORMANCE OF DIFFERENT PASSION FRUIT (*Passiflora edulis* Sims.) VARIETIES UNDER BASTAR AGRO-CLIMATIC CONDITIONS

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(Date of Receiving-20-07-2026; Date of Revision-07-09-2026; Date of Acceptance-21-09-2026)

ABSTRACT

The present study was conducted during 2025–26 at the Research-cum-Instructional Farm, Krantikari Debridhur College of Horticulture and Research Station, Jagdalpur, Bastar, Chhattisgarh, to evaluate the vegetative growth performance of different passion fruit (*Passiflora edulis* Sims.) varieties under uniform 50% pruning intensity. Six varieties, namely Red, Green, Pink, Kenian Purple, Yellow Hybrid, and Yellow Sweet Orange, were evaluated in a Randomized Block Design with four replications. Observations were recorded at 30, 60, 90, 120, and 150 days after pruning for various growth and physiological parameters. Significant differences were observed among the varieties for most of the traits. At 150 days after pruning, Yellow Hybrid recorded the maximum plant height (443.41 cm), number of leaves (395.3), leaf area (187.58 cm^2), total number of buds (66.34), number of branches (29.21), number of nodes (98.26), and internodal length (16.61 cm). Kenian Purple recorded the maximum stem girth (35.88 mm), while Red showed the earliest emergence of new branches (8.38 days). Yellow Hybrid also recorded the maximum survival percentage (98.10%), leaf area index (0.48), chlorophyll *a* (1.797 mg g^{-1}), chlorophyll *b* (0.740 mg g^{-1}), and total chlorophyll (2.535 mg g^{-1}). Overall, Yellow Hybrid exhibited superior vegetative growth and physiological performance among the evaluated varieties. The findings suggest that Yellow Hybrid has good potential for cultivation under Bastar agro-climatic conditions with 50% pruning intensity.

***Key words*:** Passion fruit, 50 % pruning intensity, varietal performance, chlorophyll, LAI, Bastar

Introduction

Passion fruit (*Passiflora edulis* Sims.) is an important tropical and subtropical fruit crop belonging to the family Passifloraceae, with a chromosome number of 2n = 18. It is native to South America, particularly Brazil and north-eastern Argentina, and is cultivated in several tropical and subtropical regions of the world (Pongener and Alila, 2015). Yellow (*Passiflora edulis* f. *flavicarpa*) and purple (*Passiflora edulis* Sims. f. *edulis*) are the major types cultivated for their desirable flavour, aroma and nutritional value (Kishore *et al*., 2006; Ferreres *et al*., 2007). In India, passion fruit is mainly cultivated in the North-Eastern states and parts of the Western Ghats, covering about 11 thousand hectares with a production of 45 thousand tonnes and average productivity of 5.02 tonnes ha^{-1}. The crop has potential for cultivation in other suitable regions, provided suitable varieties and management practices are adopted. Passion fruit is a perennial climbing vine that grows with the support of tendrils and produces flowers and fruits predominantly on new growth. Therefore, pruning is an important cultural practice for maintaining productive growth and improving fruit production. Pruning involves the removal of old and already fruited branches, thereby stimulating the

development of new shoots and improving light penetration and air circulation within the canopy. Previous studies have reported that pruning influences the growth and yield of passion fruit, with varieties showing varying responses to pruning (Gachanja and Gurnah, 1980; Gachanja, 1984; Abasi *et al.*, 2018; Othman *et al.*, 2018). Excessive pruning, however, may adversely affect plant growth and yield. Although pruning is an important management practice, information on varietal responses under the agro-climatic conditions of Bastar is scarce. Therefore, the present study was undertaken to evaluate the vegetative growth and associated physiological traits of six passion fruit varieties under a uniform 50% pruning intensity.

Material and Methods

The experiment was conducted during 2025–26 at the Research-cum-Instructional Farm of Krantikari Debridhur College of Horticulture and Research Station, Jagdalpur, Bastar, Chhattisgarh, India, under the moist and sub-humid Bastar agro-climatic region.

Six passion fruit (*Passiflora edulis* Sims.) varieties, namely Red, Green, Pink, Kenian Purple, Yellow Hybrid and Yellow Sweet Orange, were evaluated for vegetative growth under 50% pruning intensity. The experiment was laid out in a randomized block design with six treatments and four replications. Treatment details are presented in Table 1.

Observations were recorded at 30, 60, 90, 120 and 150 days after pruning (DAP). Plant height and internodal length were measured in cm, while stem girth was recorded at 10 cm above ground level using a vernier calliper and expressed in mm. Fully developed leaves, buds, branches and nodes were counted plant^{-1}. Leaf area was measured using a Systronics Leaf Area Meter 211 and expressed in cm^2. Days to new branch emergence were recorded from pruning to branch emergence.

Survival percentage was calculated as:

$$\text{Survival (\%)} = \frac{\text{Number of survived plants}}{\text{Number of plant pruned}} \times 100$$

Fig. 1: Pruning operation at 50% intensity in different passion fruit varieties under field conditions.

Table 1: Treatment details of passion fruit varieties under 50 % pruning intensity.

Treat-ment	Variety details	Pruning intensity (Current fruiting branches)
T_1	Red passion fruit	50%
T_2	Green passion fruit	50%
T_3	Pink passion fruit	50%
T_4	Kenian Purple	50%
T_5	Yellow Hybrid	50%
T_6	Yellow Sweet Orange	50%

Leaf area index (LAI) was calculated as:

$$\text{Leaf Area Index} = \frac{\textit{Total leaf area } (cm^2)}{\textit{Ground area } (M^2)}$$

Chlorophyll *a*, *b* and total chlorophyll were estimated by acetone extraction following Sadasivam and Manickam (1997), with absorbance recorded at 663 and 645 nm using a spectrophotometer. Chlorophyll contents were expressed as mg g^{-1} fresh weight using standard formulae:

$$Chlorophyll\ a = \{12.7(A663) - 2.69(A645)\} \times \frac{volume\ of\ sample}{Weight\ of\ sample\ (g) \times 1000}$$

$$Chlorophyll\ b = \{22.9(A645) - 4.68(A663)\} \times \frac{volume\ of\ sample}{Weight\ of\ sample\ (g) \times 1000}$$

$$Total\ Chlorophyll = \{20.2(A645) - 8.02(A663)\} \times \frac{volume\ of\ sample}{Weight\ of\ sample\ (g) \times 1000}$$

Where,

V is extract volume and

W is sample weight.

Data were analysed using ANOVA for randomized block design, and treatment means were compared using critical difference (CD) at 5% significance level.

Results and Discussion

Plant height (cm) and stem girth (mm)

Data presented in Table 2 showed that significant varietal differences were observed in plant height from

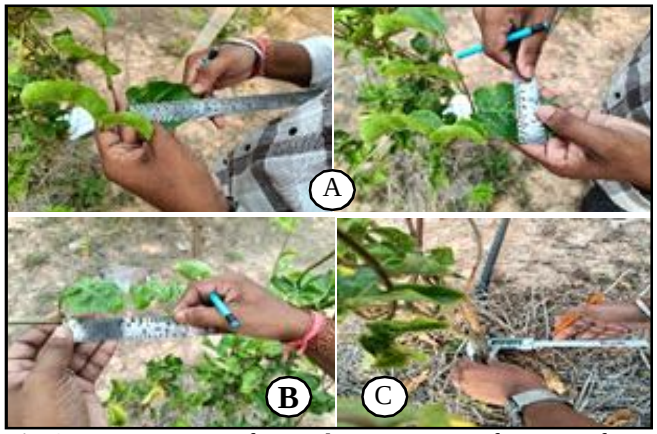

Fig. 2: Measurement of growth parameters of passion fruit: (A) leaf area, (B) internodal length and (C) stem girth.

Table 2: Effect of different treatments on plant height (cm) and stem girth (mm) of passion fruit.

Treatment	Plant height (cm)					Stem girth (mm)				
	30 DAP	60 DAP	90 DAP	120 DAP	150 DAP	30 DAP	60 DAP	90 DAP	120 DAP	150 DAP
Red passion fruit	233.16	267.21	288.32	345.52	392.46	20.57	22.57	24.27	25.82	27.24
Green passion fruit	234.18	275.17	315.55	361.40	408.42	23.81	26.01	27.98	29.93	31.35
Pink passion fruit	235.21	278.22	323.39	372.66	420.15	23.89	26.10	28.17	30.11	31.52
Kenian Purple	240.28	282.24	337.58	385.46	426.51	27.54	30.07	32.21	34.29	35.88
Yellow Hybrid	236.17	280.14	346.48	401.68	443.41	24.93	27.06	29.08	31.37	32.30
Yellow Sweet Orange	232.27	259.20	278.48	332.50	381.49	20.24	22.21	23.93	25.42	26.75
C.D. @ 5%	**N/A**	**N/A**	**40.57**	**23.41**	**33.90**	**2.93**	**3.29**	**3.85**	**4.70**	**6.15**
SE(m)±	**9.28**	**11.38**	**13.34**	**7.78**	**11.34**	**0.96**	**1.08**	**1.27**	**1.54**	**1.67**
C.V.%	**7.89**	**8.32**	**8.47**	**8.10**	**11.04**	**8.20**	**8.42**	**9.17**	**10.47**	**10.80**

Table 3: Effect of different treatments on number of leaves and leaf area (cm^2) per plant of passion fruit.

Treatment	Number of leaves plant^{-1}					Leaf area (cm^2)				
	30 DAP	60 DAP	90 DAP	120 DAP	150 DAP	30 DAP	60 DAP	90 DAP	120 DAP	150 DAP
Red passion fruit	153.5	187.4	240.3	291.6	340.7	46.37	72.51	114.58	134.68	154.28
Green passion fruit	127.5	159.5	209.3	260.6	309.2	44.62	76.21	120.41	140.30	160.90
Pink passion fruit	170.7	203.5	255.5	301.9	352.6	35.91	81.43	126.87	146.59	168.48
Kenian Purple	207.6	240.3	289.6	340.6	392.4	42.21	86.57	134.26	154.89	178.61
Yellow Hybrid	182.6	214.3	290.4	342.4	395.3	48.76	92.88	142.70	163.52	187.58
Yellow Sweet Orange	113.5	145.3	201.5	252.5	301.2	38.57	65.31	106.21	124.38	142.23
C.D. @ 5%	**22.05**	**28.74**	**38.90**	**52.91**	**65.65**	**4.88**	**9.31**	**16.08**	**19.96**	**25.42**
SE(m)±	**7.29**	**9.45**	**12.79**	**17.40**	**21.58**	**1.61**	**3.06**	**5.29**	**6.56**	**8.36**
C.V.%	**7.50**	**8.51**	**10.32**	**11.67**	**12.38**	**7.51**	**7.73**	**8.51**	**9.11**	**10.11**

90 DAP onwards, while differences were non-significant at 30 and 60 DAP. Yellow Hybrid recorded the maximum plant height at 90 DAP (346.48 cm), 120 DAP (401.68 cm) and 150 DAP (443.41 cm), generally at par with Kenian Purple and Pink. Yellow Sweet Orange recorded the minimum plant height at 90 DAP (278.48 cm), 120 DAP (332.50 cm) and 150 DAP (381.49 cm). Similar variation in plant height was reported by Othman *et al.*, (2018), while Mehta (2024) observed improved vine growth following pruning. Stem girth differed significantly among varieties at all observation stages. Kenian Purple recorded the maximum stem girth from 30 to 150 DAP (27.54–35.88 mm), whereas Yellow sweet orange recorded the minimum values. Joseph and Sobhana (2020) also reported significant variation in stem girth among passion fruit accessions, with maximum and minimum values of 13.83 and 7.83 cm, respectively. Mehta (2024) reported greater plant girth under the best pruning treatment. The observed differences indicate varietal variation in growth response following pruning, which promotes shoot renewal and vegetative growth in passion fruit (Gachanja & Gurnah, 1980).

Number of leaves plant^{-1} and leaf area (cm^2)

Data presented in Table 3 showed that significant varietal differences were observed in number of leaves and leaf area. Kenian Purple recorded the maximum number of leaves at 30 DAP (207.6) and 60 DAP (240.3), while Yellow Hybrid recorded the maximum from 90 DAP

Table 4: Effect of different treatments on total number of buds and number of branches plant^{-1} of passion fruit.

Treatment	Total number of buds plant^{-1}					Number of branches plant^{-1}				
	30 DAP	60 DAP	90 DAP	120 DAP	150 DAP	30 DAP	60 DAP	90 DAP	120 DAP	150 DAP
Red passion fruit	8.90	18.37	26.97	37.53	46.56	2.95	6.18	10.70	16.14	21.14
Green passion fruit	10.00	20.62	29.44	41.30	51.33	3.33	6.93	11.71	17.94	23.08
Pink passion fruit	11.10	22.85	32.53	45.01	55.90	3.70	7.69	12.94	19.55	25.07
Kenian Purple	13.34	27.37	36.28	49.69	61.54	4.45	9.22	14.28	21.60	27.63
Yellow Hybrid	12.28	25.18	39.49	53.61	66.34	4.09	8.47	15.34	23.30	29.21
Yellow Sweet Orange	7.75	16.13	23.17	32.93	41.81	2.58	5.43	9.43	14.30	19.00
C.D. @ 5%	**1.32**	**3.41**	**4.24**	**6.33**	**8.38**	**0.41**	**1.01**	**1.93**	**3.21**	**4.72**
SE(m)±	**0.43**	**1.13**	**1.40**	**2.08**	**2.76**	**0.13**	**0.33**	**0.63**	**1.05**	**1.55**
C.V.%	**8.20**	**8.50**	**8.91**	**9.60**	**10.23**	**7.58**	**9.11**	**10.22**	**11.21**	**12.82**

Table 5: Effect of different treatments on number of nodes per plant and internodal length (cm) of passion fruit.

Treatment	Number of Nodes plant^{-1}					Internodal length (cm)				
	30 DAP	60 DAP	90 DAP	120 DAP	150 DAP	30 DAP	60 DAP	90 DAP	120 DAP	150 DAP
Red passion fruit	10.28	21.38	37.00	55.72	72.89	9.59	10.47	11.01	11.30	13.56
Green passion fruit	11.59	24.03	41.24	61.91	79.66	9.70	10.81	11.41	11.82	13.90
Pink passion fruit	12.89	26.65	45.35	67.52	85.71	9.91	10.90	12.30	12.51	13.95
Kenian Purple	15.44	31.90	49.92	73.61	92.48	11.52	11.60	12.33	13.01	14.32
Yellow Hybrid	14.24	29.32	53.61	78.96	98.26	10.20	11.20	12.41	13.21	16.61
Yellow Sweet Orange	8.98	18.83	32.65	49.36	65.49	9.30	9.39	10.21	10.56	12.44
C.D. @ 5%	**1.55**	**3.34**	**6.10**	**9.81**	**13.09**	**1.19**	**1.31**	**1.56**	**2.00**	**2.24**
SE(m)±	**0.51**	**1.10**	**2.01**	**3.23**	**4.30**	**0.39**	**0.43**	**0.51**	**0.54**	**0.74**
C.V.%	**8.34**	**8.68**	**9.27**	**10.00**	**10.44**	**7.82**	**8.03**	**8.83**	**9.00**	**10.44**

onwards, reaching 395.3 at 150 DAP. Yellow Hybrid also recorded the maximum leaf area from 30 to 150 DAP, increasing from 48.76 cm² at 30 DAP to 187.58 cm² at 150 DAP. The greater leaf production and leaf area in Yellow Hybrid indicate better canopy recovery and vegetative development following pruning. Greater leaf area provides a larger photosynthetic surface and may contribute to better vegetative growth. Similar variation in leaf number and leaf area was reported by Aiyelaagbe *et al.*, (2005), while Valle *et al.*, (2018) also observed significant variation in leaf area among passion fruit species. The greater leaf development in Yellow Hybrid may have contributed to its better vegetative performance after pruning.

Total number of buds and branches plant^{-1}

Data presented in Table 4 showed that significant varietal differences were observed in the number of buds and branches plant^{-1} at all observation stages. Kenian Purple recorded higher numbers during the early stages, whereas Yellow Hybrid recorded the maximum number of buds at 90 DAP (39.49), 120 DAP (53.61) and 150 DAP (66.34). At 150 DAP, Yellow Hybrid was at par with Kenian Purple (61.54), while Yellow Sweet Orange recorded the minimum throughout the observation period.

Table 6: Effect of different treatments on days taken for emergence of new branches and survival percentage of passion fruit.

Treatment	Days taken for emergence of new branches	Survival percentage
Red passion fruit	8.38	89.10
Green passion fruit	8.81	94.07
Pink passion fruit	9.56	97.12
Kenian Purple	10.26	98.07
Yellow Hybrid	11.08	98.10
Yellow Sweet Orange	11.61	92.05
C.D. @ 5%	**1.04**	**3.67**
SE(m)±	**0.34**	**1.23**
C.V.%	**6.88**	**8.07**

Similarly, Kenian Purple recorded the maximum number of branches at 30 DAP (4.45) and 60 DAP (9.22), whereas Yellow Hybrid recorded maximum at 90 DAP (15.34), 120 DAP (23.30) and 150 DAP (29.21), at par with Kenian Purple (27.63) at 150 DAP. Amarnath et al. (2020) reported that pruning intensity significantly affected branch production, with 20 cm pruning producing the maximum number of branches (10.24 branches plant^{-1}). Hafle *et al.*, (2009) also reported improved productivity with 30–40 productive branches under pruning. The greater bud and branch production in Yellow Hybrid indicates better shoot development and vegetative recovery following pruning. Renewal of productive laterals is an important objective of pruning in passion fruit (Gachanja & Gurnah, 1980).

Number of nodes plant^{-1} and internodal length (cm)

Data presented in Table 5 showed that significant varietal differences were observed in node number and internodal length at all stages. Kenian Purple recorded the maximum node number during the early stages, whereas Yellow Hybrid recorded the maximum from 90 DAP onwards, reaching 98.26 nodes plant^{-1} at 150 DAP compared with 92.48 in Kenian Data presented in Table 5 showed that significant varietal differences were observed in node number and internodal length at all stages. Kenian Purple recorded the maximum node number during the early stages, whereas Yellow Hybrid

Fig. 3: Analysis of chlorophyll content in passion fruit leaves.

Table 7: Effect of different treatments on leaf area index and chlorophyll content of passion fruit leaves.

Treatment	LAI	Ca	Cb	TC
Red passion fruit	0.41	1.515	0.505	2.019
Green passion fruit	0.42	1.249	0.320	1.568
Pink passion fruit	0.44	1.494	0.410	1.903
Kenian Purple	0.46	1.579	0.387	1.964
Yellow Hybrid	0.48	1.797	0.740	2.535
Yellow Sweet Orange	0.38	1.433	0.530	1.961
C.D. @ 5%	**0.05**	**0.103**	**0.034**	**0.160**
SE(m)±	**0.02**	**0.034**	**0.011**	**0.074**
C.V.%	**7.78**	**4.48**	**4.63**	**5.28**

LAI: Leaf area index; Ca: Chlorophyll a; Cb: Chlorophyll b; TC: Total Chlorophyll

recorded the maximum from 90 DAP onwards, reaching 98.26 nodes plant^{-1} at 150 DAP compared with 92.48 in Kenian Purple. Similarly, Kenian Purple recorded maximum internodal length at 30 DAP (11.52 cm) and 60 DAP (11.60 cm), while Yellow Hybrid recorded the maximum from 90 DAP onwards, reaching 16.61 cm at 150 DAP. The greater node number and internodal length in Yellow Hybrid indicate stronger shoot elongation and vegetative development after pruning. Similar variation in internode distance has been reported in passion fruit under different growing conditions (Liang *et al.*, 2021).

Days taken for emergence of new branches

Data presented in Table 6 showed that significant varietal differences were observed in the days taken for emergence of new branches. Red recorded the earliest emergence (8.38 days), whereas Yellow sweet orange took the longest time (11.61 days). Earlier branch emergence in Red indicates a faster vegetative response to pruning and earlier initiation of new growth. This rapid response is desirable because pruning is intended to stimulate shoot renewal and maintain a productive canopy in passion fruit (Gachanja & Gurnah, 1980).

Survival percentage

Data presented in Table 6 showed that significant varietal differences were observed in survival percentage. Yellow Hybrid recorded the highest survival (98.10%), at par with Kenian Purple (98.07%) and Pink (97.12%), whereas Red recorded the lowest survival (89.10%). Higher survival in Yellow Hybrid suggests better plant establishment and adaptability under pruning conditions.

Leaf area index and chlorophyll content (mg g^{-1})

Data presented in Table 7 showed that significant varietal differences were observed in leaf area index (LAI) and chlorophyll content. Yellow Hybrid recorded the maximum LAI (0.48), which was at par with Kenian Purple (0.46) and Pink (0.44). Yellow Hybrid also recorded the maximum chlorophyll *a* (1.797 mg g^{-1}), chlorophyll *b* (0.740 mg g^{-1}) and total chlorophyll (2.535 mg g^{-1}), whereas Green recorded the minimum values (1.249, 0.320 and 1.568 mg g^{-1}, respectively). The greater LAI and chlorophyll content of Yellow Hybrid indicate better canopy development and photosynthetic potential following pruning. Similar variation in chlorophyll content among passion fruit varieties was reported by Gama *et al.*, (2013). Doke *et al.*, (2024) also reported that pruning enhanced chlorophyll content along with new sprout production in dragon fruit. The higher LAI and chlorophyll content, together with greater leaf number and leaf area, may have contributed to the superior vegetative growth of Yellow Hybrid during the later stages.

Conclusion

The present investigation revealed that significant varietal differences in vegetative growth and selected physiological traits under uniform 50% pruning intensity. Yellow Hybrid showed superior overall performance, particularly during the later growth stages, with better plant growth, canopy development, survival, LAI and chlorophyll content. Kenian Purple performed better for stem girth and several early-stage growth traits, while Red showed the earliest emergence of new branches. Overall, Yellow Hybrid emerged as the most promising variety under the experimental conditions and can be recommended for further evaluation and cultivation under similar Bastar agro-climatic conditions.

Acknowledgements

The authors sincerely acknowledge the support and facilities provided by Krantikari Debridhur College of Horticulture and Research Station, Jagdalpur, Bastar, Chhattisgarh, for conducting the present study.

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