Effect of Cutting Timing and Various NAA Hormone Concentrations on Rooting Success of Local Zarak Grape Cuttings (*Vitis vinifera* L.)

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Abstract
The study investigates the impact of cutting timing and varying concentrations of Naphthaleneacetic acid (NAA) on the rooting success of Zarak grape cuttings (*Vitis vinifera L.*) Conducted in greenhouses at the Agricultural Technical College of the Northern Technical University in Mosul, the experiment utilized woody cuttings from the Zarak variety, a popular local cultivar. The cuttings were prepared and treated with NAA at concentrations of 100 and 200 ppm, alongside a control group with distilled water. The cuttings were planted on two different dates: February 25 and March 25, 2024, with careful monitoring of rooting responses. Statistical analysis was performed using a complete randomized design (CRD) and ANOVA to assess the effects of NAA concentration and planting date on rooting characteristics. Results indicated that higher NAA concentrations significantly improved rooting success compared to the control. Specifically, at the first planting date, NAA concentrations of 100 ppm and 200 ppm yielded the highest root lengths (8.25 cm and 8.00 cm, respectively), while the control group recorded only 5.50 cm. The second planting date also showed improved results with 200 ppm NAA achieving the highest root length of 8.50 cm. On the other side of the study, the characteristic of the number of radicals, it is also noted that the hormone interference treatment NAA 200 pmm is superior to the control treatment at the first date and zero NAA, so the values reached 73.25 and 25 respectively at the first date of transplantation. While the first appointment recorded a significant superiority over the second appointment 53.41 and 45.08, as well as the superiority of the hormone coefficient 200 NAA for the first appointment over the witness The findings suggest that NAA enhances root development by promoting cell elongation and nutrient absorption, which is crucial for successful rooting The increased number of roots may be due to the effect of auxin, which enhances cell division and elongation, root differentiation, and its role in mobilizing reserve nutrients to the root initiation sites, thus producing a greater number of roots per cutting (Chakraborty & Rajkumar, 2018).

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1. Introduction

Grapes (*Vitis vinifera* L.), which belong to the family *Vitaceae*, have been one of the most popular summer fruits since ancient times. Grapes account for more than a quarter of the world's fruit production. The genus *Vitis* includes approximately 14 genera, with over 70 species of grapes and around 14,000 cultivated varieties worldwide (Alleweldt *et al*., 1990) [6]. In Iraq, approximately 70 grape varieties are cultivated, most of which are concentrated in the northern part of the country (Abdul-Qader, 2006) [1]. Grapes were domesticated between 6,000–8,000 years ago in the region between the Black and Caspian Seas. They subsequently spread east into Asia and west into the Mediterranean region. The regions located between latitudes 34-45° N and

31-38° S are considered the most suitable areas for grape cultivation (Hidalgo, 1980) [13]. According to statistics from the Food and Agriculture Organization (FAO, 2022) [18], the global area cultivated with grapes is approximately 6,730,179 hectares, with a global production of around 74,942,572 tons. In Iraq, the cultivated area reached 22,322 hectares, with a production quantity of 384,984.15 tons. Grapes contain a variety of phytochemicals, including phenolic compounds, aromatic acids, flavonoids, proanthocyanidins, stilbenoids, and tartaric acid, which are among the key chemical constituents (Parihar and Sharma, 2021) [16]. Approximately 84% of grape production is used for winemaking, 14% as raisins, while the remaining portion is utilized for natural juice production and as table grapes. Various cultivars belonging to the genus *Vitis vinifera* L., known as European grapes, are widely cultivated in Iraq. These include varieties such as Rashmiri, Azha Rashmiri, Seedless-Baidank, Thompson Seedless, Tre-Rash, Rash-Miu, Rashmiu (elongated), Taifi, Kamali, Sorsen, Kazoo, Sargola, Zareek, Surao, Helwani, Dees-Al-Anz, Awelka, and Sibi Hijazi (Al-Amili, 2008) [3].

The experiment aims to determine the best times to plant grape cuttings and assess the effectiveness of the hormone NAA in improving the rooting process. By optimizing grape planting techniques and increasing the success rate of rooting cuttings, the experiment will enhance grape production and improve agricultural efficiency.

Materials and Methods

The experiment was carried out during the 2024 growing season inside greenhouses in the fields of the Agricultural Technical College of the Northern Technical University in Mosul, Iraq. The experiment used woody cuttings taken from vineyards of the Zarak variety, one of the most popular local varieties in the northern region of Qatar, grown at the Nineveh Orchards Station, a facility of the Nineveh Agriculture Directorate, Iraq.

The cuttings are equipped with pruning scissors, cut diagonally from the top and horizontal from the bottom, 15-25 cm long and with a thickness similar to a pencil, so that each cutting have 2-3 eyes. The experiment was carried out according to the design of complete randomized experiments (CRD), where it included 3 repeaters for each treatment, and each repeater contained 15 brains.

Naphthaleneacetic acid (NAA) was used at concentrations of 100 and 200 ppm, compared to a control treatment (distilled water). After immersing the cuttings in NAA solution for 5 seconds, they were planted inside the experimental planting shrine using structural sand. The other half of the cuttings were buried in a nearby shrine to be used on the second date for planting on March 25, 2024.

The local grape variety (Zarak) is the most widespread in the governorate of Duhok and is usually grown in a demiable manner. It is considered a good and late grape variety (ripening at the end of September). It is suitable for fresh consumption or for the manufacture of juice and wine, as well as it can be dried for the manufacture of raisins. Conical cluster with small shoulders and chunky spherical beads. There are some small grains in the cluster, the color of the grains is yellowish-white, covered with a medium waxy layer. The pulp is fleshy and juicy, and the shell is rather thick, with a little tanning astringent, reduced when fully ripe, the number of seeds in the grain is 2-3, medium-sized seeds. This variety is characterized by high productivity and responds to short Dabri pruning and its fruits have good marketability, and the percentage of dissolved solids (sugar) in the fruit can reach more than 18% It is characterized by the viability of grapes on trees until November and perhaps more without damage (Al-Amili, 2008) [3].

The first date on February 25, 2024 was equipped in the middle of agriculture (construction sand) by breaking up all the large and softening it and making a settlement to be a good medium. The transactions were distributed randomly and by (45 minds) The first date was coded with A1 and used three levels of the hormone NAA (100, 200 ppm) The shrine was covered with the plastic cover (nylon) and the spray irrigation was used during the transplant period, as well as the conduct of agricultural operations.

The second date on March 25, 2024, the agricultural center (building sand) with a settlement and smoothness inside the agricultural shrine in the plastic house, and the previously stored pens extracted, clean with water, removing the dirt blocks from them, where the experiment was coded, thus A2, the date of planting, used three levels of the hormone NAA (100, 200 ppm). During the transplant period, as well as the conduct of agricultural operations.

After 40 days of planting, the cuttings were withdrawn from the planting medium after responding to rooting through the appearance of vegetative buds and securitization under the direction of a spout.

Statistical analysis

The experiment was carried out using a complete random design (CRD). The ANOVA variance analysis table was obtained using SAS on a computer and Microsoft Office Excel programs. The coefficients were compared using the Dunkin' test to obtain significant differences in the results with a probability level of 0.05.

Results and Discussion

The data in Table (1) show that higher concentrations of NAA (100 ppm and 200 ppm) achieve higher values than the treatment without hormone (0). The values were (7.87 and 8.25, respectively). At the first date of cultivation, NAA coefficients of 100 ppm and NAA 200 ppm recorded the highest values (8.25 and 8.00 respectively), while the control treatment was lower (5.50). At the second date of cultivation, the 200 ppm NAA transaction recorded the highest value (8.50), followed by the NAA treatment of 100 ppm (7.50), while the witness transaction recorded the lowest value (4.50).

Table 1: Shows the effect of the date of agriculture and the different levels of the hormone NAA on the characteristics of the length of the roots (cm) of the grape mind category (zarak)

	Hormone Concentration ppm			Date of Agriculture
	NAA 0	NAA 100	NAA 200	
First Date	5.50 ab	8.25 a	8.00 a	7.25 a
Second Date	4.50 ab	7.50 ab	8.50 a	6.83 a
	5.00 b	7.87 a	8.25 a	

The overall average indicates that transactions containing NAA outperform the control, with a 200 ppm NAA propensity to achieve the best results. The NAA coefficients of 100 ppm and 200 ppm NAA were significantly superior to the control treatment in most cases, with a 200 ppm NAA tendency to score the highest values. When comparing dates, we find that the overall effect of the hormone was positive

regardless of the date of cultivation, but with some slight differences between the values recorded on each date. The two agricultural histories' differences might be a reflection of how environmental factors, like humidity or temperature, affect the effectiveness or reactivity of hormone absorption. This could be because auxin actively promotes the accumulation of rooting components in cuttings and is beneficial in promoting root development and cell elongation (Alimam and Agha, 2021; Brighenti *et al*., 2023) [5, 7]. Additionally, it speeds up the process of drawing in and collecting nutrients as well as other elements that promote roots and leaf growth (Garcia *et al*., 1994; Al-Imam and Hamid, 2019) [11, 4]. Auxin generated from IBA is also important for the root and shoots, according to Uddin *et al*. (2020) [19].

The data in Table (2) indicate a significant effect of NAA concentration on the values measured at different cultivation histories. In general, an increase in the concentration of NAA leads to higher recorded values compared to the control (0 NAA). where the values were 64.5 and 28, respectively. At the first date of cultivation, the 200 ppm NAA transaction recorded the highest value (73.75). It was significantly superior to the rest of the transactions, followed by the NAA treatment of 100 ppm (61.50), while the witness transaction recorded the lowest value (25.00). At the second date of cultivation, the 200 ppm NAA transaction continued to record the highest values (55.25), followed by the NAA treatment of 100 ppm (49.00). In contrast, the control transaction recorded the lowest value (31.00).

Table 2: Shows the effect of the date of agriculture and the different levels of the hormone NAA on the characteristics of the number of the roots of the grape mind category (zarak).

	Hormone Concentration ppm			Date of Agriculture
	NAA 0	NAA 100	NAA 200	
First Date	25.00 c	61.50 ab	73.75 a	53.41 a
Second Date	31.00 c	49.00 b	55.25 b	45.08 b
	28.00 c	55.25 b	64.50 a	

Overall, the values on the first date were higher than the values recorded on the second date, and the values reached (53.41) and (45.08), respectively, suggesting that the positive effect of NAA was more pronounced on the first date. The NAA treatment was 200 ppm better on both dates with the highest values, demonstrating that increased NAA concentration contributed to improved thoughtful response. It was followed by the NAA treatment of 100 ppm, which also showed significant superiority compared to the control, but did not reach the level of 200 ppm NAA. The 0 NAA treatment recorded the lowest values in all cases, underscoring the important role of the hormone in promoting outcomes. Treatment with powder may have the effect of increasing the formation, differentiation, development and elongation of root primordia principles in stem cuttings, and also increases the formation of lateral roots by increasing the polarization of carbohydrates and rooting aids to the base of the cutting, where they interact with auxins and lead to better root formation and appearance. Cuttings may contain sufficient amounts of rooting compounds but lack an adequate level of auxins, so when auxins are added to cuttings, rooting improves (Ofori *et al*., 1996) [15]. The previous results can be explained by the content of natural auxins and inhibitors in the mind. When the auxin content is low, it is accompanied by an increase in the content of inhibitors. Therefore, the addition of synthetic auxins leads to an increase in the rooting rate (De Andres *et al*., 1999) [9] compared to untreated cuttings, due to their effect in increasing vascular cambium activity and thus increasing the high level of RNA in the cuttings, which increases cell division at the peak of the rooting process. This has been confirmed (Haikal, 1992) [12]. The increased number of roots may be due to the effect of auxin, It increases the number of roots per cutting by promoting cell proliferation and elongation, root differentiation, and its function in delivering reserve nutrients to the root initiation sites (Chakraborty and Rajkumar, 2018) [8]. Consequently, it supplies the carbon skeleton for the synthesis of organic chemicals used in root growth as well as carbohydrates that provide energy (Deepika *et al*., 2015) [10]. The findings supported the findings of Stancato *et al*. (2003) [17] and Kaur *et al*. (2022) [14], who ascribed the increase in leaves to robust roots, which allows the cuttings to take in more nutrients and thus generate more leaves.

Conclusion

1. The results showed that the first planting date (February 25, 2024) exceeded the number and length of roots compared to the second planting date (March 25, 2024), where the values reached 7.25, 6.83, 53.41 and 45.08 respectively.
2. The experience of using NAA hormone at a concentration of 200 ppm proved its effectiveness in increasing the number and length of roots compared to the control treatment (without hormone). The values were 8.25, 5.00, 64.50 and 28.00, respectively.

References

1. Abdul-Qader SM. Effect of training systems, canopy management and dates on the yield and quality of grape vines cv. Taifi *Vitis vinifera* L. under non-irrigated conditions. Dohuk: University of Dohuk; 2006.
2. Ahmad WW, Faris FA, Mustafa NM. Response of pomegranate transplants cvs. Halabja to biofertilization and spraying nano-iron on vegetative growth. Future Sci Assoc. 2022. Available from: http://www.futurejournals.org/.
3. Al-Amili ZA. More species in Iraqi Kurdistan. Iraqi Kurdistan: Ministry of Agriculture; 2008.
4. Al-Imam NM, Hamid QQ. Effect of the date and concentrations of the IBA on rooting and growth of semi hard wood cuttings of two olive (Olea europaea L.) varieties. Basrah J Agric Sci. 2019;32:59-69.
5. Alimam NA, Agha NSA. Rooting behavior of six grape cultivars (*Vitis vinifera* L.) using indole butyric acid. Zanco J Pure Appl Sci. 2021;33(1):135-142.
6. Alleweldt GP, Spijei-Roy A, Reich B. Grapes genetic resources of temperate fruit and nut crop. Acta Hortic. 1990;290:289-328.
7. Brighenti AF, de Freitas FR, Malohlava ITC, Votre TCG, Voltolini JA, da Silva AL, *et al*. Biostimulants and indolebutyric acid improve rooting of wood cuttings from different grapevine rootstocks. Cienc Tec Vitiviníc. 2023;38(1):1-9.
8. Chakraborty S, Rajkumar M. Effect of growth regulators and organic substances on rooting of grapes (*Vitis vinifera* L.) cv. Muscat. Asian J Sci Technol. 2018;9(7):8418-8421.
9. De Andres EF, Alegre J, Tenorio JL, Manzanares M,

Sanchez FJ, Ayerbe L. Vegetative propagation of Colutea arborescens L, a multipurpose leguminous shrub of semiarid climates. Agrofor Syst. 1999;46:113-121.
10. Deepika, Vanajalatha K, Sharma G, Singh D, Mishra G. Effect of sucrose and auxins on rooting of karonda cuttings, Carissa carandas L. Int J Farm Sci. 2015;5(4):139-144.
11. Garcia MLG, Romero CS, Munoz AB, Heredia A, Pliego-Alfaro F. Levels of endogenous indole-3-acetic acid and indole-3-butyric acid during adventitious rooting in avocado micro cuttings. J Exp Bot. 1994;45(6):865-870.
12. Haikal ME. Effect of some growth regulators on adventitious root formation in terminal stem cuttings of Ficus retusa L. Alex J Agric Res. 1992;37:301-316.
13. Hidalgo L. Viticulture dans les pays semi-arides. Bull OIV. 1980;598:845-971.
14. Kaur G, Singh S, Singh M. Growth regulators and sucrose application to improve the success rate of grape cuttings. Environ Sci Arch. 2022;1:59-63.
15. Ofori DA, Newton AC, Leakey RRB, Grace J. Vegetative propagation of Milicia excelsa by leafy stem cuttings: effects of auxin concentration, leaf area and rooting medium. For Ecol Manag. 1996;84:39-48.
16. Parihar, Sharma D. A brief overview on *Vitis vinifera*. Sch Acad J Pharm. 2021;10(12):231-239. doi:10.36347/sajp.2021.v10i12.005.
17. Stancato GC, Aguiar FFA, Kanashiro S, Tavares AR. Rhipsalis grandiflora Haw propagation by stem cuttings. Sci Agric. 2003;60:185-190.
18. Food and Agriculture Organization (FAO). The Food and Agriculture Organization. Rome: FAO; 2022. Available from: https://www.fao.org.
19. Uddin AJ, Rakibuzzaman M, Raisa I, Maliha M, Husna MA. Impact of natural substances and synthetic hormone on grapevine cutting. J Biosci Agric Res. 2020;25(01):2069-2074.

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