

## THE INFLUENCE OF STEM CUTTING LENGTH AND IBA TREATMENTS ON PROPAGATION OF NATIVE SAUDI ARABIAN GRAPEVINE

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### ABSTRACT

The Saudi Arabian Ministry of Agriculture experimental station at Al-Maddina Al-Monwarah region, identified very few plantations of the most productive *Vitis vinifera* var. *maddini* with the highest fruit quality. This research was designed to optimize rooting efficiency in relation to cutting length and auxin treatment. Cutting length (long vs short) showed strong impact on rooting ability. Results showed that longer cuttings produce more and longer roots than shorter ones. IBA treatments up to the 500 ppm level showed significant increase in root number, but do not have significant impact on root length. Rooted cuttings were planted in an open field for further evaluations. These findings may facilitate the clonal propagation of this valuable vines at Al-Maddina Al-Monwarah region, grapevine growers and Horticulturists in Saudi Arabia .

**Key words:** Propagation, Grapevine, Cuttings, Growth regulators

### INTRODUCTION

Table grapevine (*Vitis vinifera* L.) is the second largest fruit production in Saudi Arabia after date palm. "Maddini" grapevine variety has been known for hundreds of years as one of the most commercially important fruit in Saudi Arabia. In the last few years, the Saudi Ministry of Agriculture experimental station at Al-Maddina Al-Monwarah region identified very few plantations of the most productive "Maddini" grapevine with the highest fruit quality (unpublished data). Almost no attempt or references

were found in regard to mass propagation of this commercially important vines. Massive of literatures are found in grapevine vegetative propagation (Ezzili & Bejaoui, 2001; Thomas & Schiefelbein, 2001; Patil *et al* 2000; Cristoferi *et al* 1988; Harmail *et al* 1986 and Tewari, 1986). Auxins such as IAA, IBA & NAA have been traditionally applied to improve rooting of grapevine stem cuttings (Geny *et al* 1998; Zhang *et al* 1997; Preece, 1987; Tewari, 1986 and Shatat, 1986). Branch order, length and diameter can have strong effect on grapevine rooting (Jiang *et al* 2000; Castro *et al* 1994;

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(Received August 1, 2004)

(Accepted September 8, 2004)

**Cristoferi et al 1988; Harmail et al 1986; Ehrlinger & Howell, 1981 and Iacob & Popescu, 1977).** Effects of media or soil mixture were heavily researched to improving grapevine rooting (**Song et al 2001 and Kawecki & Kozłowski, 1995).** The objective of this research was to: study the impact of two cutting length (short vs. long) in combination with different concentrations of (IBA) on adventitious root formation of "Maddini" grapevine.

### MATERIAL AND METHODS

Healthy looking "Maddini" grapevine plants were selected as a source of cuttings. Cuttings were prepared three days before the actual treatments and transported to King Abdulaziz University experimental station at Hada Al-Sham. The present work was conducted on late winter of 2003/2004 at King Abdulaziz University experimental station greenhouses where controlled temperature, lighting and humidity to insure maximum root initiation and development. The study was set up in a (2x4) factorial experiment arranged in randomized complete block design (RCBD) with three replicates. Treatments consisted of control and three concentrations of (IBA) (300, 500 and 1000 ppm) applied to longer (4-5 nodes) or shorter (1-2 nodes) hardwood stem cuttings. Thirty cuttings were assigned to each replicate. Quick dip method (for 1 min.) was used to perform the auxin treatment followed by planting the treated cuttings in rooting media (1 sand: 1 perlite: 2 peat moss). For each cutting, number of roots and root length were recorded. Rooted cuttings were then planted in an open orchard at King Abdulaziz University experimental station for further

evaluation. Analysis of variance technique (ANOVA) was used to determine the significance of mean effects and their interactions. Mean separation was used by the least significant differences (L.S.D) methods (**Steel and Torrie, 1980).**

### RESULTS AND DISCUSSION

Over all results showed significant differences in root number and length for the two examined cutting lengths. However, IBA treatments showed significant differences only in root number (Table, 1). This agrees with (**Blavesly & Chaldecott, 1993**) that absolute level of auxin is important for stimulation of the primary events of root initiation. Cuttings length has been previously reported to have strong impact on grapevine rooting potential and survival (**Jiang et al 2000 and Harmail et al 1986).** Longer cuttings (4-5 nodes) had longer roots (14.25 cm) and more root number (21.80 roots) than shorter (1-2 nodes) cuttings (9.75 cm & 10.96 roots) Table 2. **Van Elk (1969)** indicated that longer stem cutting was the most common cutting length in Holland for woody plant propagation. In a study by **Hinesley and Blazich (1984),** hardwood stem cutting from hardwood rooted better when cutting length was 24 cm as opposed to 12 cm. Their work showed that long cuttings produced more and longer roots. In grapevine, the greatest number of roots and longest ones were produced from longer cuttings compared to shorter ones (**Harmail et al 1986).** However, **Iacob & Popescu, (1977)** found that the effect of cutting length varied widely among grapevine varieties. This could be the result of internal factors such as availability of carbohydrates,

Table 1. Means of root number and root length (cm) of *Vitis vinifera* var. *Maddini* stem cuttings as influenced by different cutting length and IBA concentrations

| Treatments     | Root number | Root length |
|----------------|-------------|-------------|
| Cutting length |             |             |
| Long cutting   | 21.80 a     | 14.25 a     |
| Short cutting  | 10.96 b     | 9.75 b      |
| IBA Levels     |             |             |
| Control        | 10.52 c     | 10.67 a     |
| 300 ppm        | 15.93 b     | 12.97 a     |
| 500 ppm        | 22.80 a     | 13.72 a     |
| 1000 ppm       | 16.28 b     | 10.67 a     |

- Means followed by the same within columns letter are not significantly different at 5% level

nitrogen, auxin and rooting co-factors (Salisbury & Ross, 1987).

Increasing IBA concentration up to 500 ppm led to the highest root number (22.80 roots). The 1000 ppm IBA treatment showed fewer root number (16.28 roots) and was statistically similar to the 300 ppm treatment (15.93 roots) (Table 1 & Fig. 1). Although the increases in root length which were detected, IBA has been reported to induce higher root number when applied to grapevine cuttings (Patil *et al* 2000; Cristoferi *et al* 1988; Tewari, 1986 and Shatat, 1986). Ehrlinger & Howell (1981) reported different rooting responses with IBA levels when propagating different grape cultivars. In another study the effect of IBA treatment on rooting of grape stem cuttings was influenced by the different collection date of grape cuttings (Goode & Lane, 1983).

## CONCLUSION

Cutting length (long vs short) showed strong impact on the rooting ability of *Vitis vinifera* var. *maddini*. Treating grapevine plant cutting base with IBA showed significant increase in root number, but does not have an impact on root length. These findings will help to establish an effective mass production technique to vegetatively propagation of this valuable commercially important vine at Al-Maddina Al-Monwarah Saudi Arabia.

## ACKNOWLEDGMENT

Special thanks are extended to Mr. Hameed Al-Ayobee, the general manager of the Saudi Arabian Ministry of Agriculture experimental Station at Al-Maddina Al-Monwarah region for providing the *Vitis vinifera* var. *maddini* cuttings and the historical and statistical information.

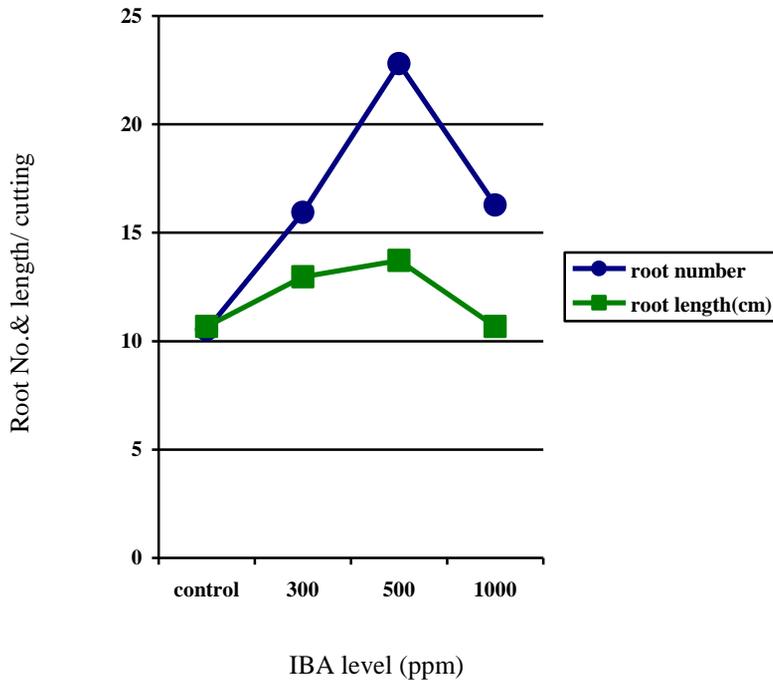


Fig. 1. Means of root number and length (cm) of *Vitis vinifera* var. *maddini* stem cuttings as influenced by the different IBA levels.

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مجلة اتحاد الجامعات العربية للدراسات والبحوث الزراعية ، جامعة عين شمس ، القاهرة ، 13(2) ، 453 - 458 ، 2005

## تأثير طول العقللة والمعاملة بانندول حمض البيوتريك (IBA) علي تكاثر أحد أصناف العنب المحلي في المملكة العربية السعودية

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(1-2 عقده) . المعاملة بانندول بحمض البيوتريك IBA أدت الى زيادة في عدد الجذور المتكونة حتى تركيز 500 جزء في المليون ، ولكن لم تظهر نتائج معنوية بالنسبة لأطوال الجذور المتكونة. العقل المجذرة تم زراعتها في الأرض المستديمة لمتابعة نموها. نتائج هذه الدراسة قد تساهم في رفع كفاءة التكاثر الخضري لهذه الفاكهة المحلية للإستفادة البحثية المستقبلية بالمدينة المنورة ومزارعين العنب والبستانيون في المملكة العربية السعودية والمناطق الصحراوية من العالم.

وجد من خلال الدراسة التي قام بها مركز الأبحاث الزراعية التابع لوزارة الزراعة في منطقة المدينة المنورة عدد قليل من بساتين العنب ذات الإنتاجية العالية والصفات الثمرية المميزة لنبات *Vitis vinifera var. maddini* . يهدف هذا البحث لتحسين طريقة التكاثر الخضري بواسطة تجذير العقل الساقية وذلك من خلال التركيز على طول العقللة والمعاملة بالأوكسين. أوضحت النتائج إن طول العقللة تأثير على التجذير، والعقل الطويلة (4-5 عقده) تميزت بعدد أكبر من الجذور وأطوال أكبر مقارنة بالعقل القصيرة

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