

The Effect of Some Auxins on Rooting and Growth of *Populus alba* L.

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ABSTRACT

Cuttings of *Populus alba* L., were treated with Horme x solution (NAA, IBA, and vitamin B-1) plus weekly drenching of the soil with diluted solution of Horme x, developed stronger root system and better shoots than the cuttings treated with Horme x solution, Horme x powder (IBA), and the control.

INTRODUCTION

The great land development and expansion of green belt around the Libyan coastal cities require various tree species capable of enduring the injurious effect of high wind and salty drifts. *Populus alba* L., can tolerate to some extent the environmental conditions of the coastal areas. But due to the critical period of the establishment newly planted seedlings cannot grow successfully unless they possess a well developed root system and a sturdy stem. The work of Hortmann and Kester (2), showed that the synthetic root promoting chemicals that have been found most reliable in stimulating adventitious root production in cuttings were indolebutyric acid and naphthaleneacetic acid, although there were others which could be used. They added that indolebutyric acid was probably the best material for general use, because it was nontoxic over a wide concentration range, and was effective in promoting rooting of a large number of plant species. Leopold (4), stated that a very wide variety of auxins were used for rooting of cuttings, but the most commonly used with great success was IBA, and the success of this compound might be due to its weak auxin activity and slow destruction by the anti-auxin enzymes system. In rhododendrons, rooting was found to occur only in the presence of auxins, and adventitious root formation was completely inhibited when auxins and sugar were not present in the culture medium (6,7). Rooting percentage of carnation cuttings was higher in a medium containing auxins (1,5). The role of B vitamins in the completion of differentiation was mentioned by Wetmore (8), who stated that the cell clusters from angiosperm would differentiate only if the culture medium contained elaborate nutrients, including auxin, and B vitamins. Jablonski and Skoog (3), added that the role of vitamin B was stimulatory to cell divisions.

This experiment was conducted to test the effect of some growth regulators on *Populus alba* L. cuttings for the production of plants with stronger root system and vegetative growth.

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MATERIALS AND METHODS

This experiment was conducted in the greenhouse of the Faculty of Agriculture, University of Alfateh, Tripoli 1976, 180 cuttings of *Populus alba* L., were taken from one year old shoots, the average length of cutting was 28.6 cm., with an average thickness of 0.79 cm., the average number of buds on each cutting was 6.7. Temperature in the greenhouse was maintained between 20°C and 25°C. The rooting hormones used were:

1. Horme *x* concentrated solution. The active ingredients are NAA 0.240%, IBA 0.013%, inert ingredients 99.747%, and 0.250% vitamin B-1 (Thiamin Hydrochloride).
2. Horme *x* rooting powder No. 8. The active ingredient is IBA 0.8%, and inert ingredient 99.2%.

The cuttings were subjected to the following treatments:

1. The basal 3 cm. of the cuttings were soaked in water for a period of 1 min.
2. The basal 3 cm. of the cuttings were soaked in a concentrated solution of Horme *x* for 1 min.
3. The cuttings were treated as followed in treatment number two, then one week after planting, the soil of the pots was drenched with Horme *x* solution containing 1 cm³ per gallon of water. This operation was repeated weekly throughout the experiment.
4. The basal 3 cm. of the cuttings were dipped in Horme *x* rooting powder.

Immediately after treatment, each cutting was inserted in a plastic bag (7.5 × 15 cm.) filled with a 1:1 sand and peat moss mixture. The design used was a randomized complete block with four treatments and three replicates. The characteristics of stem length, number of leaves, number of roots, total root length, and the percentage of rooted cuttings were recorded 90 days after treatment. Data were statistically analysed.

RESULTS AND DISCUSSION

Stem length

One bud was permitted to grow on each cutting to form the main tree stem. The length of the newly developed shoot was measured 90 days after treatment. Data presented in Table 1 indicated that the cuttings treated with Horme *x* solution plus weekly drenching with diluted solution of Horme *x* showed a highly significant increase in stem length. No significant differences were observed between the other two treatments and the control.

Number of leaves

The number of leaves was significantly higher for plants of the second and third treatments in which the cuttings were treated with Horme *x* solution. The use of Horme *x* rooting powder had no significant effect on the number of leaves.

Number of roots

A sample of three plants from each replicate was used to determine the number of roots on each cutting. As shown in Table 1, cuttings of the second and the third treatments had significantly greater number of roots as compared with the control.

Using Horme *x* powder in treatment 4, did not cause any significant effect in increasing the number of roots.

Total root length

Because of the importance of having a large root system for producing a strong and sturdy plant, the length of each root was recorded and summed up to determine the total length of roots for each cutting. As shown in Table 1, the use of Horme *x* as applied in all treatments had increased significantly the total length of roots as compared with the untreated plants. It was also observed that the total root length in treatment number three was significantly higher than the other two Horme *x* treatments.

Percentage of rooted cuttings

No significant effect for Horme *x* on the percentage of rooted cuttings was recorded in any treatment. This indicated that Horme *x* did not increase the number of survived cuttings, yet it improved the quality of plants grown as shown by the other characteristics studied.

Data showed that the application of the auxin solution in the second and third treatments, had caused a beneficial effect on shoot and root development of poplar (*Populus alba* L.) cuttings (1,2,5,6,7). In the second treatment Horme *x* solution showed a highly significant increase in the number of roots, and a significant increase in the number of leaves and total root length. The third treatment, where the cuttings were treated with Horme *x* plus weekly drenching of the planted soil area with diluted Horme *x* solution, had proved to be superior over other treatments, as it caused a highly significant increase in shoot length, number of roots, and total root length. And a significant increase in the number of leaves.

Using Horme *x* solution was better than Horme *x* rooting powder, this differences could be due to the presence of NAA (2), IBA (2,4) and vitamin B-1 as active ingredients of Horme *x* solution (3,8). While the active ingredient in the Horme *x* rooting powder was only IBA.

Table 1 The effect of Horme *x* treatments on stem length, number of leaves, number of roots, total root length, and percentage of rooted cuttings, in *Populus alba* L.

Treatment	Stem length cm	Number of leaves	Number of roots	Total root length cm	Rooted cuttings %
Water (control)	10.53	9.67	8.77	53.07	86.33
Horme <i>x</i> sol.	12.18	12.59	22.78	143.92	94.33
Horme <i>x</i> sol. + drenching	16.64	13.15	33.44	228.56	94.33
Horme <i>x</i> powder	9.32	10.15	13.89	117.28	90.67
LSD (0.05)	3.50	2.31	6.70	61.12	N.S.
LSD (0.01)	5.30	3.50	10.15	92.55	

It could be concluded that although Horme *x* did not increase the number of succeeded cuttings of poplars. Yet, it is advised to use the Horme *x* solution plus drenching of the planted soil area with diluted solution of Horme *x*, in order to produce high quality plants that have better chance for survival when planted in the permanent place near the sea.

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تأثير بعض الهرمونات على النمو وتكوين الجذور في نبات الحور

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مستخلص

اجريت هذه التجربة لدراسة تأثير بعض الهرمونات على النمو وتكوين الجذور في عقل نبات الحور *Populus alba* وهو نوع هام من أنواع الاشجار المستخدمة في تشجير المناطق الساحلية . وقد دلت النتائج على الآتى :-

١ - ان معاملة عقل نبات الحور بمحلول مركز من هرمون Hormone-X قد ادى الى زيادة مؤكدة جدا في عدد الجذور المتكونة على العقلة ، وزيادة مؤكدة في عدد الاوراق والطول الكلى للمجموع الجذرى .

٢ - ان معاملة عقل نبات الحور بمحلول مركز من Hormone-X مع اضافة محلول مخفف من نفس الهرمون الى التربة مرة كل اسبوع قد اعطت افضل النتائج اذ ادت الى زيادة مؤكدة جدا في طول الساق ، عدد الجذور المتكونة على العقلة والطول الكلى للمجموع الجذرى ، وزيادة مؤكدة في عدد الاوراق .

٣ - كان استعمال محلول Hormone-X افضل من استعمال مسحوق Hormone-X وقد يرجع ذلك الى وجود حامض نافثالين اسيتيك NAA وحامض اندول بيوتيرك IBA وفيتامين B-1 كمواد فعالة تدخل في تركيب هذا المحلول ، بينما لا يحتوى مسحوق Hormone-X الا على حامض الاندول بيوتيرك IBA كمادة فعالة .

لذلك فانه ينصح بمعاملة عقل نبات الحور بمحلول مركز من Hormone-X مع اضافة محلول مخفف

(١ سم ٣ / جالون من المياه) من نفس الهرمون الى التربة مرة كل اسبوع وذلك لانتاج نباتات ذات مجموع جذرى وخضرى قوى .