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ROOTING OF THE PURPLE ROBE *Robinia pseudoacasia* L. CUTTINGS AS INFLUENCED BY CUTTING TIME, COLD STORAGE AND IBA.

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ABSTRACT

The Purple Robe fruitless cultivar of black locust *Robinia pseudoacacia L.* is an attractive ornamental tree that widely planted throughout the world for various uses. This study was attempted to propagate this fruitless cultivar of *Robinia* by hardwood cuttings; at different cutting times, cold mist storage conditions and using various concentrations of IBA.

The results showed that taking and planting cuttings on March 15th, gave the best survival percentage of rooted seedlings, which was (20.83%) compared to February 1st (8.33%) and February 22nd (12.5%).

Cuttings treated with different concentrations of IBA significantly increased success percentage (38.33, 33.33, 25.00 and 14.17%) for (2000, 1500, 1000 and 0 ppm), respectively. While the cold moist storage duration of the cuttings negatively affected on survival percentage (16.67%) for 3 weeks and (12.5%) for 6 weeks storage compared to (20.83%) for non-stored cuttings.

Furthermore, the treatment combination of previous factors had positive effects on studied characters; the heighest value of rooting rate success (62.5%), seedling height (82.67 cm), vegetation fresh weight (66.3 g), vegetation dry weight (21.26 g), and number of leaves per plant (32.33) were obtained from cuttings taken on February 22nd and treated with 2000 ppm, whereas the highest means of roots fresh and dry weights (12.71 and 3.62 g), respectively, were observed from cuttings taken on February 1st and treated with 2000 ppm.

The results recommend taking cuttings on February 22nd, and using 2000 ppm of IBA directly (without cold moist storage) before planting to enhance cuttings survival percentage and seedlings quality.

KEYWORDS: Purple robe, Rooting, Cutting time, Storage, IBA.
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INTRODUCTION

Purple Robe *Robinia pseudoacacia* is one of the most popular medium-sized and multi-purpose deciduous tree species. It is commonly planted in a widespread from Europe to a temperate climate region in the world (Keresztesi, 1980; Keresztesi, 1988; Li *et al*., 2014; and Sitzia *et al*., 2016). Black locust is tolerant of urban environmental conditions and stresses such as low-fertility soils, drought, air pollutants, and high light intensities (Hanover, 1989). This widely known for its rapid growth and a nitrogen-fixing (Fowells, 1965; Muthoo and Kango, 1965; Keresztesi, 1980; Batzli *et al*., 1992; Cierjacks *et al*., 2013; Vítková *et al*., 2015 and Crosti *et al*., 2016). In addition it is invaluably important as an ornamental tree for roadside avenues (Muthoo and Kango 1965) and can be used in urban landscaping (Kamlesh *et al*., 2007).

This cultivar of black locust (Purple Robe) is an upright tree, has a rounded growth and short, irregular branches form a tighter canopy than the species and cast medium shade below the tree, allowing a lawn to grow. For approximately a 10-day period in late spring, the trees are flowering very showy with dense clusters of pleasant lavender fragrance blossoms (Edward and Dennis, 1994). While stem cutting is the simplest and most economical method of vegetative propagation practiced for mass production within a short time (Yong Kweon and Ki Sun, 1996), and it considered the only way to propagate this cultivar because of its fruitless characteristic.

So, this study reports on the propagation of

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Purple Robe *Robinia pseudoacacia* L. with cuttings to determine the best seasonal time for taking cuttings, verify the duration of cold storage and to define the optimal IBA concentration, for successful root formation.

MATERIALS AND METHODS

Cutting harvesting and experiment site:

One year old cuttings of *Robinia pseudoacasia* L. were obtained with the help of sterilized wood cutter from mature and healthy trees in the main campus gardens of University of Sulaimani. The testing filed was located at the nursery of the same campus at elevation 755masl. (35°57'N and 45°36'E), Sulaimani city, Kurdistan region, Iraq. This homogenous measuring of stem cuttings were between 18 to 20cm in length and 0.8-1.2cm in diameter; the top cut was slanted, which was 1cm from top node and the lower cut was perpendicular, which located exactly under the lower node. The cuttings were maintained and watered regularly under the natural shaded conditions of the nursery.

Planting media:

Cuttings were planted in 15×25 cm polyethylene bags, with river sand rooting medium.

Experimental design:

The cuttings were subjected to treatments which applied as a factorial experiment according to randomized complete block design (RCBD) in three replicates; 8 cutting for one replicate, so each treatment had 24 cuttings and a single stem cutting was planted per each pot.

The applied experiment treatments were:

1. Cutting collection time and storage duration:

Stem cuttings were collected from mature trees on February 1st, February 22nd and March 15th, 2018 with three-week intervals and planted at the same dates. Cuttings were collected on February 1st and divided into two groups, one group stored until February 22nd (for 3 weeks) in plastic boxes contained wet construction sand, closed tightly, placed vertically in a refrigerator at 5 °C, the second group stored until March 15th (for 6 weeks) in the same condition, monitored regularly to maintain the sand moist and planted on February 22nd, March 15th 2018 for 3 and 6 weeks storage, respectively.

2. IBA concentration:

In totals, sets of 24 cuttings were prepared. Thereafter, 1-2 cm bases of the cuttings were quick dipped into IBA solutions with different concentrations levels (0.00, 1000, 1500 and 2000 ppm) for 30 seconds.

3. Control (without any treatments):

Cuttings planted directly without dipping in IBA solutions as well as cold moist storage.

Therefore; Purple Robe cuttings treatment combinations were twenty experiments as following table:

Table (**1**): Distribution of the cutting treatments in the study and their symbols.

Treatment			Symbol
Collection and Planting Time	February 1st	Control 1	T1
		1000 ppm	T2
		1500 ppm	T3
		2000 ppm	T4
	February 22nd	Control 2	T5
		1000 ppm	T6
		1500 ppm	T7
		2000 ppm	T8
	March 15th	Control 3	T9
		1000 ppm	T10
		1500 ppm	T11
		2000 ppm	T12
Planting Fresh	Storage	3 weeks	T13

	Duration 3 weeks	1000 ppm	T14
		1500 ppm	T15
		2000 ppm	T16
March 15th	Storage Duration 6 weeks	6 weeks	T17
		1000 ppm	T18
		1500 ppm	T19
		2000 ppm	T20

Data collection:

At the early September 2018, three seedlings were selected randomly from each group and started collecting and recording all required data according to the following quantity and quality parameters of the seedlings:-

1. Survival percentage.
2. Seedling Height (cm).
3. Vegetative Fresh Weight (g): weighted by digital balance directly after washing off from any loose dust, then removing any free surface blot moisture.
4. Vegetative Dry Weight (g): drying vegetative dry weight at 105 °C for 24 hours in the oven.
5. Root Length (cm).
6. Root Fresh Weight (g): weighted by digital balance directly after removing the roots from the soil and washing them off from any loose soil particles, then removing any free surface blot moisture.
7. Root Dry Weight (g): drying the fresh roots in an oven set to 100° C overnight.
8. Number of Leaves per plant.
9. Leaf Area (cm^2): measured by using (Digimizer image analysis) software program application (https://www.digimizer.com/); downloaded on the personal computer, and based on image analysis by determining the dark spot images of the leaves.

Statistical analysis:

The effects of the treatments on the measured parameters were evaluated by Analysis of Variance (ANOVA), significance of the differences were analyzed by Duncan's multiple comparison test ($P \leq 0.05$). The whole data processing was completed via XLSTAT 2016 data analysis program for Windows software https://www.xlstat.com

RESULTS

1. Seedlings quantity parameter (Survival percentage):

At the end of the study, according to the values stated in Figure 1, the cuttings of Purple Robe *Robinia pseudoacasia* L. which collected on March 15th influenced more strongly the survival percentage than that collected on February 1st and February 22nd, survival percentage on February 1st, February 22nd and March 15th was 8.33, 12.50 and 20.83%, respectively.

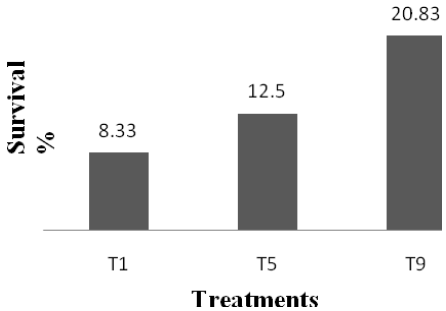

Fig. (1): Effect of cutting collection time on survival percentage of Purple Robe *Robinia pseudoacasia* L.

The cold moist storage duration of Purple Robe *Robinia pseudoacasia* L. cutting were compared for 3 weeks (T13) and for 6 weeks (T17) with non-stored cutting, planted directly (T1), (T5) and (T9).

There was a great value (20.83%) for non-stored cuttings (T9) compared with a negative affected of stored cuttings for 3 and 6 weeks on survival percentage which were 16.67 and 12.5%, respectively (Figure 2).

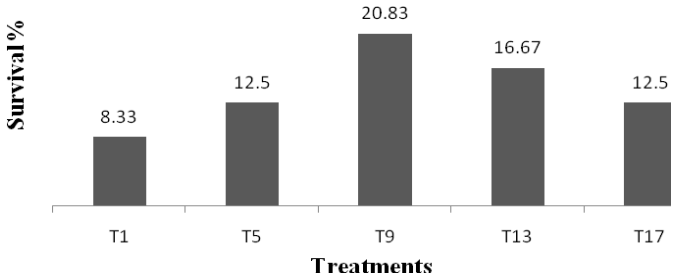

Fig. (2): Effect of cold moist storage duration on survival percentage of Purple Robe *Robinia pseudoacasia* L.

Based on statistical evaluation, the cutting collection time and the IBA concentration had important effects on the survival rates of Purple Robe *Robinia pseudoacasia* L. cuttings. The data shown in Figure (3) indicated that the cuttings collected on February 22nd and immersed in 2000 ppm concentration of IBA for 30 seconds. The survival rate was significantly increased to 62.5% as compared to control (12.5, 45.83 and 58.33%) for IBA 1000, 1500 ppm, respectively.

Also on February 1st; results were 8.33, 20.83, 29.17 and 41.67%, while on March 15th the values 20.83, 29.17, 41.67 and 45.83%, respectively were achieved for control, 1000, 1500 and 2000 ppm of IBA.

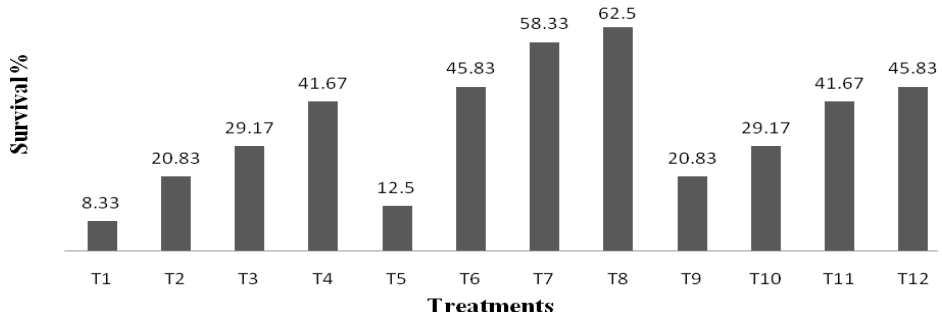

Fig. (3): Effect of cutting collection time and IBA concentration on survival percentage of Purple Robe *Robinia pseudoacasia* L.

Figure (4) shows average of seedling survival percentages ranged from 12.5 to 25%. The highest percentage occurred with interaction of cuttings stored for 3 weeks at cold moist condition and IBA 2000 ppm (T16) and the lowest percentage obtained in (T5), (T17) and (T18).

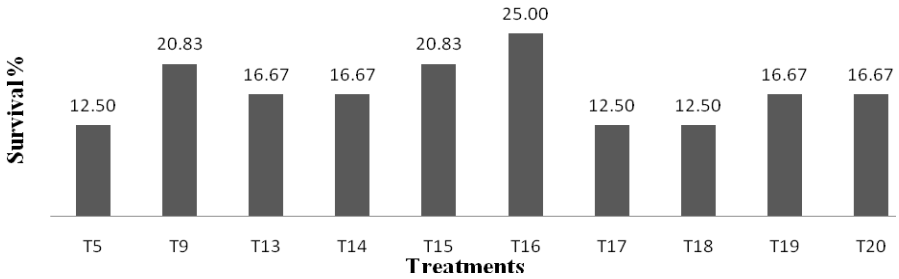

Figure 4. Combination effect of cold moist storage duration and IBA concentration on survival percentage of Purple Robe *Robinia pseudoacasia* cuttings.

2. Seedlings quality parameters:

According to cutting collection times; the differences in the majority of parameters were also significant, but values increased significantly in cutting collected on February 22nd (T5), in which the values of seedling height (61 cm), vegetative fresh weight (28.45 g), vegetative dry weight (10.11 g), root length (81.17 cm), root fresh weight (4.25 g), root dry weight (1.41 g), number of leaves per plant

(15.84) and average leaf area (191.41cm^2) were resulted.

However, the lowest values of seedling height (18.83 cm), vegetative fresh weight (10.90 g), vegetative dry weight (4.05 g), root length (55.17 cm), root fresh weight (1.02 g) and average leaf area (51.10cm^2) were observed from cuttings collected on March 15th (T9) (Table 2).

Table (2): Effect of cutting collection time on studied seedling growth parameters of Purple Robe *Robinia pseudoacasia* L.

Treatment	Seedling Height (cm)	Vegetative Fresh Weight (g)	Vegetative Dry Weight (g)	Root Length (cm)	Root Fresh Weight (g)	Root Dry Weight (g)	Leaves Number per plant	Leaf Area (cm^2)
T1	38.50 b *	28.55 a	09.79 a	57.67 b	1.93 b	0.57 b	09.37 b	79.33 b
T5	61.00 a	28.45 a	10.11 a	81.17 a	4.25 a	1.41 a	15.84 a	191.41 a
T9	18.83 c	10.90 b	04.05 b	55.17 b	1.02 b	0.61 b	11.33 b	51.10 c

***** Columns values followed by the same letter did not differ significantly (P≤0.05) according to Duncan's multiple range test.

It is clear from Table (3) that all treatments of cold storage periods were affected significantly in a negative manner and decreases were shown in all of vegetative and root growth parameters, which were gradually decreased by the extension of the cold storage period 3 and 6 weeks as compared to controls. Consequently, the values for each seedling height (18.67, 5.67 cm); vegetative fresh weight (08.85, 8.23 g); vegetative dry weight (3.35, 2.75 g) and number of leaves per plant (7.0, 4.6), respectively were recorded.

Whereas all of root growth characteristic parameters were 13.17 cm root length, 0.59 g root fresh weight and 0.18 g root dry weight for cuttings stored 6 weeks.

Table (3): Effect of cold moist storage duration on studied seedling growth parameters of Purple Robe *Robinia pseudoacasia* L. cuttings.

Treatment	Seedling Height (cm)	Vegetative Fresh Weight (g)	Vegetative Dry Weight (g)	Root Length (cm)	Root Fresh Weight (g)	Root Dry Weight (g)	Leaves Number per plant	Leaf Area (cm^2)
T1	38.50 b*	28.55 a	9.79 a	57.67 c	1.93 b	0.57 c	9.37 c	79.33 d
T5	61.00 a	28.45 a	10.11 a	81.17 a	4.25 a	1.41 a	15.84 a	191.41 a
T9	18.83 c	10.90 b	04.05 b	55.17 c	1.02 bc	0.61 bc	11.33 b	51.10 e
T13	18.67 c	08.85 c	3.35 b	68.00 b	1.24 b	0.78 b	7.00 d	100.16 c
T17	05.67 d	08.23 c	2.75 b	13.17 d	0.59 c	0.18 d	4.60 e	139.02 b

***** Columns values followed by the same letter did not differ significantly (P≤0.05) according to Duncan's multiple range test.

It is evident from data presented in Table (4) that the vegetative and root growth parameters of Purple Robe; seedling height (cm), vegetative fresh weight (g), vegetative dry weight (g), root length (cm), root fresh weight (g), root dry weight (g) number of leaves per plant and leaf area (cm^2) affected by combination of cutting collection times with IBA rooting hormone concentrations. Values are fluctuating between cutting collection times and IBA concentration. Results indicate that superior values for example; seedling height (cm) was (82.67) for T3 and T8 and (81.67) for T7, while vegetative fresh weight (g) was (66.30) for T8, (55.91) for T7 and (48.90) for T4, root length (cm) was (81.00, 81.17 and 93.50 for T4, T5 and T6) respectively, leaves number per plant were 30.00, 31.67 and 32.33 for T6, T7 and T8, respectively.

Table (4): Effect of cutting collection time and IBA concentration on studied seedling growth parameters of Purple Robe *Robinia pseudoacasia* L. cuttings.

Treatment	Seedling Height (cm)	Vegetative Fresh Weight (g)	Vegetative Dry Weight (g)	Root Length (cm)	Root Fresh Weight (g)	Root Dry Weight (g)	Leaves Number per plant	Leaf Area (cm^2)
T1	38.50 e *	28.55 d	09.79 c	57.67 b	01.93 d	0.57 c	09.37 d	79.33 c
T2	45.33 de	40.99 bc	14.03 b	40.67 c	04.84 c	1.29 b	31.00 a	101.17 b
T3	82.67 a	39.11 bc	13.47 b	28.00 d	09.62 ab	2.97 a	14.91 c	311.48 a
T4	50.67 cde	48.90 b	17.76 a	81.00 a	12.71 a	3.62 a	30.00 a	150.28 b
T5	61.00 bc	28.45 e	10.11 c	81.17 a	04.25 c	1.41 b	15.84 b	191.41 ab
T6	71.83 ab	45.22 bc	16.60 ab	93.50 a	03.90 c	1.77 ab	30.00 a	118.61 b
T7	81.67 a	55.91 ab	19.10 a	59.00 b	10.60 a	3.28 a	31.67 a	121.24 b
T8	82.67 a	66.30 a	21.26 a	58.17 b	07.49 bc	2.91 a	32.33 a	139.57 b
T9	18.83 f	10.90 e	04.05 d	55.17 bc	01.02 d	0.61 b	11.33 d	51.09 c
T10	41.67 de	20.63 d	07.95 c	77.17 b	01.65 d	0.62 b	13.00 c	75.74 bc
T11	45.17 de	23.43 d	08.64 c	63.00 b	02.73 d	0.78 b	16.67 b	65.84 c
T12	55.17 cd	23.71 d	09.18 c	34.00 cd	02.98 d	0.96 b	18.00 b	69.58 c

* Columns values followed by the same letter did not differ significantly (P≤0.05) according to Duncan's multiple range test.

The interaction data in Table (5) indicates that some of the vegetative and roots growth parameters of Purple Robe were decreased by the extension of the storage period from 3 to 6 weeks combined with increasing concentration of IBA solution from1000, 1500 to 2000 ppm. These reflected different results; in which the greatest values of seedling height (61.00 cm), root length (81.17 cm), root fresh weight (4.25 g), root dry weight (1.41g) and leaf area (191.41 cm^2) were observed from T5, however the highest values of vegetative fresh weight (61.01 g) and number of leaves per plant (22.67) were given by T15, however vegetative dry weight (19.52 g) was backed to T16. While the lowest values of seedling height (05.67 cm), vegetative fresh weight (08.23 g) vegetative dry weight (02.75 g), root length (13.17 cm), and number of leaves per plant (04.60) were resulted from cuttings treated by T17, root fresh weight (0.55 g) resulted from T18, root dry weight (0.24 g) from T20 and leaf area (51.1cm^2) from cuttings treated by T9.

Table 5. Combination effect of cold moist storage duration and IBA concentration on studied parameters of Purple Robe *Robinia pseudoacasia* L. cuttings.

Treatment	Seedling Height (cm)	Vegetative Fresh Weight (g)	Vegetative Dry Weight (g)	Root Length (cm)	Root Fresh Weight (g)	Root Dry Weight (g)	Leaves Number per plant	Leaf Area (cm^2)
T1	38.50 b *	28.55 d	09.79 c	57.67 bc	1.93 b	0.57 c	09.37 c	79.33 ef
T5	61.00 a	28.45 d	10.11 bc	81.17 a	4.25 a	1.41 a	15.84 b	191.41 a
T9	18.83 e	10.90 e	04.05 d	55.17 bc	1.02 b	0.61 c	11.33 c	51.10 f
T13	18.67 e	08.85 e	03.35 d	68.00 ab	1.24 b	0.78 b	07.00 e	100.16 ce
T14	26.83 cd	41.30 bc	15.30 ab	38.17 c	2.57 a	0.91 ab	19.33 ab	167.14 a
T15	29.17 cd	61.01 a	18.34 a	24.50 d	2.80 a	0.94 ab	22.67 a	166.30 ab
T16	27.83 cd	49.71 b	19.52 a	31.00 c	2.94 a	1.05 a	21.00 a	182.76 a
T17	05.67 f	08.23 e	02.75 d	13.17 e	0.59 bc	0.18 d	04.60 e	139.02 b
T1	08.67 f	08.65 e	03.26 d	14.00 e	0.55 c	0.16 d	06.00 e	115.74 bc

8								
T19	32.17 bc	44.65 b	16.99 a	17.50 de	0.81 b	0.25 d	14.33 b	154.17 b
T20	23.83 de	35.19 cd	13.45 b	20.50 d	0.77 bc	0.24 d	12.33 c	132.04 bc

* Columns values followed by the same letter did not differ significantly (P≤0.05) according to Duncan's multiple range test.

DISCUSSION

The stem cutting is influenced by several internal and external factors to success rooting formation (Gyana, 2006). As well, equally diverse exogenous factors can affect rooting parameters, for example; auxin applications can increase the rooting capacity of many plants (Marks and Simpson, 2000; Husen and Mishra, 2001; Husen, 2003; Kiran, 2008). Therefore, auxin is widely used in propagation (generally IBA) (Kotis *et al.*, 2009).

The values stated in the Figure 1 display that the cuttings of Purple Robe *Robinia pseudoacasia* L. which collected on March 15th influenced more strongly on the survival percentage 20.83%.

According to table (2), the differences between collection times in all other parameters were also significant, but values increased significantly in cutting collected on February 22nd (T5) which gave 61 cm seedling height, 28.45 g vegetative fresh weight, 10.11 g vegetative dry weight, 81.17 cm root length, 4.25 g root fresh weight, 1.41 g root dry weight, 15.84 leaves per plant and 191.41 cm^2 leaf area. The lowest values were 18.83 cm seedling height, 10.90 g vegetative fresh weight, 4.05 g vegetative dry weight, 55.17 cm root length, 1.02 g root fresh weight and 51.10 cm^2 leaf area collected on March 15th (T9).

The best results reported by (Proebsting, 1984) who had reached with hard cuts, independent of the collection season or the environment of propagation.

The survival rate of the cuttings decreasing depended on the duration of cold storage. The results shows that the greatest value (20.83%) for non-stored cuttings (T9), while storing cuttings for 3 and 6 weeks negatively affected on survival percentage which was 16.67 and 12.5%, respectively (Figure 2).

All treatments of cold storage periods were affected significantly in a negative manner and decreased all of vegetative and root growth parameters, which were gradually decreased by the extension of the cold storage period 3 and 6 weeks as compared to controls which were 18.67, 5.67 cm seedling height; 08.85, 8.23 g vegetative fresh weight; 3.35, 2.75g vegetative dry weight and 7.0, 4.6 number of leaves per plant, respectively. While root growth characteristic parameters gave 13.17 cm root length, 0.59 g root fresh weight and 0.18 g root dry weight for cuttings stored for 6 weeks (Table 3).

These results for the cuttings were similar to the conclusions of (Holey and Farmer, 1951). Also the results are in approval with (Lopez and Runkle, 2008) information on *Impatiens hawkeri*, that most characters were negatively affected by storage the cuttings at 5 to 24°C, which; increasing storage period at 0°C led to decreases in quality parameters. De Almeida and Agrarias (2002) denoted that on average after two weeks of cold storage of Chrysanthemum, the rooting of cuttings was affected. Furthermore, Zenciriran (2010) noted that the cuttings showed differences in survival rates on two standard carnation cultivars.

The values in Figure (3) show that the cuttings collected on February 22nd and immersed in 2000 ppm concentration of IBA for 30 seconds; the rooting percentage was significantly increased to 62.5% as compared to control (12.5%), (45.83%) and (58.33%) for IBA 1000, 1500 ppm, respectively. Also on February 1st; the means 8.33, 20.83, 29.17 and 41.67% while on March 15th were achieve 20.83, 29.17, 41.67 and 45.83%, respectively were achieved in each control, 1000, 1500 and 2000ppm of IBA.

Table (4) data are fluctuating between cutting collection times and IBA concentration. Results indicate that superior values for example; in seedling height (cm) was (82.67) for T3 and T8 and (81.67) for T7, vegetative fresh weight (g) was (66.30) for T8, (55.91) for T7 and (48.90) for T4, root length (cm) were 81.00, 81.17 and 93.50 for T4, T5 and T6, respectively, the number of leaves per plant were 30.00, 31.67 and 32.33 for T6, T7 and T8, respectively, and so on.

In figure (4); the average of seedling survival percentages ranged from 12.5 to 25%. The highest percentage occurred with interaction of cuttings stored for 3 weeks at cold moist condition and IBA 2000 ppm (T16) and the lowest percentage obtained in (T5), (T17) and (T18), and Table (5) indicates that some of the vegetative and roots growth parameters of Purple Robe were decreased by the extension of the storage period from 3 to 6 weeks combined with increasing concentration of IBA solution from1000, 1500 to 2000 ppm.

These results are approved the notification of (Rahdari *et al*., 2010), that application of IBA in high concentration can prevent the stem cuttings, and agreed with Husen and Pal (2007), which they found that exogenous application of IBA had significant positive effect on the rooting and growth parameters of *Tectoma grandis* cuttings.

de Andres *et al*. (1999; 2004) denoted that the use of different hormonal concentrations of IBA induced significant differences in cuts rooting, because number of roots and root length indicate the cutting ability to assimilate nutrients, survive in the soil, have structural support, and develop buds to ensure the future CO_2 assimilation of the plant, these also indicate the acclimatization for future planting, which may increase survival efforts.

Rooting success of the various IBA concentrations was similar to the results of Cornu (1973) and contrary to that reported by Proebsting (1984).

ˇStefanˇciˇc *et al.* (2005) reported that the process of adventitious root formation is influenced by a number of internal and external factors. Among the internal factors, the most important role is ascribed to phytohormones, especially the auxins. It is generally accepted that auxins have a certain role in the rooting initiation and therefore leads to control growth and development in plants, including lateral root initiation, root gravity response and other vegetative growth parameters such as seedling height (cm), vegetative fresh weight(g), vegetative dry weight (g), number of leaves per plant and leaf area (cm^2).

Many studies have shown that exogenous application of auxins results in increased initiation of lateral roots which its development is highly dependent on auxin and auxin transport (Chhun *et al.*, 2003). Patricia *et al.* (2001) explored that root lengths and ratings increased linearly with increasing hormone concentration, but meanwhile indicated that increasing the hormone level from 8000 to 10000 ppm had no significant effect on root lengths. Kotis *et al.* (2009) concluded that the exogenous auxins play a major role in the fixing of rooting ability, whereas commercially most of the propagation is done by using IBA.

Result is in conformity with that obtained from the following studies in which the effects of auxin group of hormones on rooting and plant development have been discussed.

Alvarez *et al.* (1989) resolved the effectiveness of IAA and IBA in *Malus pumila*; *Chukrasia velutina*; Nordstr¨om *et al.* (1991) studied the action of IAA and IBA in *Pisum sativum*; De Klerk *et al.* (1997) explored the effectiveness of IAA, IBA, and NAA in *Malus*; Tchoundjeu *et al.* (2002) investigated the influence of IBA in *Prunus Africana*; Swamy *et al.* (2002) studied the impact of IBA and NAA in both *Robinia pseudoacacia* and *Grewia optiva*. Martin (2002) studied the effect of IBA in *Holostemma ada-kodien*; Chhun *et al.* (2003) researched the action of IAA, IBA, and NAA in *Oryza sativa*; Hussain and Khan (2004) surveyed the impact of IAA and IBA in *Rosa* species; Hossain *et al.* (2004) examined the influence of IBA in *Swietenia macrophylla* ˇStefanˇciˇc *et al.* (2005) studied the effectiveness of IAA and IBA in *Prunus* spp. as well as IBA and NAA in *Pseudotsuga menziesii*. At last Ozel *et al.* (2006) analyzed the effect of IAA and NAA in *Centaurea tchihatcheffii*.

Finally many of the treatments resulted in different survival percentages. While a great deal of historical guidelines for propagation of woody plants by cutting on selection rooting hormone treatments, the environment factors such as the amount of light, type of the rooting medium and relative humidity should also be considered which make a notable effects directly on rooting time and rooting percentage and so affect on the other seedlings parameters wholly.

CONCLUSION

Based on the results of this experiment, to propagate and obtain special quality and quantity seedlings of Purple Robe fruitless cultivar of black locust *Robinia pseudoacasia* L. cuttings should be collected on February22nd (LatFebruary) and immersed in 2000ppm

concentration of IBA for 30seconds directly before planting.

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ڕەگکردنی ڕۆبینیای ئەرخەوانی Robinia pseudoacacia L. بە کاریگەری کاتی وەرگرتنی قەڵەم و هەڵگرتنی سارد وشێدار وترشی ئیندۆڵ بیوتریک. IBA

پوختە

داری ڕۆبینیای ئەرخەوانی (The Purple Robe) چەشنێکی بێبەرە لە ڕۆبینیا Robinia pseudoacacia L. کە دارێکی سەرنج ڕاکێشە بە شێوەیەکی فراوان بۆ مەبەستی جۆراوجۆر دەڕوێنرێت لە جیهاندا. ئەم لێکۆڵینەوەیە هەوڵی زۆرکردنی ئەم چەشنە بێبەرەی ڕۆبینیا دەدات لە ڕێگای وەرگرتنی قەڵەم لە کاتی جیاوازدا و هەڵگرتن لە دۆخی سارد و شێدار لەگەڵ بەکارهێنانی خەستی جیاواز لە ترشی ئیندۆڵ بیوتریک.(IBA)

ئەنجامەکان نیشانیاندا کە وەرگرینی قەڵەم وڕواندنیان لە 15ی ئایاردا باشترین ڕێژەی سەرکەوتنی دا لە ڕەگکردنی نەمامەکان کە (20.83 ٪) بوو بەراورد بە 1ی شوبات (8.33 ٪) و 22ی شوبات (12.5 ٪).

بەکارهێنانی ترشی ئیندۆڵ بیوتریک بە خەستیی جیاواز ڕێژەی سەرکەوتنی لە قەڵەمەکاندا بە شێوەیەکی بەرچاو زۆر کرد(38.33 ، 33.33 ، 25.00 و14.17٪) بۆ هەر یەک لە (2000 ، 1500 ، 1000 و 0 بەش لە ملیۆنێک) بەدوای یەکدا ، لە کاتێکدا ماوەی هەڵگرتنی سارد وشێدار کاریگەری نەرێنی بوو لەسەر ڕێژەی سەرکەوتن (16.67 ٪) بۆ ماوەی 3 هەفتە و (12.5 ٪) بۆ ماوەی 6 هەفتە هەڵگرتن بەراورد بە (20.83 ٪) بۆ ئەو قەڵەمانەی کەهەڵنەگیراون.

لەگەڵ ئەمانەشدا هەردوو مامەڵەکە بە یەکەوە کاریگەری ئەرێنی هەبوو لەسەر سیفاتە لێکۆڵراوەکان ، بەرزترین ڕێژەی سەرکەوتن (62.5٪) ، بەرزی نەمامەکان (82.67 سم) ، کێشی تەڕی بەشی سەوز (66.3 غم) ، کێشی ووشکی بەشی سەوز (21.26 غم) ژمارەی گەڵا/ڕووەك (32.33) لە 22ی شوبات لەگەڵ بەکارهێنانی 2000 بەش لە ملیۆنێک ترشی ئیندۆڵ بیوتریک ، ڕاسپاردەی ئەنجامەکان ئەوەیە وەرگرتنی قەڵەمەکان لە 22ی شوبات لەگەڵ بەکارهێنانی 2000 بەش لە ملیۆنێک ترشی ئیندۆڵ بیوتریک ڕاستەوخۆ پێش چاندن بۆ باشکردنی ڕێژەی سەرکەوتن و جۆرییەتی نەمامەکان.

کلیکی ووشەکان: ڕۆبینیای ئەرخەوانی ، ڕەگکردن ، کاتی وەرگرتنی قەڵەم ، هەڵگرتن ، ترشی ئیندۆڵ بیوتریک.

تجذير روبينيا الأرجواني .*Robinia pseudoacacia* L متأثراً بوقت أخذ الأقلام و الخزن البارد الرطب و حامض إندول بيوترك IBA .

الخلاصة

شجرة روبينيا الارجواني (The Purple Robe) صنف غير مثمر من روبينيا *Robinia pseudoacacia* L. و هي شجرة جذابة تزرع لإستخدامات مختلفة على نطاق واسع في جميع أنحاء العالم. حاولت هذه الدراسة إكثار هذا الصنف غير المثمر لروبينيا عن طريق أخذ أقلام خشبية في

أوقات مختلفة و ظروف الخزن البارد الرطب مع إستخدام تراكيز مختلفة من محلول حامض إندول بيوترك (IBA) .

أظهرت النتائج أن أخذ وزرع الأقلام في 15 آذار ، أعطى أفضل نسبة نجاح لتجذير الشتلات ، و كانت (20.83 ٪) مقارنة مع 1 شباط (8.33 ٪) و 22 شباط (12.5 ٪).

الأقلام المعاملة بتركيزات مختلفة من حامض إندول بيوترك زادت بشكل واضح نسب النجاح الى (38.33 ، 33.33 ، 25.00 و 14.17٪) لكل من (2000 ، 1500 ، 1000 و 0 جزء في المليون) على التوالي في حين أثرت مدة الخزن الرطب البارد للأقلام سلباً على نسبة النجاح (16.67 ٪) لمدة 3 أسابيع و (12.5 ٪) لمدة 6 أسابيع خزن مقارنة بـ (20.83 ٪) للأقلام غير المخزونة .

علاوة على ذلك ، كان لتداخل المعاملات السابقة آثار إيجابية على الصفات المدروسة ؛ تم الحصول على أعلى قيمة لنجاح التجذير (62.5٪) ، إرتفاع الشتلات (82.67 سم) ، الوزن الطري للمجموع الخضري (66.3 غم) ، الوزن الجاف للمجموع الخضري (21.26 غم) وعدد الأوراق/نبات (32.33) في 22 شباط مع المعاملة بـ 2000 جزء في المليون من حامض إندول بيوترك ، في حين لوحظت أعلى الأوزان للجذور الطرية والجافة (12.71 و 3.62 غم) على التوالي من الأقلام المأخوذة في 1 شباط مع معاملتها بـ 2000 جزء في المليون من حامض إندول بيوترك.

توصي النتائج بأخذ الأقلام في 22 شباط مع إستخدام 2000 جزء في المليون من حامض إندول بيوترك قبل الزرع مباشرة لتحسين نسبة نجاح الاقلام وجودة الشتلات.

الكلمات الدالة: روبينيا الأرجواني ، التجذير ، وقت اخذ الاقلام ، الخزن ، حامض اندول بيوترك.