Comparing Germination in three Species: Ammodendron, Milk Thistle and Silybummarianus in Hydroponic System and Soil Culture

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Abstract: To investigate the effect of the type of germination medium on germination of three species, namely Ammodendron, Milk Thistle and Silybummarianus, a factorial experiment with a completely randomized design with three replications was conducted. The studied factors were plant type, hydroponic culture, hydroponic culture with nutrition by Liquid fertilizer phosphorus and potassium, and soil culture. Daily germination speed and amount data was collected in 11 days. The studied indices were stem length in three species. Results showed that the highest stem growth were related to Ammodendron. Among the studied treatments, the best medium was hydroponic culture with fertilizer and there was a significant difference between this medium and the other media at p=.05.
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Key words: hydroponic; root length, seed germination; fertilizer.

1. Introduction

Plants are considered as one of the most important parts of an ecosystem. Also, providing food for the country's growing population and the need to achieve self-sufficiency in the production of forage will ultimately lead to food security (Khoshgoftar et al., 2007). Iran is located in arid and semi-arid areas, so a major part of its territory is devoted to dry farming. In these areas, the biggest limiting abiotic factor is water stress which affects the plants, especially in poor environmental conditions. The water stress, by influencing on the leaf surface, vegetation, photosynthesis and crop growth rate, greatly reduces the vegetative growth and grain yield (Kuchaki, 1995). Qualitative and quantitative restriction of soil and water resources is considered as a fundamental pasture production bed. A high percentage of arable land in Iran faces with problems of salinity, sodium and waterlogging, to varying degrees. Considering these, it seems necessary to adopt new policies and provide more favorable conditions for the plant's nutrient. Hydroponic cultivation is an advanced form of planting the crops that makes special controls on distribution of nutrients to plants possible (Calpas, 2001).

According to many researchers, hydroponic substrate must be drained easily, have adequate ventilated power, have a good water holding capacity, be free of weed seeds and other harmful substances, and be affordable in a low price (Cantliffe at al., 2007, Allaire et al., 2004). In Hydroponics, despite the need for sufficient expertise and a relatively high initial capital compared to soil cultivation, many advantages such as high performance, low labor requirement, easy working, no need to complying with crop rotation, weed control, uniformity of plant growth, minimal water loss, lack of plants' competition for water and nutrients, possibility to supply nutrients tailored to the needs of plants and less use of chemicals and consequently the availability of more healthy agricultural products can be seen (Miceli et al., 2003; Takeda, 2000; Jaenaksorn & Ikda, 2004).

2. Materials and methods

This study was conducted in the greenhouse of Yazd University, Faculty of Natural Resources in 2014. To this aim, seeds of Ammodendron, Milk Thistle and Silybum marianus were prepared. The pot experiment was carried out in greenhouse of Yazd University with a factorial experiment, using a completely randomized design with three replications. The three factors were hydroponic culture, hydroponic culture with nutrition by Liquid fertilizer phosphorus and potassium, and culture in the soil medium with a loamy context, respectively.

The studied indices were stem length (cm) in three species. Because the assumptions of normality and equality of variances were met, the collected data were analyzed using two-way ANOVA. Means of treatments were compared using Duncan's test and corresponding graphs were plotted using Excel software. All the statistical analyses were done using SPSS 16.

3. Results

ANOVA results showed a significant difference between the accessions (table 1), the stem length (p <./ 05). ANOVA indicated a significant difference

between the growth rate of three plant species in three different media (hydroponic culture with fertilizer, hydroponic culture without fertilizer and soil with fertilizer).

Table 1. The mean squares from analysis of variance of the studied traits

Stem length	DF	Sources of changes
**13.358	2	Treatment

*- significance at.01 level، **- significance at.05 level، ns- non-significant

Mean comparison using Duncan test showed that the highest plant growth in terms of germination, stem growth was related to hydroponic culture (with or without fertilizer) (table 2).

Table 2. Comparing the means of the experimented accessions in terms of the studied traits

Stem length	Medium	Row
10.3333 a	Hydroponic with fertilizer	1
a9	Hydroponic	2
6.1667 b	soil	3

Based on Duncan's multiple range test (5%), there is no statistically significant difference between the average treatments with the same letters.

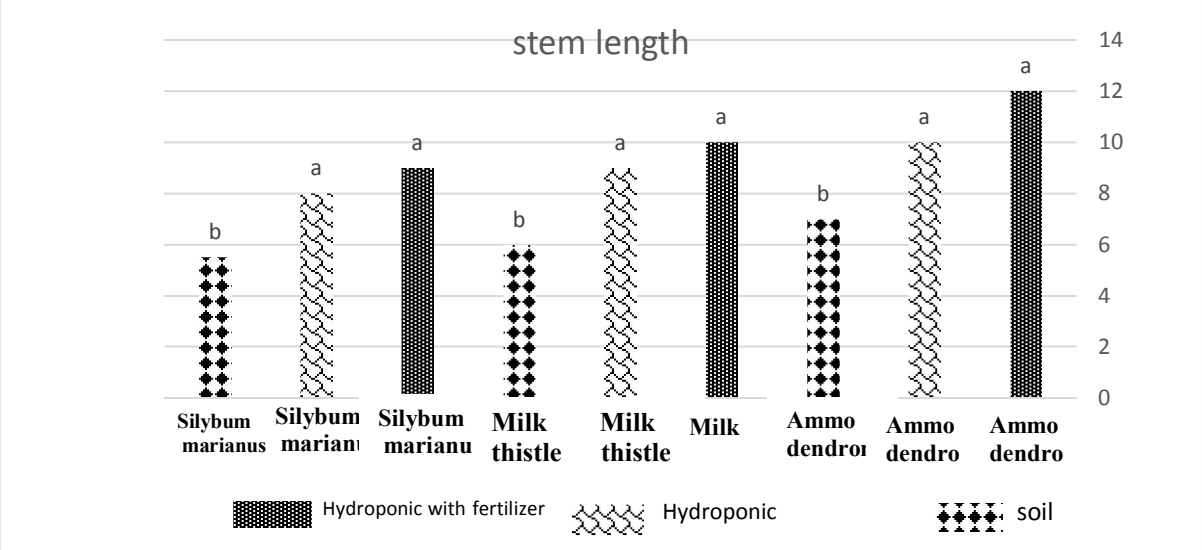

Figure 1. Comparison of stem length in 3 species in different experimental media

4. Discussion

In general, soilless media have more efficiency and benefits in horticulture, than the soil cultures. Hydroponics leads to a higher production per unit area (FAO, 1990; Resh, 1998). Low water consumption and increased production per unit area is the most important indicators of hydroponics. In hydroponic culture, water consumption per hectare is equivalent to. 0.34 L/S, which is almost one-third of water consumption in conventional tillage. The excellent quality and pollution-free and off-season production is also possible in this method (Turner Bambi, 2008). In general, hydroponic products are high quality and earlier from a week to a month (Mehrjerdi Zare, 2010). Also, in this method, the soil-borne pathogens or improper physical and chemical properties of soil are avoided, and growth and production become optimized due to increased water and minerals available in the root (Scott et al., 1988).

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