Original Article

Effect of Location, Indole Butyric Acid, and Aloe Vera Gel Treatment on Rooting of Rosa Canina Cuttings

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Abstract

The study was conducted in Bsheli and Helbako in Lattakia governorate, Syria to evaluate the effect of location and treatment with 1000 ppm concentration of indole butyric acid and *aloe vera* gel on the rooting of *Rosa canina* cuttings. The design was completely randomized in this factorial experiment. The results showed that the rooting percentage (52%) in the Bsheli was superior to Helbako (47%) while average root length in Helbako at 5.85 cm exceeded that of the Bsheli's 4.40 cm. At the same time, location had no significant effect on the average number of roots and buds or on survival percentage. The highest rooting rate (86%) was achieved for Bsheli cuttings treated with 1000 ppm indole butyric acid concentrations for ten seconds combined with *aloe vera* gel, followed by those treated similarly from Helbako (79%). The lowest rates were obtained from the untreated cuttings from Bsheli and Helbako at 14.97% and 11.73%, respectively. The interaction between location and experimental treatments significantly affected average rooting percentage, number of roots, root length, and number of buds on the cuttings. The findings recommend using 1000 ppm indole butyric acid concentrations together with *aloe vera* gel to obtain the best rooting and highest survival percentage for the rose hip cuttings.

Keywords: Rose hips, number of buds on cuttings, carotenoid content of leaves, rooting percentage, root length

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Introduction

Rosehip (*Rosa canina*) is part of the Rosa genus within the Rosaceae family. It includes over 100 wild shrub species that vary in fruit size and color, each exhibiting notable nutritional properties. The most prominent species among them are *R. canina* L. and *R. rubiginosa* L. (14).

The rose is a thorny shrub known for its fragrant pink or white flowers. These shrubs are spread worldwide, especially in Asia, North America and the Middle East, and their fruits are used to manufacture food products such as syrup, jam, fruit vinegar, and others (13).

Vegetative propagation by stem cuttings is the preferred method in plants, due to its various advantages, as it maintains the characteristics of the mother plant. The resulting plants from this method have rapid

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growth and high production, and obtaining seedlings takes a short time compared to the sexual propagation method by seeds (15). Indeed, a group of synthetic hormonal substances (auxins) is used in the process of vegetative propagation. Indole butyric acid (IBA) is one of the most important auxins that encourage rooting (17), but excessive concentrations of auxins have the opposite effect (4).

A study (13) on two types of ground roses, *Rosa elfrid* and *Weisse immensee*, showed that using IBA positively affected the rooting percentage and stimulated the growth of new shoots on the cuttings. Another study on the effect of different levels of the IBA hormone (0, 1000, 1500, and 2000 mg. L^{-1}) and the position of the cut (lower, middle, upper) on the rooting of the cherry brandy rose showed that the 1500 mg. L^{-1} concentration produced the highest rooting percentage and root length (20).

A study in India to determine the response of rose cuttings to IBA at concentrations of 15, 30, 45, 60, and 75 ppm found that it significantly affected all rooting indicators, with the 75 ppm dosage recording the best results in number and length of roots formed (9). Another study on *Rosa damascena* cuttings at 0, 2000, and 4000 ppm IBA concentrations showed significant positive percentage impacts on all rooting parameters (2).

Aloe vera leaf gel is among the most important natural treatments for improving the rooting of cuttings (8). A study on *Camellia sinensis* showed that treating its cuttings with the gel at 100% increased rooting by 78.3% compared to 29.8% for the control. The use of the gel also affected the number of roots formed, which reached 10.4 and 2.3 roots. $cutting^{-1}$ in the gel and control treatments, respectively (22). It was found that the use of *aloe vera* gel on the weeping fig plant (*Ficus benjamina*) had a significantly superior effect on the rooting indices, providing a rooting percentage of 54.17% after 60 days of planting and 25% in the control, while not affecting cutting root lengths (1).

A study on the Indian rose (*Rosa Indica*) showed that cuttings treated with *aloe vera* gel for 5 minutes registered the highest rooting percentage (96%), number of roots formed (9 roots. $cutting^{-1}$), and their lengths (6.54 cm) compared to the control and the other treatments (23).

This research was based on the important environmental role of the rose plant, its nutritional and medicinal value, the difficulty of reproducing it through sexual propagation, and the urgent need to use vegetative propagation methods by cuttings to obtain large numbers of seedlings in a short time and at low cost. Therefore, this study examined the effect of using indole butyric acid and *aloe vera* gel as a natural plant regulator in rooting rose cuttings obtained from the Bsheli and Helbako locations in Syria's Lattakia governorate.

Materials and Methods

Study location

Cuttings were obtained from the Helbako and Bsheli sites in Lattakia governorate, Syria.

Plant material

Three mother plants of the rose shrubs were collected from each location within a radius of 20-30 m on the edges of the forest. The selected shrubs were 2-3 m in height, homogeneous in vegetative growth, of vigorous growth, free from diseases and insects, had good branching, and not exposed to agricultural practices.

Greenhouse conditions

The experiment was carried out in the greenhouse of the Bouqa nursery (Tishreen) under controlled environmental conditions suitable for the rooting process. The greenhouse temperature was between 25-27 °C during the day and 15-18 °C at night, suitable for the 20-22 °C medium temperature required for rooting. Humidity was close to 100% while ventilation was provided by large fans or through windows and doors as well as to expel gases. The fiberglass roof of the greenhouse allowed good light transmittance, and the

building was painted with lime in conditions of high temperature and strong lighting. Hydration inside the greenhouse was by spray or fog irrigation. The plants were grown in a medium of black pumice, a black volcanic material with high moisture retention capacity.

Date of taking cuttings

Cuttings from branches of the selected shrubs were made on 12/20/2023.

Preparing the cuttings for planting

Branches collected from the shrubs were taken to the greenhouse and prepared from the basal parts that were 12 cm long, free of leaves, and 0.5 cm thick. The horizontal cuts were made directly under the lower bud and obliquely above the upper bud by about 0.5 cm. The number of cuttings from each bush was 100 i.e., with 300 cuttings from each location.

Treatment of the cuttings

Altogether, 100 cuttings from each of the three shrubs in each location were taken and divided into four groups. The first group was immersed in the IBA solution (1000 ppm) for 10 seconds, the second in *aloe vera* gel for 10 seconds, the third in the IBA solution (1000 ppm) for 10 seconds and then in *aloe vera* gel for 10 seconds, and the fourth in distilled water for 10 seconds. After immersion, the cuttings were set aside for 15 minutes before planting in the greenhouse.

Cultivation medium (black pumice)

The cuttings were planted in basins with black pumice at a depth of 2 cm. The rows were spaced 5 cm apart, the cuttings at 2 cm apart, and a 5 cm space was left between each replicate.

Studied indicators

The rooting indicators for the cuttings were noted after 3 months of planting. The indicators comprised: rooting percentage; number of lateral roots formed on the cutting (root. cutting^{-1}); length of lateral roots (cm); number of buds on the cutting (bud. cutting^{-1}); survival rate (%); number of leaves per cutting (leaf. cutting^{-1}); number of leaflets in the leaf (leaflet. leaf^{-1}); leaf weight (g); leaf length (cm); leaf width (cm), leaf area (cm^2); leaf content of chlorophyll *a* and *b*, according to the method by (7); leaf content of carotenoids estimated using the same method as for chlorophyll but at a wavelength of 470 nm.

Experimental design and statistical analysis

A completely randomized design was adopted for this factorial experiment. The first factor was the two locations and the second was the rooting enhancers (IBA, *aloe vera* gel, control). Three replications were made for each treatment. GenStat 12 software was used to conduct ANOVA analysis, and Duncan's test was adopted to study the significance of differences between means at 0.05 significance level.

Results and Discussion

Results

Location effect

Table 1 shows that the 52% rooting rate in the Bsheli exceeding the 47% of the Helbako, while the latter's average root length at 5.85 cm was higher than the 4.40 cm for the former. Location did not affect the average number of roots (root. cutting^{-1}), and ranged between 6.62 and 7.86. cutting^{-1} in the Helbako and Bsheli, respectively, nor did it affect the average number of buds on the cuttings and their survival rate (%).

Table 1. Effect of location on rooting rate, average root length, number, average number of buds on the cutting, and survival rate of cuttings of Rosehip

Location	Rooting %	Mean root length (cm)	Mean root number (root. cutting^{-1})	Mean bud number (bud. cutting^{-1})	Survival rate (%)
Bsheli	52.00 ^{a}	4.40 ^{b}	7.86 ^{a}	1.76 ^{a}	57.80 ^{a}
Helbako	47.00 ^{b}	5.85 ^{a}	6.62 ^{a}	1.71 ^{a}	62.00 ^{a}

*Different letters within the same columns indicate significant differences at the 0.05 level.

Figure 1. Rooted rosehip cutting (12/6/2024)

Table 2 shows that the number of leaves ranged from 3.59 to 3.68 leaf. cutting^{-1} without significant variations among geographical location. The number of leaflets in the leaf was higher in Bsheli (4.61 leaflet. leaf^{-1}), but with significant variations in the Helbako (3.78 leaflet. leaf^{-1}). Mean leaf weights, lengths, and widths were almost similar at 0.114g, 2.3 cm, and 2.2 cm, respectively, and not significant for both locations.

Table 2. Effect of location on the number of leaves on the cutting, number of leaflets, leaf weight, leaf length, leaf width, and leaf area

Location	No. of leaves on cuttings (leaf. cutting^{-1})	No. of leaflets per leaf (leaflet. leaf^{-1})	Leaf weight (g)	Leaf length (cm)	Leaf width (cm)	Leaf area (cm^2)
Bsheli	3.59 ^{a}	4.61 ^{a}	0.114 ^{a}	3.29 ^{a}	2.23 ^{a}	4.52 ^{a}
Helbako	3.68 ^{a}	3.78 ^{a}	0.114 ^{a}	3.28 ^{a}	2.24 ^{a}	5.07 ^{a}

*Different letters within the same columns indicate significant differences at the 0.05 level.

Table 3 shows that carotenoid content ranged from 56.16 to 58 µg mL^{-1}, chlorophyll *a* from 928.47 to 924.04 µg mL^{-1}, and chlorophyll *b* from 604.77 to 616.43 in the leaves formed on the cuttings of the Helbako and Bsheli samples, respectively. However, none of the mentioned indices were affected by the geographical location of the cuttings.

Table 3. Effect of location on carotenoid and chlorophyll content (µg. mL^{-1})

Location	Carotenoid	Chlorophyll *a*	Chlorophyll *b*
Bsheli	58.00 ^{a}	924.04 ^{a}	616.43 ^{a}
Helbako	56.16 ^{a}	928.47 ^{a}	604.77 ^{a}

Effect of indole butyric acid and aloe vera gel

Table 4 shows that the rooting at 82.50% of the cuttings treated with IBA and *aloe vera* gel together was superior to all treatments, followed by the IBA treatment alone (62.12%). In comparison, the control cuttings had the lowest rooting percentage (13.35%), while those treated with *aloe vera* gel alone had a relatively low rooting value at 39.33%.

Table 4. Effect of IBA and *aloe vera* gel treatment on rooting rate, average root length, number, average number of buds, and survival rate of Rosehip cuttings

Treatment	Rooting %	Mean root length (cm)	Mean root number (root. cutting^{-1})	Mean bud number (bud. cutting^{-1})	Survival rate (%)
Control	13.35 ^{d}	2.53 ^{d}	2.35 ^{c}	1.20 ^{b}	22.80 ^{c}
IBA (1000 ppm for 10 sec.)	62.12 ^{b}	3.95 ^{c}	6.36 ^{b}	1.77 ^{ab}	38.42 ^{b}
***Aloe vera* gel**	39.33 ^{c}	5.92 ^{b}	8.45 ^{b}	1.7 ^{ab}	88.50 ^{a}
IBA + *A. vera* gel	82.50 ^{a}	8.1 ^{a}	11.78 ^{a}	2.18 ^{a}	90.00 ^{a}

*Different letters within the same columns indicate significant differences at the 0.05 level.

Cuttings treated with IGA and *aloe vera* gel produced the highest average root length (8.1 cm), root numbers (11.78 roots. cutting^{-1}), buds (2.18 bud. cutting^{-1}), and survival rate (90%), while the untreated control cuttings had the lowest averages for the indices. Cuttings treated with *aloe vera* gel only showed good values for average root length (5.92 cm) and number (8.45 roots. cutting^{-1}), superior to the hormone only treatment (3.95 cm) and (2.35 roots. cutting^{-1}), though the differences were weak for average number of buds on the cuttings. The treatment with *aloe vera* gel had a significant effect on the survival rate of the cuttings (88.5%), and no significant differences appeared between this treatment and that for the hormone and gel together, while the lowest survival rate was for the untreated cuttings (control) at 22.8%.

In contrast, as seen in Table 5, the number of leaflets in the leaf were not affected by IBA or *aloe vera* treatments, ranging from 2.583 to 4.167 leaf. cutting^{-1} in the control and IBA + *A. vera* treatment. IBA treatment gave the highest number of leaflets in the leaf (5.22 leaf. leaf^{-1}), superior to IBA + *A. vera* (3.48 leaf. leaf^{-1}) and control (3.08 leaf. leaf^{-1}) treatments. Leaf weight as well as leaf length, width, and area were unaffected by any of the treatments, with almost similar and insignificant variations in their values.

Table 5. Effect of IBA and *aloe vera* gel treatment on the number of leaves on the cutting, the number of leaflets, leaf weight, leaf length, leaf width, and leaf area

Treatment	No. of leaves per cutting (leaf. cutting^{-1})	No. of leaflets per leaf (leaf. leaf^{-1})	Leaf weight (g)	Leaf length (cm)	Leaf width (cm)	Leaf area (cm^2)
Control	2.583 ^{a}	3.08 ^{b}	0.112 ^{a}	3.317 ^{a}	2.133 ^{a}	4.725 ^{a}
IBA (1000 ppm for 10 sec.)	3.983 ^{a}	5.00 ^{a}	0.114 ^{a}	3.433 ^{a}	2.3 ^{a}	4.728 ^{a}
***Aloe vera* gel**	3.817 ^{a}	5.22 ^{a}	0.1137 ^{a}	2.767 ^{a}	2.267 ^{a}	4.996 ^{a}
IBA + *A. vera* gel	4.167 ^{a}	3.48 ^{b}	0.1157 ^{a}	3.633 ^{a}	2.233 ^{a}	4.729 ^{a}

*Different letters within the same columns indicate significant differences at the 0.05 level.

Table 6 shows that none of the treatments affected the carotenoid content which ranged from 54.98 to 59.53 µg mL^{-1} for IBA and IBA + *A. vera* gel, respectively. The control treatment produced the highest chlorophyll *a* content (964.1 µg mL^{-1}), while the IBA treatment gave the lowest (874.4 µg mL^{-1}), though the variations among all means were not significant. Similarly, none of the studied treatments affected chlorophyll *b* content which ranged from 539.1 to 668.3 µg mL^{-1} for the IBA and *A. vera* treatments, respectively.

Table 6. Effect of IBA and *aloe vera* gel treatment on carotenoid and chlorophyll content in the leaves of rooted rose cuttings (µg mL^{-1})

Treatment	Carotenoid	Chlorophyll *a*	Chlorophyll *b*
Control	57.49 [a]	964.1 [a]	649.8 [a]
IBA (1000 ppm for 10 sec.)	54.98 [a]	874.4 [a]	539.1 [a]
***Aloe vera* gel**	56.33 [a]	916.9 [a]	668.3 [a]
IBA + *A. vera* gel	59.53 [a]	949.8 [a]	585.2 [a]

*Different letters within the same columns indicate significant differences at the 0.05 level.

Interaction effect between the studied factors

Table 7 shows the results of the interaction treatments between location and the two types of hormones. The Bsheli cuttings treated with 1000 ppm IBA hormone concentration and *aloe vera* gel together outperformed the other treatments at 86% followed by the Helbako cuttings treated in the same way (79%), while the lowest rooting values were for the untreated Bsheli (14.97%) and Helbako (11.73%) cuttings.

Table 7. Effect of some treatments on rooting rate and average number of buds on cuttings and survival rate of Osprey cuttings taken from the two locations in Lattakia governorate, Syria

Location	Treatment	Rooting %	Mean no. of buds (bud. $cutting^{-1}$)	Survival rate %
Bsheli	**Control**	14.97 [g]	1.38 [bc]	20.90 [c]
	IBA (1000 ppm for 10 sec.)	71.77 [c]	1.99 [ab]	30.33 [c]
	***Aloe vera* gel**	35 [f]	1.89 [abc]	90.00 [a]
	IBA + *A. vera* gel	86 [a]	1.77 [abc]	90.00 [a]
Helbako	**Control**	11.73 [g]	1.03 [c]	24.70 [c]
	IBA (1000 ppm for 10 sec.)	52.47 [d]	1.55 [bc]	46.50 [b]
	***Aloe vera* gel**	43.67 [e]	1.67 [bc]	87.00 [a]
	IBA + *A. vera* gel	79 [b]	2.60 a	90.00 [a]

*Different letters within the same columns indicate significant differences at the 0.05 level.

Analysis of variance showed a significant effect of the interaction between location and the studied treatments on the average number of buds in the cuttings (bud. $cutting^{-1}$). Helbako cuttings treated with IBA and *aloe vera* gel recorded the highest average number of buds (2.6 buds. $cutting^{-1}$), without significant differences from the Bsheli cuttings treated with IBA (1.99 buds. $cutting^{-1}$) and *aloe vera* gel (1.89 buds. cutting-1) and those treated with the IBA and gel together (1.77 buds. $cutting^{-1}$). The study treatments affected the survival rate of the cuttings with high rates of up to 90% obtained for those treated with *aloe vera* gel and those receiving it and IBA together in both study locations, outperforming all the remaining treatments. The lowest survival rate was for the untreated cuttings (control) from Bsheli (20.9%) and Helbako (24.7%) without any significant differences compared to those from Bsheli and treated with 1000 ppm IBA concentration (30.33%).

A significant interaction was indicated between both locations and the studied treatments in both the average number of roots (root. $cutting^{-1}$) and root length (cm) (Figure 2). The highest average root length was from the Helbako cuttings treated with *Aloe vera* gel (8.87 cm), followed by those from the same location treated with the hormone and gel together (8.23 cm), and finally those from Bsheli treated with the hormone and gel together (7.97 cm). There were no significant differences between these treatments, while the untreated control cuttings from Bsheli registered the lowest average root length (2.03 cm). The Bsheli cuttings treated with IBA and *aloe vera* gel produced the highest average number of roots formed per cutting (13.73 roots. $cutting^{-1}$), outperforming all other treatments. However, no significant differences were found in the number of roots formed per cutting among the samples treated with hormone and *aloe vera* gel, with the

untreated control cuttings recording the lowest average at 2.03 roots. cutting^{-1}.

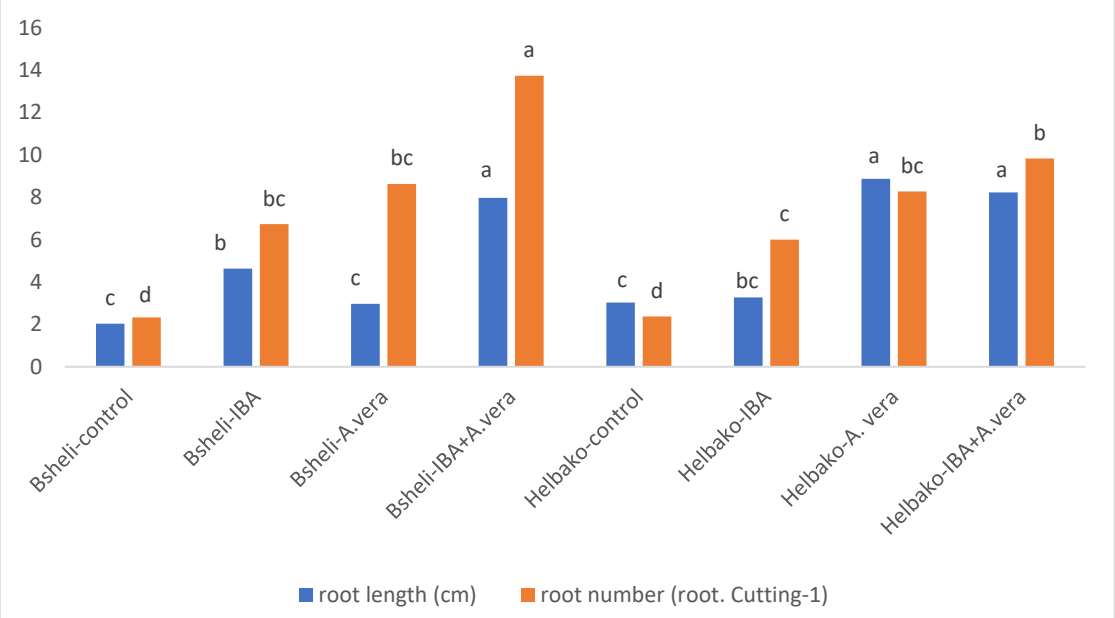

Figure 2. The effect of various treatments on the rooting of Rosehip cuttings

Table 8 shows no significant interaction between location and hormonal treatments in the number of leaves formed on the cutting and their average weight and area, while significant interaction was seen in the number of leaflets per leaf. The cuttings from Bsheli treated with *aloe vera* gel gave the highest average number of leaflets per leaf (6.767 leaflets. leaf^{-1}), while those not treated (control) gave the lowest average number at 3 leaflets. leaf^{-1}. The Bsheli cuttings treated with the hormone and *aloe vera* gel together gave the highest average leaf length (4.167 cm), outperforming those treated with *aloe vera* gel only (2.20 cm), with no significant differences seen among all the other treatments.

Table 8. Effect of treatments on the rooting rate and average number of buds on the cutting and survival rate of hyssop cuttings taken from the two locations in Lattakia governorate, Syria

Location	Treatment	No. of leaves on the cuttings (leaf. cutting^{-1})	No. of leaflets per leaf (leaf. leaf^{-1})	Leaf weight (g)	Leaf length (cm)	Leaf width (cm)	Leaf area (cm^2)
Bsheli	Control	2.73 ^{a}	3.00 ^{b}	0.114 ^{a}	3.70 ^{ab}	2.1 ^{a}	3.44 ^{a}
	IBA (1000 ppm for 10 sec.)	3.63 ^{a}	5.00 ^{ab}	0.114 ^{a}	3.10 ^{ab}	2.33 ^{a}	3.68 ^{a}
	Aloe vera gel	3.00 ^{a}	6.767 ^{a}	0.114 ^{a}	2.20 ^{b}	2.33 ^{a}	5.17 ^{a}
	IBA + *A. vera* gel	5.00 ^{a}	3.667 ^{b}	0.114 ^{a}	4.167 ^{a}	2.13 ^{a}	5.78 ^{a}
Helbako	Control	2.43 ^{a}	3.167 ^{b}	0.110 ^{a}	2.93 ^{ab}	2.167 ^{a}	6.013 ^{a}
	IBA (1000 ppm for 10 sec.)	4.33 ^{a}	5.00 ^{ab}	0.114 ^{a}	3.767 ^{ab}	2.267 ^{a}	5.77 ^{a}
	Aloe vera gel	4.63 ^{a}	3.667 ^{b}	0.114 ^{a}	3.33 ^{ab}	2.2 ^{a}	4.82 ^{a}
	IBA + *A. vera* gel	3.33 ^{a}	3.30 ^{b}	0.117 ^{a}	3.1 ^{ab}	2.33 ^{a}	3.68 ^{a}

*Different letters within the same columns indicate significant differences at the 0.05 level.

No significant interaction was seen between location and hormone treatments. Carotenoid content ranged from 51.13 µg mL−1 of the Bsheli cuttings treated with A. vera gel to 65.91 µg mL−1 with those treated with IBA + A. vera gel .

Cuttings from Bsheli and treated with IBA + A. vera gel gave the highest chlorophyll a content (996.9 µg mL−1), while the lowest content was from cuttings taken from Helbako and treated with IBA (846.1 µg mL−1). No significant variations were found among all treatments, meaning that the interaction between location and hormone was insignificant. Insignificant interactions were also found in chlorophyll b content, ranging from 539.1 µg mL−1 for both Bsheli and Helbako cuttings treated with IBA and 668.3 µg mL−1 for the untreated control Bsheli samples and treatment with IBA, and those treated with A. vera for both locations.

Table 9. Effect of some treatments on carotenoid and chlorophyll content in the leaves of the rooted rose cuttings (µg mL^{-1})

Location	Treatment	Carotenoid	Chlorophyll *a*	Chlorophyll *b*
Bsheli	Control	58.46 [a]	945.6 [a]	668.3 [a]
	IBA (1000 ppm for 10 sec.)	56.51 [a]	902.6 [a]	539.1 [a]
	Aloe vera gel	51.13 [a]	851.2 [a]	668.3 [a]
	IBA + *A. vera* gel	65.91 [a]	996.9 [a]	590.0 [a]
Helbako	Control	56.51 [a]	982.6 [a]	631.3 [a]
	IBA (1000 ppm for 10 sec.)	53.45 [a]	846.1 [a]	539.1 [a]
	Aloe vera gel	61.52 [a]	982.6 [a]	668.3 [a]
	IBA + *A. vera* gel	53.16 [a]	902.6 [a]	580.4 [a]

*Different letters within the same columns indicate significant differences at the 0.05 level.

Discussion

This study investigated the effect of 1000 ppm IBA concentration and *aloe vera* gel treatments on rooting rosehip cuttings taken from two locations. A significant effect of location was found on rooting percentage and average root length. This could be attributed to two factors. One is genetic variations of the genotypes between locations, especially since this species reproduces naturally by seeds, which requires the occurrence of genetic isolation and variation between genotypes, which may affect the cuttings' ability to root. The second factor is the variation in environmental conditions between the two locations, which involves variations in soil and climate and their effect on the ability of the cuttings to root (9). The greatest effect on rooting of the cuttings was due to the IBA hormone, while that on survival rate was due to the *aloe vera* gel alone or in combination with the hormone. Numerous studies have indicated the positive and stimulating effect of synthetic hormones, especially IBA, on rooting cuttings of various plant species due to their role in cell division and growth (٣).

In general, the effect of the IBA hormone was optimum in most of the rooting characteristics of rosehip cuttings. This is consistent with (٥) who found the highest rooting rates, number of roots and their lengths when treating eucalyptus cuttings with IBA at 1000 ppm concentration, while the effect of *aloe vera* gel was average but better than the untreated control. This is also consistent with the results of (18) who noted a positive effect of *aloe vera* gel on the rootings of dragon fruit cuttings. Its effect was comparable to that of IBA concerning the number of roots formed on the cuttings and their lengths. This variation may be attributed to differences in plant species, as (٣) observed no significant impact of *aloe vera* gel on the rooting of *Eriobotrya japonica* cuttings. These findings are also consistent with results obtained from various ornamental plants (16 , 6).

Aloe vera gel contains plant hormones such as auxins gibberellins and root growth stimulants such as salicylic acid (١9), and it also has antibacterial properties that contribute to accelerating the rooting of cuttings (8). Previous studies demonstrated that treating stem cuttings of Rosa damascena with *Aloe vera* gel extract significantly enhanced rooting parameters and survival rates, performing comparably or superior to the synthetic growth regulator IBA. Specifically, Aloe vera

treatment yielded the highest number of roots (up to 5.80), root length (up to 3.20 cm), and survival rates (up to 98.02%) in the cultivars Noorjahan and Ranisahiba, confirming its potential as an effective natural alternative for propagation (21).

These chemical components may have a greater role in increasing survival rather than rooting rates, as their content of plant hormones is less than the concentration of IBA used alone (١٩,٨). No significant effect was observed for any of the studied treatments on the characteristics of leaves formed on the cutting, such as length, width, area, number of leaflets, or its content of carotenoids and both chlorophyll types. This may be attributed to the primary effect of the hormone on root formation and has no significant effect on the aerial mass at this stage or that its effect may be localized at the site of its application, especially since the immersion time in the hormonal solution was short. In contrast, other studies—such as that conducted by (2١)—have reported that treating olive cuttings with *Aloe vera* extract significantly increased the number of leaves formed, a discrepancy that may be attributed to differences in plant species.

Conclusion

Location significantly affected the rooting ability of the cuttings, while treatment with IBA at 1000 ppm concentration had a strong impact on the rooting of rosehip cuttings. In turn, *aloe vera* gel significantly affected the rooting characteristics but to a lesser extent than IBA. There was significant interaction between IBA and *aloe vera* gel on the rooting characteristics of rosehip cuttings. The study recommends using IBA with *aloe vera* gel as stimulants to obtain the best rooting and survival rates for rosehip cuttings.

Author Contributions
Author 1: methodology, writing - original draft preparation; authors ٢ and 3: review and editing; author 4: statistical analysis, writing and editing the manuscript**.** All authors have read and approved the published version of the manuscript.

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Informed Consent Statement
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Data Availability Statement
None.

Conflicts of Interest
The authors declare no conflict of interest.

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مقالة أصيلة

تأثير الموقع والمعاملة بحمض أندول بيوتريك وجيل الألوفيرا في تجذير عقل ورد النسرين Rosa canina

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الخلاصة

تم تنفيذ البحث في موقعي بشيلي وحلبكو التابعين لمحافظة اللاذقية، سورية بهدف تقييم تأثير الموقع والمعاملة بحمض أندول بيوتريك اسيد بتركيز ١٠٠٠ جزء بالمليون وجيل الألوفيرا في تجذير عقل ورد النسرين Rosa canina. اعتمد التصميم كامل العشوائية في هذه التجربة العاملية. بينت النتائج تفوق نسبة التجذير في موقع بشيلي (٥٢٪) على موقع حلبكو (٤٧٪)، في حين تفوق متوسط طول الجذور(سم) في موقع حلبكو (٥.٨٥ سم) على موقع بشيلي (٤.٤٠ سم)، بينما لم يكن هناك تأثير معنوي للموقع في كل من متوسط عدد الجذور، كما لم يؤثر الموقع معنوياً في متوسط عدد البراعم على العقلة، ومعدل البقاء (%).أن أعلى نسبة تجذير (%) كانت عند معاملة العقل المأخوذة من موقع بشيلي بهرمون الأندول بيوتريك بتركيز ١٠٠٠ جزء بالمليون لمدة عشر ثوان وجيل الألوفيرا معاً (٨٦٪) متفوقة على جميع المعاملات المدروسة، تلتها العقل المأخوذة من موقع حلبكو والمعاملة بنفس الطريقة (٧٩٪)، في حين تم الحصول على أقل نسب للتجذير من العقل غير المعاملة بالهرمون أو الجيل والمأخوذة من موقع بشيلي (١٤.٩٧٪) وحلبكو (١١.٧٣٪). كان للتداخل بين الموقع ومعاملات التجربة تأثير معنوي في متوسط نسبة التجذير، عدد الجذور، طول الجذور، وعدد البراعم على العقلة. تقترح النتائج استخدام اندول بيوتريك أسيد بتركيز ١٠٠٠ جزء بالمليون بشكل مشترك مع جيل الألوفيرا للحصول على أفضل نسبة تجذير وأعلى نسبة بقاء لعقل ورد النسرين.

كلمات مفتاحية: ورد النسرين، عدد البراعم على العقلة، محتوى الأوراق من الكاروتينات، نسبة التجذير، طول الجذور.

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