

Full Length Research Paper

Evaluation the effect of rooting media and hormonal concentrations (IBA) in three olive cultivars growing in SiwaOasis-Egypt

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This study was carried out to determine the effects of three rooting media (perlite, mixturepeat-moss+perlite and Sand+peat-moss) and Indole Butyric Acid (IBA) treatment (2000, 4000 or 5000 ppm) on rooting ability of three olive cultivars from Siwa Oasis, Egypt (Hamed, Wateken and Maraki). Parameters were measured, the percentage of cuttings that rooted, the number of roots produced by cutting and the survival rate. These parameters were significantly influenced by the interactive effect of rooting media, cultivar and IBA treatment. The cuttings planted in perlite had higher rooting percentage than those planted in perlite&pet-moss and sand&pet-moss with a significant difference between cultivars. Very low rooting occurred in cuttings dipped in low concentration for all cultivar and rooting media. The greatest percentage of rooting (100 %), were in 4000 and 5000 ppm IBA in perlite medium with Wateken and Hamed variety, respectively, the highest percentage of rooted cuttings was observed in perlite (100%), perlite&pet-moss 1:1 (80%) and sand&pet-moss 1:1(70%) with cultivar Hamed and Wateken respectively, while Maraki cv. Recorded worst performance in all substrates tested. The results showed that cultivar had a significant effect on all measured parameters.

Key words: *Olea europaea*, Maraki, Hamed, Wateken, propagation, Rooting media, Auxins.

INTRODUCTION

Olive it is found in pharos tombs and temples as pictures and fruits, the goddess Isis educated the Egyptians about the cultivation of olives and how to produce oil through the pressing of its fruit. Olive cultivation originated in antiquity on the eastern shores of the Mediterranean basin. Olive a planet from *oleaceae* family and *olea* type. Olive (*Olea europaea* L.) can be propagated in several ways, although mist propagation of leafy cuttings is currently the method most widely employed (Hartmann *et al.*, 2002; Fabbri *et al.*, 2004). Unfortunately, economically important cultivars that show intermediate or even poor rooting capacities are to be found in most olive producing countries (Fabbri *et al.*, 2004; Hegab, Y. 2010). The auxin indole-3-acetic acid (IAA) was the first plant hormone to be used in rooting (Cooper 1935). Clonal variation, the type of cutting material, the concentration of hormone (indole butyric acid) applied, and the physical properties of the rooting medium can all influence rooting, especially in more difficult-to-root cultivars (Loreti and Hartmann, 1964; Fernandes Serrano *et al.*, 2006; Mehri H *et al.*, 2013). Rooting media should

be considered an integral part of the propagation system percentage rooting and the quality of the roots produced are directly influenced by the medium (Mehri, H. *et al.*, 2013). The appropriateness of the medium depends on the species, the cutting type, the season, the propagation system used, and the cost and availability of the medium components (Macdonald, 1986; Hartmann *et al.*, 2002). Perlite is by far the most used rooting substrate in olive producing countries. Mixtures such as perlite plus peat, coconut fiber or vermiculite have also given good results (Fabbri *et al.*, 2004). The present study was carried out to investigate the rooting ability of three local olive cultivar (Maraki, Hamed and Wateken) in response to rooting media and IBA concentration.

MATERIALS AND METHOD

Leafy, semi-hardwood olive cuttings were collected on 15 November 2013 during 90 days from three variety at the (Hamed Wateken and Maraki) selected stock plants growing

Olive Growing in Siwa Oasis, Egypt. All were taken from vigorous 1 year-old shoots about 6-7 mm in diameter and 20 cm in length. Sub-terminal cuttings with 3-4 pairs of leaves were used. These were soaked in a fungicide solution. The work was conducted into the greenhouse of the Sustainable Development Center for Matrouh. The experiment was designed by split plot with three replicates for each treatment and 30 cuttings in each replicate.

The cuttings were treated by different concentrations of Indole-3-butyric acid (IBA). This solutions were freshly prepared dissolving IBA powder (Sigma, St Louis, MO, USA) in an alcohol/water for the following concentrations: 2000, 4000 or 5000 ppm. The cuttings were treated with different concentration of IBA for 3-5 seconds and thereafter inserted in three different propagation media: perlite, peat-moss+perlite and mixture Sand+peat-mossin Volume (1:1 v/v).

All cuttings were then placed in 10 x 20 x 11 cm root flats filled. The rooting flats were placed in a low polyethylene tunnel equipped with mist nozzles. Shading cloth was suspended over the tunnel and natural sunlight reduced to approximately 80%. Changes in daily ambient temperature and relative humidity were recorded. The design of the experiments was a split-plot design. The essential attributes as rooting indexes in this survey the percentage of cuttings that rooted, the number of roots produced by cutting and the survival rate. Statistical analysis: this experiment consist of three replications and each replication consisted of 10 cutting. At sampling date, analysis of variance was performed to study the effect of the substrate, cultivar, IBA concentration and their interaction.

Significant difference were determined with LSD range test at $p < 0.05$.

RESULTS

Olive cuttings taken from different Egyptian cultivars (Hamed- Wateken- Maraki) to assess the influence of media and different concentration of Indol-Butyric Acid (IBA) on root ability of olive cutting for this variety. Changes in rooting ratio of different rooting substrate and dose of IBA for this variety are show in (Table 1). The analysis of variance indicated that the percentage of cuttings that rooted, the mean number of roots produced per cutting and survival of rooted cuttings were significantly affected by rooting media, variety and IBA concentration and their interaction.

According to experimental result it is evident from the data recorded for the 3 rooting media, that perlite substrate gave best results with regard to percentage rooting developed highest root number per cutting. The minimum rooting rate, and rooting number were recorded in cuttings dipped in 2000 ppm IBA concentration, the percentage of rooted cuttings varied between 83% and

10% depending on the variety and on the kind rooting of substrates tested.

The greatest percentage of rooting (100 %), were in 4000 and 5000 ppm IBA in perlite medium with Wateken and Hamed variety, respectively, the highest percentage of rooted cuttings was observed in perlite (100%), perlite&pet-moss(1:1 v/v) (80%) and sand&pet-moss(1:1 v/v) (70%)with cultivar Hamed and Wateken respectively (Table 1).

Generally observed significant difference from the use of different concentrations of IBA with Wateken and did not show any effect on the Maraki and Hamed with the sand&pet-moss rooting media, on the contrary, in the media of rooting perlite&pet-moss there was a significant effect of different concentrations of IBA on the percentage and number of roots, where the concentration was low with 2000, but increased avrage number of root cutting for the Hamed and Maraki in the tow concentration IBA. The highest root number in cutting (8.7) was in 5000 ppm IBA in perlite medium and the least in 2000ppm IBA treatment (0.1) in perlite& peat moss medium.

The effect of the concentration of IBA on rooting percentage and number of roots, was significantly increased by using only 2000 ppm for Wateken (1.7) and 4000 and 5000ppm for (3.7 and 7.3, respectively) number of root cuttings (Table 1).

It is clear from (Figure 1) that rooting number of all olive cultivars respondes diferently to IBA concentration. The interaction between olive cvs and media and IBA treatments had significant effects on roots and survival %.

The promotive effects of IBA and media on rooting were clearly shown in those hard to root cuttings of olive cv. Hamed, Wateken and Maraki. The results of analysis of variance, there was significant interaction between media rooting, cultivar and IBA concentration for characters root number (Figure 1).

The greatest rooting percent (100%) was in treated cutting by 4000 and 5000 mg/L IBA in perlite medium with the Wateken.

The interaction cutting IBA x medium x variety had a significant effect on the rooting variables studied ($P < 0.01$).

Different medium, hormone concentrations and the interaction effects of medium and hormone had significant effects on root numbers of Egyptian olive cuttings.

Percentage survival of the cuttings showed substantial variations among different media and hormone concentrations Figure 2. The highest survival percentage with a mean value of 30 cutting was obtained among perlite media with 4000 and 5000 ppm hormone concentration; while rooting perlite media gave the highest percentage of rooting with all concentrations and also all varieties compared toother rooting media in this study.

Table 1. Effect of treatments on the percentage of rooted cuttings, number of roots per cutting in olive cuttings cv. (Hamed-Wateken-Maraki).

Hormone dose		Rooting (%)			Average number of roots/cutting		
Substrate	Cultivar	2000 ppm	4000 ppm	5000 ppm	2000 ppm	4000 ppm	5000p pm
Perlite	Hamed	67	80	80	0.96f	4.9bc	3.8cd
	Wateken	83	100	100	2.4de	5.4b	8.7a
	Maraki	20	67	60	0.4ef	3.7cd	2.7d
Perlite & pet-moss	Hamed	13	80	80	0.1c	4.2a	3.0ab
	Wateken	33	36	36	1.3bc	2.4ab	2.7ab
	Maraki	10	16	43	0.3c	1.2bc	4.1a
Sand & pet-moss	Hamed	16	43	23	0.2c	1.8c	0.9c
	Wateken	47	40	70	1.7c	3.7b	7.3a
	Maraki	13	13	16	0.6c	0.9c	0.7c

Means within columns followed by different letters were significantly different at P # 0.05 using Duncan's test.

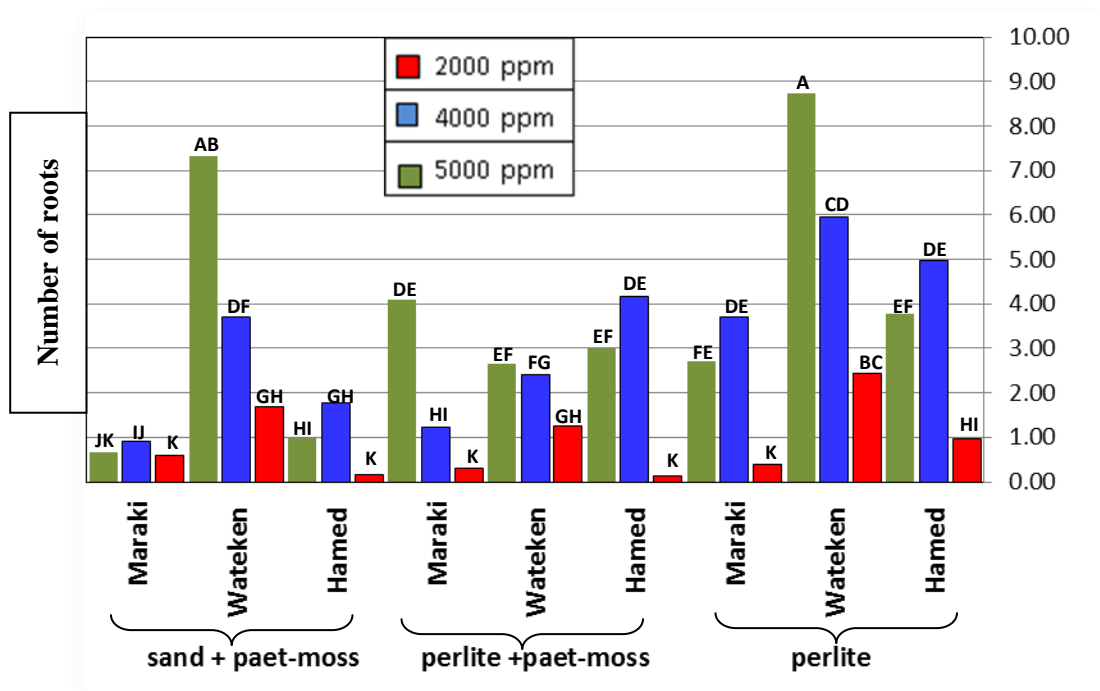


Figure 1. The interaction effects of different IBA concentration and different medium on the number of roots in stem cuttings of olive variety. Columns followed by the same letter are significantly different at p ≤ 5% level (ANOVA test).

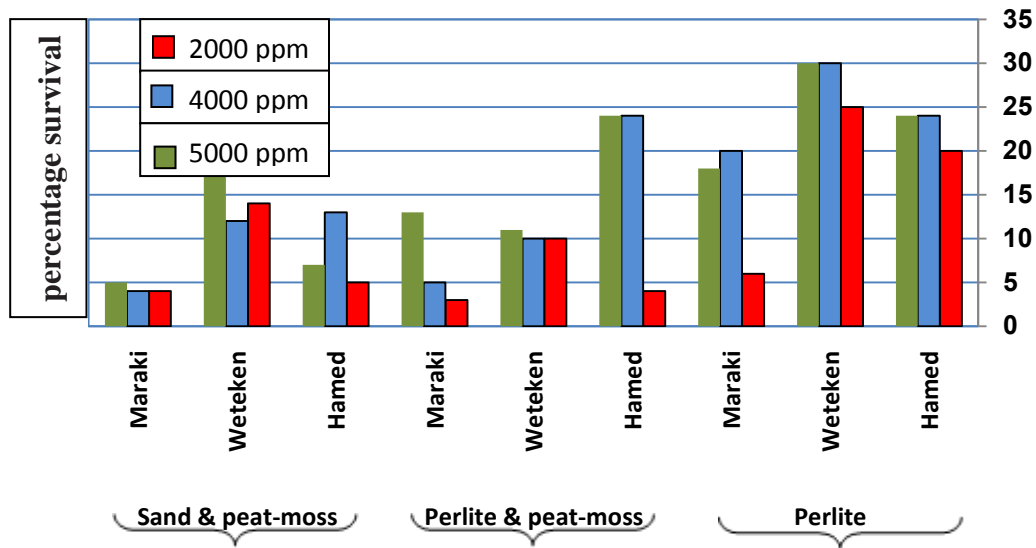


Figure 2. Effect of rooting media and IBA concentration on percentage survival of stem cutting in olive variety. Each number is the number of successful stem of the total 30 for the treatment of root cutting.

CONCLUSION

The results show that perlite is the best medium for olive cultivar stem cuttings; as the highest root numbers and percentage survival; were obtained in this medium. Depending on the result obtained for Argo (1998) a good medium would provide sufficient support for the plant serve as a reservoir for nutrients and water, allow oxygen diffusion to the roots and permit gaseous exchange between roots and atmosphere. This medium seems a convenient bed for olive; as it has good drainage, good aeration, and is a good water absorbent. In this research the highest number of root and percentage survival in cuttings was observed in 4000 and 5000 ppm of IBA concentration; and caused higher number of roots. It is recommended to use perlite and 4000 ppm IBA concentration in olive stem cuttings that perlite gave the best values in terms number root by cutting. This is consistent with the results obtained by (Mehri H. *et al.*, 2013). Wiesman and Lavee (1995), who obtained a rooting percentage of 37% in cv. Cornicabra cuttings treated with 0.8% IBA talc powder, considered this cultivar moderately easy to root. However, in a study carried out by Del Río and Caballero (2005), a rooting percentage of 70% was obtained when cuttings were dipped in 3000 ppm IBA for 5 s. In our study, the percentage of rooted cuttings in the IBA treatment ranged between 10% and 100% Table 1.

Increased rooting rates due to the use of different media have been reported for olive cutting (Awan *et al.*, 2003; Isfendiyaroglu *et al.*, 2009; Mahri H, *et al.* 2013. The

difference in rooting percentage between the two olive cultivars in the present study, was found also in other olive cultivars (Ayoub SJ and Qrunfleh MM 2006; El-Said *et al.*, 1990).

As a conclusion, these results confirmed that it is possible for solving the poor of rooting in different olive cvs by dipping cuttings in solution containing IBA at 2000 ppm.

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