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Full Length Research Paper

Effects of different culture media on rooting of *Urtica dioica* L. stem cuttings

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In the present study, the rooting behavior was evaluated for stem cuttings of one of medicinally important plant, *Urtica dioica* L. Among four treatments of rooting media which includes field soil, sand, small sand and water, average of rooting in field soil was highest. There were no differences in root production between macro sand and water treatments. The same patterns occurred with root weight per cutting. Other hand the potential of root production in nettle stem cuttings was: water = macro sand < field soil. The plants rooted transplantation into plastic bags very well and grew until the flowering stage. The amount of produced biomass per plant is about 400 grams after 4 months growth. From results of this study it can be concluded that vegetative propagation of this important plant is feasible through application of stem cuttings on soil propagation bed, better than other *in vivo* media under controlled conditions.

Key words: Soil, growth conditions, medicinal plants.

INTRODUCTION

Medicinal plants are a primary or supplementary element of 80% of the world's health care practices. Worldwide use of medicinal plants has risen significantly over the past two decades, fueling development of an important agricultural market valued at over US $ 60 billion annually (World Health Organization, 2004). This rapid rise in demand, however, has not been matched by equal increases in cultivation (Pagliarulo et al., 2004). Also, the pharmaceutical industry is largely dependent upon the wild populations for supply of these plant species for the extraction of their intrinsic bioactive component (Tiwari and Das, 2010). Because the land sources of wild medicinal plants are limited, attempts to allow the replenishment or cultivation of this important flora is more necessary and there is an urgent need to develop effective propagation methods for cultivation of these important medicinal plants which will ultimately lead to their conservation as well as supply for commercial use.

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More often, plant species are hard to propagate sexually and they also show complexities and undesirable characters (Johnston et al., 1959). Thus, vegetative propagation through stem cutting is the most vital and sole method to reproduce these plants species (Nanda, 1970; Tiwari and Das, 2010). In vegetative propagation, the rooted plants by cottage have many advantages, such as faster growth rate (Ooyamma and Toyoshima, 1965), greater stock stand uniformity, better site matching and true– to- type planting material production (Fielding, 1969). Cutting can be categorized into three groups; easy to root, difficult to root and obstinate to root (Nanda, 1970; Mumtaz et al., 2009).

The nettle (*Urtica dioica* L.) is a perennial plant grown in temperate and tropical wasteland areas around the world (Stepniak and Szewczuk, 2001; Povoa et al., 2003). In folk medicine, nettles have been used as a diuretic agent and for the treatment of arthritis and rheumatism. Nowadays, nettle is an important medicinal herb and is consumed as a component of the human diet due to its content of minerals, chlorophyll, amino acids, lecithin, carotenoids, flavonoids, sterols, tannins and

Figure 1. All the experiment was conducted under green house conditions in Zanjan University Landscape Unite (a); the nettle rhizomes that cultured in medicinal plant nursery (b); the morphology of nettle (c); the experimental design was arranged in randomized complete block design with five replications for each treatment (d).

vitamins. Several compounds present in the nettle have demonstrated antiviral properties potentially applicable for treatment of certain diseases for example, HIV and several common respiratory viruses. Some compounds also have antiproliferative effect on human prostate cancer cells (Krystofora et al., 2010). Fiber nettle has potentials as a fiber crop in the natural textiles industry, an industry requiring production by organic methods (Vogal and Hartl, 2003; Gatti et al., 2008). In this present study, the rooting of nettle stem cuttings in different rooting media (propagation bed), which includes field soil, sand, small sand and water, were evaluated.

MATERIALS AND METHODS

All the experiment were conducted under green house conditions in the Landscape Unit, Research Institute of Physiology and Biotechnology, University of Zanjan, Zanjan, Iran, during autumn of 2009. The nettle rhizomes that were collected from the Tarom region mountains (Zanjan Province) were cultured in medicinal plant nursery. The stem cuttings were prepared at same size each (0.3 to 0.5 cm diameter and 10 cm long), with three nodes and four leaves. Stem cuttings were directly placed in four propagation beds without any hormone treatment. The four different rooting media which includes field soil, sand, small sand and water, were used as bed culture. Cuttings were harvested 2 weeks after planting and evaluated for percent cutting rooted and number of roots per cutting. The experimental design was arranged in randomized complete block design with five replications for each treatment and the data was analyzed for the variance (Figure 1d).

RESULTS AND DISCUSSION

Stinging nettle showed a good aptitude for being propagated by stem cuttings (Figures 1 and 2). Root organs developed without particular problems in 12 to 15 days. Stem cuttings from juvenile plants are generally recommended over stem cuttings from mature plants for propagation (Dore, 1953; Hartmann and Kester, 1983; Ferguson et al., 1985; Kesari et al., 2010).

Our data indicated that only juvenile cuttings with a small leaf area produced more roots than mature cuttings

Figure 2. Comparison of 4 studied treatments including a) macro sand, b) soil, c) small sand and d) only water on rooting of nettle stem cuttings.

Figure 3. Rooted nettle stem cuttings after 25 days (a) and production of fresh nettle roots after 90days.

with the same leaf area. Furthermore, leaf area of juvenile cuttings did not affect root production, but leaf area on mature cuttings did. Plants that developed through stem cuttings were transplanted (approximately 20 cm tall) to culture boxes (Figure 3a). Between four treatments of rooting media which includes field soil, sand, small sand and water, average of rooting in field soil is highest (Figure 2). There were no differences in root production between macro sand and water treatments. The same patterns occurred with root weight per cutting. On the other hand, the potential of root production in nettle stem cuttings is:

Water = macro sand < field soil (Table 1)

The plants with root were properly transplanted into plastic bags and grew until the flowering stage. The amount of produced biomass per plant is about 400 g after 4 months growth (Figure 3b).

Because the nettle prefer nitrogen rich soils in the wild lands, using a rich potting medium and regular fertilization will result in healthy nursery stock. Since there is considerable variability in the rooting of stem cuttings of different nettle species, large-scale propagation should not be attempted until the best procedures for producing rooted stem cuttings of specific species have been determined.

Conclusion

In this present study, efforts were made to develop an

Table 1. Analysis of variance output for the effect of different rooting media on nettle stem cuttings.

Average of root number per stem cutting	Treatment
6[a]	Soil
4[b]	Sand
2[c]	Macro sand
2[c]	Water

Different lowercase letter above any column indicates that means are statistically different at $p < 0.01$ according to Duncans multiple range test.

efficient, rapid and inexpensive method for large scale propagation of *U. dioica* L. The results indicate that it is possible to successfully propagate nettle using stem cuttings that originate in Zanjan-Iran mountains. The best rooting rate (98%) at green house conditions was obtained in field soil bed culture.

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