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Short Communication

Propagation studies in *Farsetia aegyptia* Turra

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Native plants are key components of the global biological diversity, and are highly adapted to the local environmental and climatic conditions. As Kuwait's native plants are threatened in their natural habitat and have begun to disappear at an alarming rate, their use in landscape projects will help in conserving biodiversity and heritage. *Farsetia aegyptia* Turra. is a grey green, exceedingly rare woody perennial with potential to adapt to urban landscape conditions. In this study, efforts were made to standardize the techniques for mass propagation of *F. aegyptia*. Results indicated that pre-treating *F. aegyptia* seeds with 1000 ppm (78%), 750 ppm (77%), and 500 ppm (76%) GA_3 was effective in enhancing the germination, compared to the control (49%).

Key words: Urban landscape, greenery development, bio-diversity, conservation of native plants, *Farsetia aegyptia*.

INTRODUCTION

Semi arid regions of the world are most susceptible to land degradation and desertification with serious implications for sustainable use of the natural environment (Kassas, 1995; Brown, 2003). The term 'desertification' is somewhat controversial, but in this study is used in accordance with Dregne (1986), referring particularly to a reduction in plant productivity (due to the loss of perennial shrub cover), a decline in species diversity and the loss of soil resources (Brown and Mazrooei, 2003). The arid eco-systems of the world can support plants with minimum water requirements that are drought and salt tolerant, for use in afforestation, landscaping and gardening projects, as drought has always been a normal recurrent event in arid and semi-arid lands (Le Houérou, 1996). Perennial vegetation cover in Kuwait is sparse, and is usually less than 10% (Brown, 2001). As in other arid and semiarid countries, annuals are the most dominant species (256 species) followed by herbaceous perennials (83 species), shrubs and under shrubs (34 species) and tree (one) species (Omar and Bhat, 2008). Kuwait's native vegetation is of enormous scientific value as it represents a transition between semi-desert and desert vegetation and it is highly tolerant to harsh environmental conditions such as extreme temperatures, drought and salinity. Several native desert plants are being threatened and are facing danger of extinction due to anthropogenic causes (Sudhersan et al., 2003). In addition to their contribution to the integrity of the environment, native plants are invaluable sources of useful genes for genetic improvement of crop plants (AboEl-Nil, 1997). Shrubs in specific are significant for desert rangeland vegetation and have the potential for urban landscape utilization (Abo El-Nil et al, 1993).

The climate of Kuwait is characterized by extremely hot summer, with daytime temperature exceeding 50°C and winter, cooler and at times wet, with temperature sometimes falling below 4°C (Annual Statistical Report, 2006). The mean annual rainfall is 113 mm (Omar et al., 2007). The total conventional fresh water resources available in Kuwait is six million m^3/ year while the total water demand has exceeded 350 million m^3/ year in the year 2000 (Hamoda, 2001). Native soil in Kuwait is mostly sandy in texture with high infiltration rate and is calcareous in nature (Omar et al., 2007).

Al Lbanah (*Farsetia aegyptia* Turra.) is one of the native perennial species that belong to the Cruciferae family. It is of fodder value and has potential to adapt to urban landscape conditions where several exotic species are now being used. It is a grey green, woody perennial about 30 cm high. It has slender, smooth and multi-branched stems. The flowers are creamy brown with four petals. Two rows of seeds are formed in an oval-shaped

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Figure 1. *Farsetia aegyptia* Turra. (a) pod; (b) seeds.

seed pod (Figure 1). It flowers during April and the propagation is through seeds (Omar et al., 2007). *F. aegyptia* is now an exceedingly rare perennial. Literature study indicated that there are no previously published reports on mass propagation of this species (Brown and Mazrooei, 2003).

Unfortunately, efficient propagation and establishment techniques that are crucial for both conservation of native plants and large-scale use in landscape programs are currently unavailable. Hence, this study investigates the possibility of mass propagation via seeds.

MATERIALS AND METHODS

Seed source

Seeds used in this study were obtained from the seed bank of Kuwait Institute for Scientific Research (KISR) in November 2007. These seeds were collected from Sulaibiya (Kuwait) in April, 2007. Prior to their use in the experiment, seed viability was determined using Triphenyl Tetrazolium Chloride (TTC) Test (ISTA, 1999). In this test, viable embryos are stained pink due to the reduction of 2, 3, 5- TTC by respirative activity in the cell. For this, 100 seeds (four replicates of 25 seeds each) were soaked in distilled water overnight, placed in a Petri dish, soaked in 0.1% TTC solution, covered the Petri dish with aluminum foil and left for 24 h at room temperature (25°C). Following the treatment, seeds were washed thoroughly with distilled water to remove excess stain and examined under the microscope.

Germination studies

In this experiment the combined effects of dry heat (50°C) exposure of seeds for 10 or 20 days and treatment with 0, 500, 750 or 1000 ppm GA_3 solution for 24 h prior to sowing on germination of *F. aegyptia* were studied. For this the seeds from room temperature storage (25°C) were kept in an oven at 50°C for 10 or 20 days, after which they were removed from the oven and treated with GA_3 for 24 h. The individual effect of various concentrations of GA_3 (500, 750 or 1,000 ppm) in enhancing the germination of *Capparis spinosa* seeds was also assessed. The control seeds were not subjected to either heat or GA_3 treatment. Seeds with radicle that are at least 2 mm in length considered germinated and were recorded weekly in each treatment. The total germination was calculated when no more seeds germinated. In all there were 12 treatments which were replicated five times in a randomized design. Seeds were sown in a soil substratum comprising of three parts agricultural soil and one part peat moss (v/v basis) in jiffy pots and maintained in laboratory conditions at 25°C. The data were analyzed using R analysis procedure of Analysis of Variance (ANOVA) and Dunkan's Multiple Range Test to ascertain the significant differences among treatments (Little and Hill, 1978; Crawley, 2005).

RESULTS AND DISCUSSION

Viability of seeds used in these studies was found to be 90%. The highest germination (78%) occurred when the seeds were subjected to 1000 ppm GA_3 for 24 h (Table 1). Pre-treatment with 750 and 500 ppm of GA_3 also resulted in 77 and 76% respectively. Forty nine percent of the untreated seeds germinated. While heat treatment alone for ten days resulted in slight reduction in germination (38%), exposure to extended duration of heat (20 days) increased the germination marginally. It is interesting to note that germination decreased with the increase in GA_3 concentrations in seeds that were exposed to dry heat for 10 days. The improvement in germination by dry heat and GA_3 was significant at $P \leq 0.001$ level compared to control.

The findings of this study are essential as this is the first attempt to standardize the propagation techniques of *F. aegyptia*, and to promote its usage in urban landscape projects. It is of ultimate necessity to develop and enhance seed and vegetative propagation techniques to ensure their adoption by the agricultural sector in Kuwait, including local agricultural nurseries. Results of this study are imperative as desert rehabilitation and biodiversity conservation is crucial to prevent the extinction of valuable

Table 1. Effect of dry heat (50°C) exposure and GA3 on germination of *Farsetia aegyptia* seeds

Heat treatment	Germination (%) [i]			
	GA_3 Treatment (ppm)			
	0	500	750	1000
	24 h			
RT	49 ab [ii] ± 4.29	76 de± 7.31	77 e ± 3.39	78 e± 2.55
50°C 10 Days	38 a ± 4.67	71 cde± 7.18	55 abc ± 10.20	41 a ± 12.22
50°C 20 Days	56 abcd ± 6.18	61 bcde ± 3.74	64 bcde ± 3.40	52 abc ± 4.29

[i] Seeds with 2 mm or longer radicle or shoot are considered as germinated. [ii] The means followed by the same letter are not statistically different at p 0.001.

native plants in Kuwait (Suleiman et al., 2004: Omar et al., 2007).

Conclusions

For achieving re-establishment of the natural vegetation which is on the verge of extinction, restoration practices like artificial establishment of the same type of vegetation is essential. Utilizing native plants in the urban landscape promotes their sustainability in that region, facilitates conservation of natural plant diversity and imparts a fully natural appeal to the landscape. This is the initial step for the commercial production of these plants in Kuwait's nurseries. Mass propagation of native plants like *F. aegyptia,* a rare perennial in Kuwait, can be standardized for further commercial use. Pre treating the seeds of *F. aegyptia* with 500, 750 or 1000 ppm GA_3 was capable of increasing the germination percentage effectively.

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