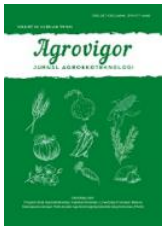
Open Access & Available Online

Agrovigor: Jurnal Agroekoteknologi

ISSN: 1979-5777 (*Print*), 2477-0353 (*Online*)

Journal homepage: https://journal.trunojoyo.ac.id/agrovigor



Article

Effects of Scion Variety and Scion Length on the Growth of Grafted Avocado Plants (*Persea americana* L.)

Ida Sugeng Suyani[1*], Sulis Dyah Candra[1], Dini Cipta Candra Yani[1], Aprilia Hartanti[1]

[1]Agrotechnology Study Program, Faculty of Agriculture, Universitas Panca Marga, Probolinggo, East Java, Indonesia.

*Corresponding author: **Ida Sugeng Suyani** (idasugengsuyani@upm.ac.id)

ARTICLE INFO

Article history
Received: July 2026
Accepted: September 2026
Published: September 2026

Keywords
Vegetative propagation;
Shoot emergence; Leaf development;
Graft compatibility;
Nursery production;

DOI:
https://doi.org/10.21107/agrovigor.v19i2.36107

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ABSTRACT

Avocado (Persea americana L.) is a high-value fruit crop. This study evaluated the effects of scion variety and scion length on the growth of grafted avocado plants. The experiment was conducted in Cukurgondang Village, Grati District, Pasuruan, East Java, from June to August 2024. A factorial randomized block design was used with four scion varieties (Miki, Aligator, Kendil, and Raja Giri), three scion lengths (5, 10, and 15 cm), and three replications. Observed parameters were shoot emergence time, shoot length, number of leaves, and leaf area. Scion variety significantly affected all four parameters, with highly significant effects on shoot length and number of leaves. Scion length had a highly significant effect on shoot emergence time and number of leaves, but did not significantly affect shoot length or leaf area. No significant interaction between scion variety and scion length was observed. Miki produced the longest shoots and the highest number of leaves at 14 weeks after grafting (WAG), whereas Kendil produced the largest leaf area. The 5-cm scion produced the earliest shoot emergence. These findings indicate that the effects of scion variety and scion length on vegetative growth were independent.

INTRODUCTION

Avocado (Persea americana L.) is an important horticultural commodity cultivated in many tropical and subtropical regions. The crop is valued for its fruit and its potential contribution to agricultural income. Commercial production requires healthy, uniform, and high-quality planting materials. Therefore, the selection of an appropriate propagation method is important for establishing productive avocado orchards.

Avocado seedlings can be propagated generatively through seeds or vegetatively through grafting. Seed propagation is relatively simple and can produce plants with strong root systems; however, seedlings may show variation from the parent plant and generally require a longer juvenile period before bearing fruit. Vegetative propagation through grafting is used to maintain desirable characteristics of selected parent plants and to produce planting materials with more uniform traits (Kasana et al., 2024; Subash et al., 2023).

Grafting joins a scion from a selected plant to a rootstock so that the two parts develop as one plant. Its success and subsequent growth are influenced by the physiological condition and compatibility of the rootstock and scion, the grafting technique, and post-grafting environmental conditions. Recent studies on avocado propagation have shown that grafting method, scion condition, and rootstock characteristics can affect graft survival and seedling growth (Kasana et al., 2024; Subash et al., 2023; Hidayat et al., 2026).

The scion is an important component in grafting because it carries the genetic characteristics of the selected parent plant. Scion characteristics, including variety, physiological maturity, and length, may influence bud emergence and subsequent vegetative growth. Scion length may also affect the amount of stored reserves available during the period before the graft union becomes fully functional (Maulana et al., 2020; Mahadwi et al., 2024).

The choice of scion variety may result in different growth responses because varieties can differ in their genetic and physiological characteristics. Differences in shoot development, leaf production, and leaf expansion have been reported among avocado cultivars and grafting treatments (Kasana et al., 2024). Therefore, evaluating scion varieties is necessary to identify planting materials with suitable early vegetative growth.

Scion length is another factor that may influence graft performance. A scion that is too short may contain limited stored reserves, whereas a longer scion may require more water and resources to maintain its tissues. The appropriate length may therefore depend on scion condition and the environment during graft establishment. Studies of avocado grafting have reported that scion length and scion physiological condition can influence early growth and grafting success (Maulana et al., 2020; Mahadwi et al., 2024; Hidayat et al., 2026).

Previous studies have examined grafting methods, scion characteristics, and rootstock conditions in avocado propagation (Supriyanto & Yulianto, 2022; Kasana et al., 2024; Subash et al., 2023). However, information comparing the Miki, Aligator, Kendil, and Raja Giri varieties at different scion lengths remains limited. This study was therefore conducted to determine the effects of scion variety and scion length, as well as their interaction, on the vegetative growth of grafted avocado seedlings.

Previous research has also examined plant growth regulator treatments in avocado grafting (Muchairi et al., 2024). However, comparative information on the Miki, Aligator, Kendil, and Raja Giri varieties at different scion lengths remains limited. This study was therefore conducted to determine the effects of scion variety and scion length, as well as their interaction, on the vegetative growth of grafted avocado seedlings.

MATERIALS AND METHODS

The study was conducted at IP2TP Cukurgondang, Cukurgondang Village, Grati District, Pasuruan Regency, East Java, from June to August 2024. The research site was located at an altitude of approximately 50 m above sea level, with Latosol soil, annual rainfall of 1,332 mm, an average temperature of 27°C, and a relative humidity of 65%. The materials used were avocado rootstocks; scions of the Miki, Aligator, Kendil, and Raja Giri varieties; transparent wax-plastic wrapping; 18 cm × 25 cm polybags; soil; NPK Grower fertilizer; Gandasil D fertilizer; abamectin-based pesticide; and labels. The equipment included a grafting knife, pruning shears, ruler, watering can, camera, and shade net (paranet). The shade net was used to reduce direct solar exposure during graft establishment; the shade-net shading level (%) must be added based on the actual product specification or measurement.The study used a factorial Randomized Block Design (RBD) consisting of two factors. The first factor was scion variety (V), namely V1

= Miki, V2 = Aligator, V3 = Kendil, and V4 = Raja Giri. The second factor was scion length (P), namely P1 = 5 cm, P2 = 10 cm, and P3 = 15 cm. The two factors resulted in 12 treatment combinations, each replicated three times. Each treatment combination consisted of 35 plants, resulting in a total of 1,260 plants.

The study began with the preparation of tools and materials and the provision of rootstocks and scions. The rootstocks were avocado seedlings approximately 3–6 months old and about 50 cm tall, planted in 18 cm × 25 cm polybags. Scions were obtained from mother plants of the Miki, Aligator, Kendil, and Raja Giri varieties cultivated at IP2TP Cukurgondang, with lengths according to the treatments, namely 5 cm, 10 cm, and 15 cm. Grafting was performed using the cleft grafting technique. The graft union was wrapped with transparent wax plastic, and the upper part of the scion was covered to maintain humidity.Plant maintenance included watering every two days, fertilization with 2 g of NPK Grower fertilizer per plant one week after grafting, pest and disease control using abamectin-based pesticide at the recommended dose, and manual weed control. The experimental data were analyzed using a factorial analysis of variance (ANOVA) based on the randomized block design. The model was:

$$Yijk = \mu + \beta k + Vi + Pj + (VP)ij + \varepsilon ijk \quad (1)$$

The observed parameters were shoot emergence time, shoot length, number of leaves, leaf area, and grafting success percentage. Shoot emergence time was recorded as the number of days from grafting until the first new shoot became visible on each grafted plant; please confirm that this was the operational definition and observation frequency used in the experiment. Shoot length was measured from the base of the emerging shoot to its growing tip, and the number of leaves was counted on each plant at each observation. Leaf area was estimated using LA = L × W × K, where LA is leaf area (cm²), L is leaf length (cm), W is maximum leaf width (cm), and K is the correction factor (1.61) used in this study. [AUTHOR TO CONFIRM: provide the reference or calibration method supporting K = 1.61]. Grafting success percentage was calculated as: Grafting success (%) = (number of living grafted plants / total number of grafted plants) × 100. Please confirm the date on which grafting success was assessed. Where Yijk is the observed value for the ith scion variety, jth scion length, and kth block; μ is the overall mean; βk is the effect of the kth block; Vi is the effect of the ith scion variety; Pj is the effect of the jth scion length; (VP)ij is the interaction effect between scion variety and scion length; and εijk is the experimental error. When the ANOVA indicated a significant treatment effect, means were compared using the 5% Least Significant Difference (LSD) test. The Duncan's Multiple Range Test should be deleted unless it was actually used in the analysis.

RESULTS AND DISCUSSION

Shoot Emergence Time

The results showed that scion variety (V) significantly affected shoot emergence time, whereas scion length (P) had a highly significant effect. In contrast, no interaction was found between the two factors (V × P), indicating that each treatment acted independently in affecting shoot growth responses in grafted avocado plants.The absence of interaction indicates that the physiological process of shoot formation was influenced more strongly by internal plant mechanisms after graft union formation. Successful grafting followed by the formation of connecting tissue allows the distribution of water, nutrients, and growth hormone signals such as auxin and cytokinin. These hormones play an important role in initiating cell division activity at the growing point, thereby promoting shoot emergence. Thus, variation in treatment combinations was not strong enough to produce a significant interaction effect. This finding is consistent with Muchairi et al. (2024), who reported that the application of plant growth regulators did not interact with scion length for the shoot emergence time parameter in avocado. The mean shoot emergence time for each treatment is presented in Table 1.

For scion variety, V2 (Aligator) had the shortest mean shoot emergence time (29.36 days), followed closely by V3 (Kendil; 29.48 days) and V1 (Miki; 29.67 days). V4 (Raja Giri) had the longest mean (30.11 days). For scion length, P1 (5 cm) produced the earliest shoot emergence (29.30 days), followed by P3 (15 cm; 29.70 days) and P2 (10 cm; 29.96 days). The LSD grouping should be interpreted together with the letters shown in Table 1; the numerical ranking alone does not establish that every pair differs significantly.

Table 1. Shoot emergence time (days) as affected by scion variety and scion length

Treatment	Mean Shoot Emergence Time (days)
V4	30.11 a
V1	29.67 ab
V3	29.48 b
V2	29.36 b
LSD 5%	0.47
P2	29.96 a
P3	29.70 ab
P1	29.30 b
LSD 5%	0.4038

Note: V1 = Miki; V2 = Aligator; V3 = Kendil; V4 = Raja Giri. P1 = 5 cm; P2 = 10 cm; P3 = 15 cm. Means followed by the same letter within each factor are not significantly different according to the 5% LSD test.

For the scion-length factor, P1 (shorter scion) tended to produce shoots earlier than P2 (longer scion). Physiologically, this may be explained by the shorter transport pathway for water, nutrients, and hormones from the rootstock to the growing point when a shorter scion is used. This transport efficiency may enable faster metabolic responses to support shoot initiation. In addition, shorter scions have a lower tissue-maintenance burden during the early post-grafting phase, allowing plant energy to be allocated more rapidly to growth. These results indicate that scion variety and scion length affected shoot emergence time independently because their interaction was not significant. The differences may be associated with the physiological condition of the scion and the establishment of the graft union. Similar studies have reported that scion characteristics and grafting conditions influence early shoot development in avocado (Mahadwi et al., 2024; Hidayat et al., 2026).Therefore, scion variety and scion length affected shoot emergence time independently, without interaction. The selection of a variety with good callus-forming ability and the use of shorter scions may support earlier shoot emergence in avocado grafting.

Shoot Length

Growth in shoot length of grafted avocado plants showed that scion variety had a more dominant effect than scion length. During the early growth phase (1 WAG), plants were still adapting after grafting, so differences among treatments were not yet pronounced. This is consistent with Supriyanto & Yulianto (2022), who stated that plant growth results from interactions between internal and external factors; therefore, during the early post-grafting phase, plants still focus on tissue union before entering the active growth phase. Based on Table 2, variation in growth among varieties was observed at each observation age. V2 and V3 tended to show higher growth than V4 during most of the early phase. This indicates that genetic differences among varieties affect the ability of plants to respond to grafting, particularly in vascular tissue formation and the distribution of photosynthetic products. According to Setiyono & Munir (2017), shoot growth in top-grafted plants is strongly influenced by the plant's ability to form an effective tissue union. A perfect union accelerates the flow of water, nutrients, and growth hormones, thereby supporting apical meristem activity in cell elongation.

In addition, Supriyanto & Yulianto (2022) explained that auxin plays an important role in shoot elongation by increasing cell-wall elasticity and stimulating cell division. The activity of this hormone is one of the main factors causing differences in growth rates among varieties after grafting. On the other hand, scion length treatment showed relatively no significant differences during this early phase. This indicates that scion length does not directly affect shoot growth as long as tissue union is successful and vascular function has been properly established. Based on Table 3, shoot-length growth during the later phase showed increasingly clear differences among varieties. V1, V2,

and V3 had higher growth than V4 at almost all observation ages. This indicates that after the adaptation phase was completed, varietal genetics became the dominant factor controlling vegetative growth.

Table 2. Shoot length (cm) at 1–7 weeks after grafting (WAG) as affected by scion variety and scion length

Treatment	Mean Shoot Length (cm)						
	1	2	3	4	5	6	7
V1	0.82 a	2.24 bc	3.39 bc	4.58 bc	5.72 b	6.63 c	7.58 b
V2	1.00 a	2.08 b	3.14 b	4.19 ab	5.23 a	6.26 ab	7.14 a
V3	1.29 a	2.57 c	3.60 c	4.66 c	5.71 b	6.56 bc	7.48 b
V4	0.62 a	1.50 a	2.58 a	3.81 a	4.87 a	5.97 a	6.86 a
BNT 5%	ns	0.37	0.39	0.40	0.39	0.37	0.37
P1	1.03 a	2.17 a	3.22 a	4.36 a	5.42 a	6.43 a	7.32 a
P2	0.82 a	1.94 a	3.06 a	4.18 a	5.28 a	6.29 a	7.22 a
P3	0.96 a	2.18 a	3.26 a	4.39 a	5.45 a	6.38 a	7.26 a
BNT 5%	ns	ns	ns	ns	ns	ns	ns

Note: V1 = Miki; V2 = Aligator; V3 = Kendil; V4 = Raja Giri. P1 = 5 cm; P2 = 10 cm; P3 = 15 cm. WAG = weeks after grafting. Means followed by the same letter within each factor and observation time are not significantly different according to the 5% LSD test; ns = not significant.

Table 3. Shoot length (cm) at 8–14 weeks after grafting (WAG) as affected by scion variety and scion length

Treatment	Mean Shoot Length (cm)						
	8 WAG	9 WAG	10 WAG	11 WAG	12 WAG	13 WAG	14 WAG
V1	8.16 c	8.49 c	8.75 c	9.10 c	9.43 c	9.81 b	10.29 b
V2	7.72 ab	8.11 ab	8.38 ab	8.76 b	9.06 ab	9.37 b	9.68 a
V3	8.03 bc	8.43 bc	8.68 bc	9.04 bc	9.37 bc	9.64 b	10.00 b
V4	7.47 a	7.82 a	8.07 a	8.41 a	8.74 a	9.00 a	9.39 a
LSD 5%	0.33	0.33	0.32	0.33	0.32	0.33	0.32
P1	7.91 a	8.26 a	8.52 a	8.87 a	9.18 a	9.48 a	9.83 a
P2	7.78 a	8.18 a	8.42 a	8.78 a	9.10 a	9.39 a	9.76 a
P3	7.85 a	8.21 a	8.48 a	8.83 a	9.17 a	9.50 a	9.93 a
LSD 5%	ns	ns	ns	ns	ns	ns	ns

Note: V1 = Miki; V2 = Aligator; V3 = Kendil; V4 = Raja Giri. P1 = 5 cm; P2 = 10 cm; P3 = 15 cm. WAG = weeks after grafting. Means followed by the same letter within each factor and observation time are not significantly different according to the 5% LSD test; ns = not significant.

According to Setiyono & Munir (2017), varieties with better adaptation to environmental conditions show more optimal growth because of greater efficiency in physiological processes such as photosynthesis and assimilate distribution to growing tissues. Meanwhile, scion length continued to show no significant effect at all observation ages. This indicates that after the graft union was fully established, shoot growth was determined more by apical meristem activity and endogenous hormonal balance than by the initial scion length. Overall, the results showed that scion variety had a more consistent effect on avocado shoot length than scion length, both during the early and later growth phases.

Number of Leaves

The results showed that scion variety had a highly significant effect on the number of leaves of avocado plants at all observation ages (1–14 WAG). This indicates that genetic differences among varieties play an important role in

determining the plant's ability to form leaves during the vegetative growth phase. Meanwhile, scion length significantly affected the number of leaves from the early stage through 11 WAG, but no longer affected it at 12–14 WAG. The interaction between scion variety and scion length was not significant at any observation age.

Table 4. Number of leaves at 1–7 weeks after grafting (WAG) as affected by scion variety and scion length

Treatment	Mean Number of Leaves						
	1 WAG	2 WAG	3 WAG	4 WAG	5 WAG	6 WAG	7 WAG
V1	19.02 b	19.53 b	19.71 b	20.18 b	20.63 b	21.09 b	21.54 b
V2	12.30 a	12.83 a	13.23 a	13.56 a	13.88 a	14.22 a	14.38 a
V3	11.10 a	11.49 a	11.82 a	12.11 a	12.37 a	12.64 a	12.96 a
V4	18.06 b	18.54 b	19.04 b	19.47 b	19.90 b	20.36 b	20.80 b
LSD 5%	2.53	2.56	2.65	2.71	2.74	2.78	2.84
P1	13.98 a	14.48 a	14.83 a	15.19 a	15.51 a	15.86 a	16.23 a
P2	14.59 ab	15.05 a	15.38 ab	15.78 ab	16.13 ab	16.52 ab	16.89 a
P3	16.78 b	17.28 b	17.64 b	18.02 b	18.44 b	18.86 b	19.14 a
LSD 5%	2.19	2.22	2.29	2.34	2.38	2.40	ns

Note: V1 = Miki; V2 = Aligator; V3 = Kendil; V4 = Raja Giri. P1 = 5 cm; P2 = 10 cm; P3 = 15 cm. WAG = weeks after grafting. Means followed by the same letter within each factor and observation time are not significantly different according to the 5% LSD test.

Among the varieties, V1 (Miki) and V4 (Raja Giri) generally had more leaves than V2 (Aligator) and V3 (Kendil) during the early observation period. For scion length, P3 (15 cm) tended to produce the highest leaf number during the early observations. These results suggest that both varietal characteristics and the initial scion length contributed to early leaf development. According to Setiyono & Munir (2017), leaf number is strongly influenced by the plant's ability to adapt after grafting, particularly in forming an effective tissue union. A good union supports efficient transport of water, nutrients, and growth hormones, allowing leaf organ formation to proceed optimally.

In addition, Supriyanto & Yulianto (2022) stated that leaf number is closely related to shoot growth; more vigorous shoots tend to produce more leaves because they have more nodes and growing points. This explains the relationship between vegetative growth and increasing leaf number in grafted avocado plants. Scion length also contributed to leaf formation during the early phase. Longer scions are presumed to contain greater food reserves, enabling them to support leaf formation during early growth before the plant becomes fully physiologically independent.

Based on Table 5, differences in leaf number among varieties became more pronounced during the later phase. V1 and V4 showed higher leaf numbers than V2 and V3 at almost all observation ages. This indicates that after the plants passed the initial adaptation phase, varietal genetics became the dominant factor controlling leaf formation. According to Setiyono & Munir (2017), varieties with better adaptation to environmental conditions show more optimal vegetative growth, including leaf formation. This is related to physiological efficiency in photosynthesis and assimilate distribution to growing tissues.

Meanwhile, the influence of scion length began to decline during this phase. This indicates that food reserves from the scion contribute mainly during the early growth phase, whereas subsequent leaf growth is determined more by photosynthetic activity and the plant's ability to form new tissues independently. The pattern observed in this study is consistent with recent avocado propagation research, which identifies scion and rootstock characteristics as factors associated with vegetative development (Kasana et al., 2024; Subash et al., 2023). Leaf development is also influenced by environmental conditions and the plant's capacity to produce and distribute assimilates. Overall, the results showed that scion variety had a more consistent effect on avocado leaf number than scion length, both during the early and later growth phases.

Table 5. Number of leaves at 8–14 weeks after grafting (WAG) as affected by scion variety and scion length

Treatment	Mean Number of Leaves						
	8 WAG	9 WAG	10 WAG	11 WAG	12 WAG	13 WAG	14 WAG
V1	22.00 b	22.38 b	22.80 b	23.30 b	23.51 b	23.89 b	24.02 b
V2	14.83 a	15.13 a	15.62 a	16.12 a	16.30 a	16.46 a	16.57 a
V3	13.27 a	13.56 a	13.83 a	14.20 a	14.34 a	14.48 a	14.72 a
V4	21.26 b	21.54 b	22.01 b	22.36 b	21.46 b	21.71 b	22.01 b
LSD 5%	2.88	2.91	2.94	2.96	2.73	2.70	2.72
P1	16.49 a	16.72 a	17.08 a	17.54 a	17.76 a	17.98 a	18.18 a
P2	17.29 ab	17.62 ab	18.05 ab	18.52 ab	18.66 a	18.91 a	19.09 a
P3	19.73 b	20.13 b	20.57 b	20.93 b	20.29 a	20.51 a	20.72 a
LSD 5%	2.50	2.53	2.54	2.56	ns	ns	ns

Note: V1 = Miki; V2 = Aligator; V3 = Kendil; V4 = Raja Giri. P1 = 5 cm; P2 = 10 cm; P3 = 15 cm. WAG = weeks after grafting. Means followed by the same letter within each factor and observation time are not significantly different according to the 5% LSD test; ns = not significant.

Leaf Area

The results showed that scion variety significantly affected the leaf area of avocado plants at 7–14 WAG. This indicates that varietal genetics play an important role in determining leaf-area development during the vegetative growth phase. Meanwhile, scion length did not significantly affect leaf area at any observation age, indicating that its contribution to leaf-area formation was limited. The interaction between scion variety and scion length was also not significant, indicating that the two factors acted independently.

In general, leaf area increased with plant age. V3 showed the highest leaf-area values at almost all observation ages, indicating that this variety had better physiological ability to support leaf-organ development. This was associated with more effective photosynthesis, cell division, and leaf-tissue differentiation than in the other varieties.

Leaf-area development is related to the growth and expansion of leaf tissues. The differences among varieties observed in this study may reflect their distinct genetic and physiological characteristics. Similar differences in vegetative traits among avocado cultivars and grafting treatments have been reported by Kasana et al. (2024). A larger leaf surface can increase the area available for light interception, although photosynthetic rate was not measured in the present study.

Table 6. Leaf area (cm²) at 7–10 weeks after grafting (WAG) as affected by scion variety and scion length

Treatment	Mean Leaf Area (cm²)			
	7 WAG	8 WAG	9 WAG	10 WAG
V1	83.43 a	85.09 a	86.90 a	88.60 a
V2	87.31 ab	89.29 ab	91.40 ab	93.13 ab
V3	96.56 b	98.57 b	100.41 b	102.57 b
V4	79.78 a	81.43 a	83.76 a	85.53 a
LSD 5%	10.16	10.23	10.26	10.42
P1	91.14 a	92.93 a	95.03 a	96.83 a
P2	82.29 a	84.24 a	86.33 a	88.24 a
P3	86.88 a	88.62 a	90.49 a	92.30 a
LSD 5%	ns	ns	ns	ns

Note: V1 = Miki; V2 = Aligator; V3 = Kendil; V4 = Raja Giri. P1 = 5 cm; P2 = 10 cm; P3 = 15 cm. WAG = weeks after grafting. Means followed by the same letter within each factor and observation time are not significantly different according to the 5% LSD test; ns = not significant.

Table 7. Leaf area (cm²) at 11–14 weeks after grafting (WAG) as affected by scion variety and scion length

Treatment	Mean Leaf Area (cm²)			
	11 WAG	12 WAG	13 WAG	14 WAG
V1	89.82 a	91.40 a	92.88 a	93.79 a
V2	94.79 ab	96.49 ab	98.26 ab	99.60 ab
V3	104.50 b	106.23 b	107.96 b	109.53 b
V4	87.09 a	88.82 a	90.40 a	91.47 a
LSD 5%	10.52	10.57	10.59	11.17
P1	98.56 a	100.27 a	102.02 a	103.02 a
P2	89.58 a	91.45 a	93.11 a	94.37 a
P3	94.01 a	95.49 a	96.99 a	98.41 a
LSD 5%	ns	ns	ns	ns

Note: V1 = Miki; V2 = Aligator; V3 = Kendil; V4 = Raja Giri. P1 = 5 cm; P2 = 10 cm; P3 = 15 cm. WAG = weeks after grafting. Means followed by the same letter within each factor and observation time are not significantly different according to the 5% LSD test; ns = not significant.

Scion length treatment showed relatively similar values across treatments at all observation ages. This indicates that scion length plays a role only during the initial grafting phase by supporting temporary energy reserves, but does not directly affect leaf expansion after the plant enters an independent growth phase. Once the graft union is well established, leaf growth is controlled more strongly by the physiological activity of the scion variety.The absence of interaction between scion variety and scion length further confirms that the two factors acted independently. Thus, leaf area in grafted avocado plants was determined more by the genetic potential of the variety than by the scion length used.

Grafting Success

The observations showed that all grafted avocado seedlings had a 100% survival rate. This indicates that the grafting technique was performed very successfully and produced compatible unions between the rootstocks and scions, with no growth failure among the experimental units. This success indicates that cambial tissue union proceeded optimally, as shown by good callus formation and vascular connection between the rootstock and scion. This condition allowed water, nutrients, and photosynthetic products to flow smoothly, thereby supporting seedling survival. The high success rate was also related to the suitability of the plant materials, namely the use of healthy, actively growing rootstocks and scions with good freshness. In addition, physiological compatibility between the two plant components also determines how quickly tissue union can occur.

Environmental factors during grafting also played an important role, particularly humidity and temperature that supported callus formation and reduced the risk of scion desiccation. The use of graft protection also helped maintain stable microclimatic conditions around the graft union, allowing new tissues to form properly without external disturbance. The success of grafting is generally associated with compatibility between the rootstock and scion, the physiological condition of the plant materials, and the formation of a functional graft union. Recent avocado propagation studies have likewise identified grafting method and scion or rootstock characteristics as important factors affecting graft establishment (Subash et al., 2023; Kasana et al., 2024; Hidayat et al., 2026). In this experiment, all grafted seedlings were recorded as surviving, giving a grafting success percentage of 100%. This result applies to the experimental conditions and assessment period used in this study. It should not be interpreted as proof that the same success rate will necessarily be obtained under other nursery or field conditions.

CONCLUSION

Scion variety significantly affected shoot emergence time, shoot length, number of leaves, and leaf area, whereas scion length significantly affected shoot emergence time and number of leaves. No significant interaction between scion variety and scion length was detected for the observed parameters. Among the varieties, Aligator (V2)

had the shortest mean shoot emergence time (29.36 days); Miki (V1) produced the longest shoots (10.29 cm) and the highest number of leaves (24.02 leaves) at 14 WAG; and Kendil (V3) produced the largest leaf area (109.53 cm^2) at 14 WAG. Among scion lengths, 5 cm (P1) resulted in the earliest mean shoot emergence (29.30 days), while 15 cm (P3) generally produced a higher number of leaves during the early observation period. Scion length did not significantly affect shoot length or leaf area.

REFERENCES

Hidayat, R., Da Costa, A. J. S., Pikir, J. S., Romadhon, M. R., Talitha, O., & Fathin, T. S. (2026). Anatomical compatibility of avocado grafting at different scion growth stages. Asian Journal of Agriculture, 10(1). https://doi.org/10.13057/asianjagric/g100131.

Maulana, O., Rosmaiti, & Syahril, M. (2020). Success of Top-Grafting Several Mango Varieties (Mangifera indica) Using Different Scion Lengths. Jurnal Agroteknologi dan Ilmu Pertanian, 5(1), 12–22. Universitas Samudra. doi: 10.31289/agr.v5i1.4006.

Muchairi, A., Suharno, & Siti, A. (2024). Effect of Plant Growth Regulator Type and Concentration on the Success of Avocado (Persea americana) Top-Grafting. Jurnal Ilmu-Ilmu Pertanian, 31(1), 56–63. Politeknik Pembangunan Pertanian Yogyakarta Magelang. https://doi.org/10.55259/jiip.v31i1.41

Parsaulian, T., Bandem, P. D., & Patriani, D. (2012). Effect of Scion Length on the Success of Top-Grafting of Wax Apple (Syzygium samarangense) Seedlings. Jurnal Sains Mahasiswa Pertanian, 1(1), 1–9. Universitas Tanjungpura.

Prihatman, K. (2000). Avocado (Persea americana Mill. / Persea gratissima Gaerth.). Budidaya Pertanian (February). Bappenas.

Putri, D., Gustia, H., & Suryati, Y. (2016). Effect of Scion Length on the Success of Grafting Avocado Plants (Persea americana Mill.). Jurnal Agrosains dan Teknologi, 1(1), 31–44. https://doi.org/10.24853/jat.1.1.32-45

Setiyono, A. E., & Munir, M. (2017). Growth Response of Grafted Seedlings to Scion Position and Several Garifta Mango Varieties (Mangifera indica L.). Agrotechbiz, 4(1), 17–24. Universitas Panca Marga.

Subash, B., Muthuramalingam, S., Balakumbahan, R., Venkatesan, K., & Anitha, T. (2023). Standardization of softwood grafting in avocado (Persea americana Mill.) var. TKD1. International Journal of Environment and Climate Change, 13(10), 2444–2451. https://doi.org/10.9734/ijecc/2023/v13i102910.

Supriyanto, E., & Yulianto, W. (2022). Effect of Auxin Plant Growth Regulator Concentration and Scion Length on the Growth of Avocado (Persea americana L.) Seedlings. Jurnal Inovasi Pertanian, 24(1), 75–86. Universitas Pekalongan.