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Investigation on Sexual and Asexual Propagation of Chinaberry (*Melia azedarach* L.)

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Abstract: Propagation methods of Chinaberry (*Melia azedarach* L.) is important to those growing this ornamental and medicinal tree. Factors influencing sexual and asexual propagation of Chinaberry were investigated. Scarification of fruit with sand paper, soaking fruits in water, keeping fruits under running water or stratification of fruits form 10 to 60 days significantly increased germination. Similarly, stratification for more than 10 days or treating the seeds with 800 ppm gibberellic acid (GA_3) significantly increased seed germination. For asexual propagation, different types of Chinaberry cuttings were treated with different concentrations of indolebutyric acid (IBA) to improve rooting. The highest rooting obtained in semihardwood cuttings treated with 3000 ppm IBA.

Key words: Scarification, propagation, Chinaberry, IBA

Introduction

Chinaberry (*Melia azedarach* L.) is an important ornamental and medicinal plant in many countries of world. The umbrella-shaped crown produces shade and the leaves and fruits have medicinal and insecticidal properties (Zakir *et al*., 1991; Chen *et al*., 1996; Nardo *et al*., 1997; Valladares *et al*., 1997). Little is known on optimum Chinaberry propagation techniques. Moncur and Gunn (1989) reported that the orange or yellow seeds of green fruits of Chinaberry are viable. Removal of the fruit flesh improved seed germination and emergence. Storage of fruits or endocarps at low temperature (3°C) had no effect on germination. In another investigation, seeds of Chinaberry seeds were soaked in 200 ppm of IAA for 24 h and better germination was obtained compared with using IBA and GA_3 (Banerjee, 1998). Khosh-Khui (2003) suggested that, for Chinaberry propagation, the seeds can be sown in spring at a constant temperature of 18°C or, alternatively, cuttings can be taken from young branches in summer or autumn and being kept at 19-18°C for rooting. To optimize the propagation methods, the objectives of the present study were to determine the factors affecting the sexual and asexual methods of Chinaberry propagation.

Materials and Methods

Sexual Propagation

The following treatments were used to excise seeds from the fruits: a) Concentrated sulfuric acid for 1, 2, 3, 4, 5, 10 and 15 min; b) 66.6% v/v sulfuric acid for 1, 2, 3, 4, 5, 15, 25 and 35 min. c) 33.3 v/v sulfuric acid for 1, 2, 3, 4, 5, 25, 35 and 45 min. The seeds were washed immediately after each treatment; d) Soaking fruits under water for two weeks.

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The following pregermination treatments were applied to promote seed germination: a) Soaking the seeds in water for 1, 2 and 3 days; b) Keeping the seeds under running water for 0, 1, 3, 6, 12 and 24 h; c) Scarifying the seeds with sandpaper for 30, 60 and 90 sec; d) Stratifying the seeds at 4±1°C for 5, 10, 15, 20, 25 and 30 days; e) Exposing the seeds to darkness or 1500 lux light emitted by two fluorescent lamps for one week and f) Treating the seeds with gibberellic acid (GA_3) at concentrations of 200, 500 and 800 ppm.

Following treatments were applied on fruits to hasten seed germination: a) Soaking fruits in water for 0, 1, 2, 3, 4, 5 and 6 days; b) Keeping fruits under running water for 0, 6, 12, 18, 24, 30, 36, 42 and 48 h; c) Scarifying by sandpaper for 0, 2, 4, 6 and 8 min. and; d) Stratifying at 4±1°C for 0, 10, 20, 30, 40, 50 and 60 days.

Asexual Propagation

To improve the rooting of Chinaberry cuttings, hardwood, semihardwood and softwood cuttings of Chinaberry were selected and treated with 0, 1000, 2000, 3000, 4000 and 5000 ppm. Indole-3-butyric acid (IBA).

Each experiment of this investigation was conducted as a completely randomized design with 4 replications and means were compared by Duncan's multiple range test. All experiments on sexual and asexual propagation were repeated in two successive years and the means of two years were used for analysis.

Results and Discussion

Sexual Propagation

The results obtained showed that treating the fruits with concentrated sulfuric acid for 2 min was the best treatment for excising the seeds from the fruits. Keeping the fruits under stationary water for two weeks was also effective.

Among the treatments applied on seeds, stratification for 10 days had significantly higher seed germination at 1% level of probability than control. Longer stratification treatments did not affect seed germination (Table 1). Similarly, concentration of 800 ppm of GA_3 resulted in highest germination percentage (34%). This difference was significant at 1% level of probability (Fig.1).

On the basis of data obtained in this investigation, it seems that embryo dormancy is responsible for seed dormancy in this plant. This is in accordance with data presented by Hilhorst and Karssen (1992) for *Corylus avellana* L. a related species.

All treatments applied on Chinaberry fruits were significant at 5% level with control for seed germination. The optimum stratification period was 40 days which had 60% seed germination (Table 2).

Since all treatments on fruits significantly increased seed germination, it may be concluded that presence of one or more inhibitors in fruits of this tree may also be responsible for inhibiting of seed germination as it is reported for other species (Hartmann *et al.*, 2002).

Table 1: Effect of stratification period on germination percentages of Chinaberry seeds

Stratification period (days)						
0	5	10	15	20	25	30
7.0^{c†}	9.8^{bc}	14.0^{a}	12.3^{ab}	12.1^{ab}	11.8^{ab}	12.0^{ab}

†Means followed by the same letter (s) are not significantly different at the 1% level of probability using Duncan's new multiple range test

Table 2: Effects of keeping Chinaberry fruits under running water, soaking in water, scarification and stratification on germination percentage of Chinaberry seeds

	A. Time of keeping fruits under running water (h)								
	0	6	12	18	24	30	36	42	48
Germination (%)	15^{b}	53.57^{a†}	51.25^{a}	52.5^{a}	51.25^{a}	62.5^{a}	55^{a}	57.5^{a}	63.75^{a}
	B. time of soaking fruits in water (day)								
	0	1	2	3	4	5	6		
Germination (%)	23.75^{c}	48.75^{b}	71.25^{ab}	68.75^{ab}	68.75^{ab}	61.25^{ab}	78.75^{a}		
	C. Scarification period (min)								
	0	2	4	6	8	10			
Germination (%)	11.25^{b}	60^{a}	62.5^{a}	73.75^{a}	70^{a}	56.25^{a}			
	D. Stratification period (day)								
	0	10	20	30	40	50	60		
Germination (%)	30^{b}	52.5^{a}	58.75^{a}	57.5^{a}	60^{a}	53.75^{a}	55^{a}		

† Means, in each row, followed by the same letter (s) are not significantly different at 1% (A and C) and 5% (B and D) levels of probability using Duncan's new multiple range test

Table 3: Effects of types of cuttings on root fresh weight, dry weight ad length.

Tape of cutting	Fresh weight (mg)	Dry weigh (mg)	Length (cm)
Hardwood	8.955^{b†}	3.527^{b}	0.355^{a}
Semihardwood	62.143^{a}	21.915^{a}	0.838^{a}
Softwood	9.65^{b}	2.55^{b}	0.283^{a}

† Means in each of column, followed by the same letter (s) are not significantly different at the 1% level of probability using Duncan's new multiple range test

Table 4: Effect of IBA concentration on root fresh weight, dry weight and length of Chinaberry cutting.

IBA concentration (ppm)	Fresh weight (mg)	Dry weight (mg)	Length (cm)
0	0^{b}	0^{b}	0^{b}
1000	21.12^{b}	6.08^{b}	0.64^{ab}
2000	28.22^{b}	9.67^{b}	0.27^{b}
3000	63.81^{a}	21.82^{a}	0.41^{a}
4000	27.18^{b}	12.68^{ab}	0.34^{ab}
5000	18.15^{b}	7.711^{b}	0.38^{ab}

† Means, in each column, followed by the same letter (s) are not significantly different at the 1% level of probability using Duncan's multiple new range test

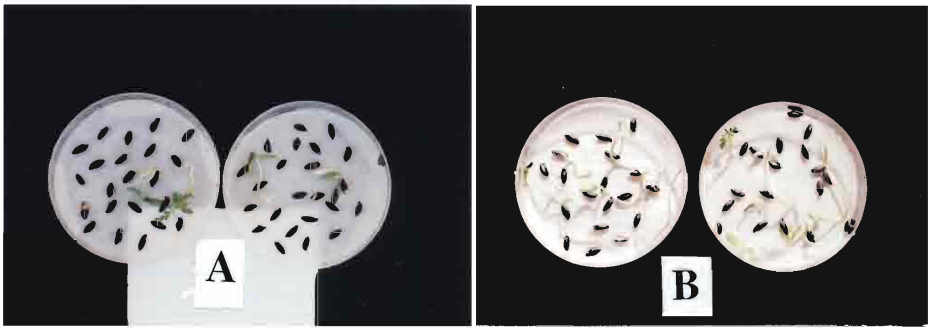

Fig. 1: Germinated Chinaberry seeds. A. Control, B. Using concentration of 800 ppm of GA_3

Fig. 2: Effects of IBA concentrations on rooting of Chinaberry cuttings. Left to right: application of 0, 1000, 2000, 3000, 4000 and 5000 ppm IBA

Asexual Propagation

Semihardwood Chinaberry cuttings were superior to both hardwood and softwood cuttings (Table 3).

Using 3000 ppm IBA produced the highest root length, fresh weight and dry weight. The differences were significant at 5% level probability (Table 4 and Fig. 2). These results are similar to those obtained by Hassan *et al*. (1993) for apricot.

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