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Effect of Different Soil Media and Irrigation Intervals on the Growth of Aerial Plant Parts of *Sophora secundiflora*

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Abstract: The effect of different soil media and irrigation intervals on the growth of aerial plant parts of *Sophora secundiflora* was investigated. Seven different media i.e., sand, silt, clay, sand + silt (1:1), sand + clay (1:1) silt + clay (1:1) and sand + silt + clay (1:1:1) were subjected to different irrigation intervals i.e., daily irrigation, alternate day irrigation and irrigation with two days interval. Among the tested media sand + silt + clay showed statistically significant effect as regards plant survival (75.67%), plant height (20.80 cm), stem weight (6.41 g) and number of leaves per plant (23.02). Maximum germination (92.22%) was observed in sand + silt. Irrigation with two days interval significantly affected plant survival (66.42%), plant height (17.53 cm), stem weight (5.42 g) and number of leaves per plant (20.12). Germination percentage was maximum (86.19%) in seeds receiving daily irrigation. It can be concluded that medium sand + silt + clay irrigated with two days interval was found to be the best among the tested media and the irrigation intervals for the growth of aerial plant parts of *Sophora secundiflora*.

Key words: *Sophora secundiflora*, soil media, irrigation intervals, growth

Introduction

Mescal bean (*Sophora secundiflora*) belongs to family Leguminosae and is a native of Texas and Mexico (Baily, 1963). It is a small tree which can be grown in tropical and sub-tropical regions. It is an evergreen tree reaches to a height of ten meters with short slender trunk and upright branches. The flowers are pea shape, violet blue and very fragrant. Economically *S. secundiflora* is an important plant fetching a good price. It contains sophorine, a poisonous alkaloid which is used in various insecticides and medicines. It can be successfully propagated by seeds. Seedlings can be raised on variety of soil but it thrives best on well drained, sandy loam and fairly well in rather dry soil.

Soil media plays a very important role in the growth and development of various plant parts. Similarly water also plays a vital role in the success of plant because water makes food nutrients in solution form and lowers the temperature of the plant as well. Water deficiency keeps the plant under stress and disturb the physiological processes of the plant.

Sheikh and Khan (1985) carried out research on trees of four species (*Leucaena leucocephala*, *Tecoma undulata*, *Robina Pseudoacacia* and *Certonia siliqua*). They were watered every 1, 2, 3 or 4 weeks (or not watered). *Leucaena leucocephala* grew best of all species under all treatments. Height, growth and biomass production both increased with increasing irrigation, reaching a maximum with weekly irrigation. Height and growth of *C. siliqua* also increased with increasing irrigation. Singh and Sharma (1985) taken cuttings of *poultus ciliata* from plants grown in the nursery over one season were planted in tins containing 5 different soil mixtures. Mixes were purely nursery soil, pure sand or mixtures of these containing 25, 75, or 50 % of nursery soil. Growth was determined by measuring height, diameter of root and shoot and dry weight of rooted cuttings. The height and diameter were greatest and root: shoot ratio was least in the 50: 50, soil mixtures. It was concluded that best growth occurred in sandy loam (50: 50 mix). Al-kawaz and Alwai (1988) noticed the effect of soil media and irrigation intervals on the germination and growth of *prosopis tamaruga* and found that best medium for germination was sandy soil and best for seedling growth was loamy soil. Further irrigation intervals significantly affected all parameters except survival with the best interval being one day. Ahmad *et al.* (1996) worked on aerial and subterranean plant parts of *Ficus elastica* as affected by different soil media and recorded maximum plant height, shoot thickness, number of leaves and number of roots in sand + silt + clay, while minimum values were recorded in sand + clay for all parameters mentioned. Subhanullah *et al.* (1997) conducted experiment on the effect of different soil media and irrigation intervals on growth of aerial parts of the *Tecoma grandiflora* cuttings. Several different combinations of sand, silt, clay and sawdust were subjected to different irrigation intervals i.e., daily irrigation, at alternate days and with two days interval. Maximum sprouting and plant survival were observed in sand + silt + clay + sawdust. Maximum plant height, stem thickness, stem weight and number of leaves per plant were noted in media sand + silt + sawdust receiving daily irrigation.

Materials and Methods

In order to investigate the effect of different soil media and irrigation intervals on the aerial plant parts of *sophora secundiflora*, the experiment was conducted at Ornamental Nursery, Department of Horticulture, NWFP Agricultural University, Peshawar during 1996-97. The following seven media were used in the experiment

Sand, Silt, Clay, Sand Silt (1:1), Sand + Clay + (1:1), Silt + Clay(1:1), Sand + Silt + Clay (1:1:1).

The media were filled in polythene bags of size 8x18 cm². The experiment was laid out in a two factorial RCB design and 10 seeds per treatment were sown in bags. Thus 630 seeds were sown for the whole experiment.

Irrigation was done at the following intervals:

- Daily irrigation.
- Irrigation at alternate day.
- Irrigation with two days interval.

The evaluation was based on germination percentage(%), plant survival rate(%), plant height (cm), stem weight (g) and number of leaves per plant. The data recorded on different parameters was statistically analyzed according to approximate statistical techniques (Steel and Torrie, 1984) for Randomized Complete Block Designee.

Results and Discussion

Germination percentage (%): The germination percentage was significant due to the media and irrigation intervals (Table 1 and 2). Highest germination percentage (92.22%) observed in sand + silt, reflects the fact that this medium might has provided conditions essential for activating enzymatic and biochemical processes which ultimately resulted in better germination. The addition of silt in this medium has improved the moisture retentive property and sand has improved it aeration. These findings are in accordance with Al-Kawaz and Alwai (1988) who reported that best medium for germination was sandy soil. The minimum germination percentage (62.22%) in clay medium may be due to its compactness and poor aeration creating hypoxic conditions. In case of irrigation intervals maximum germination percentage (86.19%) was observed in seeds receiving daily irrigation. This suggests that this irrigation interval might have created an ideal conditions for seeds to resume growth and development more effectively and quickly than other irrigation intervals. The minimum germination percentage was recorded in seeds receiving irrigation with two days interval.

Percent plant survival: The maximum plant survival (75.67%) was observed in plants, grown in sand + silt + clay as compared to the rest of the media (Table 1). The maximum survival in this medium may be due to the porous texture and excellent air circulation and drainage. These findings are in accordance with Subhanullah *et al.* (1997) who reported maximum plant survival in sand + silt + clay + saw dust in *Tecoma grandiflora* cuttings. Minimum plant survival (51.06%) was recorded in medium clay. It is evident

Table 1: Effect of different soil media on aerial plant parts of *sophora secundiflora*

Media	Germination %age	Percent survival (%)	Plant height (cm)	Sem weight (g)	Number of leaves per plant
Sand	86.6713b	52.47e	10.53f	3.25f	10.80f
Silt	81.11c	56.99d	14.69e	4.72d	17.55d
Clay	62.22e	51.06e	14.23e	4.34e	16.15e
Sand + silt	92.22a	67.84b	17.29c	5.22c	20.32c
Sand + clay	80.00c	63.56c	15.55c	4.74d	18.11e
Silt + clay	70.00d	58.46d	18.08b	5.51b	21.34e
Sand+silt + clay	85.56b	75.67a	20.80a	6.41a	23.02a

Means not followed by same letters are significantly different at 5% level of probability.

Table 2: Effect of different irrigation intervals on aerial plant parts of *sophora secundiflora*

Irrigation intervals	Germination % age	Percent survival (%)	Plant height (cm)	Stem weight (g)	Number of leaves per plant
Daily irrigation	86.19a	54.98c	13.49c	4.14c	15.71c
Irrigation on alternate day	79.05b	61.10b	16.63b	5.09b	18.72b
Irrigation with two days intervals	73.81c	66.42a	17.53a	5.42a	20.12a

Means not followed by same letters are significantly different at 5% level of probability.

from Table 2 that plants irrigated at two days interval rate showed maximum survival (56.03%). This might be due to the availability of optimum moisture at this interval. Thus root absorption is improved which ultimately caused vigorous growth of aerial plant parts. Minimum plant survival (47.38%) at daily irrigation reflects the situation that too much water caused saturation of media, which created anoxia for plants. Plants roots are therefore, asphyxiated and unable to respire properly.

Plant height (cm): The plant height was maximum (20.80 cm) in sand + silt + clay. Maximum plant height in this medium may be due to the low leaching of nutrients and good texture produced optimum conditions for plants growth. Plants grown in this medium had maximum number of leaves per plant that might have enhanced the photosynthetic activities, prepared sufficient food for plant growth and had a deeper root system which fully utilized the nutrients. The said results are in accordance with the findings of Singh and Sharma (1984) who concluded that height and diameter increased when 50% sand was added to media and found that the best growth occurred in sandy loam. Minimum plant height (10.53 cm) was recorded in medium sand. Plants irrigated at two days interval were tallest (17.53 cm). Daily irrigation gave minimum plant height (13.49 cm). Minimum plant height due to daily irrigation reflects the situation that too much water caused saturation and media remained wetted leading to suppression of root growth which resulted in lower absorption ultimately caused dwarfness of plants.

Stem weight (g): It is evident from the data that different soil media and irrigation intervals had a significant effect on stem weight (Table 1 and 2). Maximum stem weight (6.41g) was recorded for plants growing in sand + silt + clay. It is due to maximum plant height and stem thickness in this medium. The stem weight is sum total of stem height and stem thickness. The minimum stem weight (3.25 g) was recorded in sand. Comparing the means of irrigation intervals it was found that stem weight was maximum (5.42 g) for plants irrigated with two days interval, while minimum stem weight (4.14 g) was recorded for plants receiving daily irrigation.

Number of leaves per plant: The maximum number of leaves per plant (23.02) was recorded in medium sand + silt + clay, followed by silt + clay with 21.34 leaves per plant (Table 1). Maximum number of leaves in sand + silt + clay may be due to maximum plant height, which ultimately resulted in

maximum number of leaves per plant. The results of good performance in this medium are in line with the work of Ahmad *et al.* (1996) who reported maximum number of leaves per plant in medium, sand + silt + clay in *Ficus elastica* cuttings. As the plants in this medium showed a vigorous growth due to the availability of a suitable soil mixture and timely application of water, therefore, an increased number of leaves was recorded in this medium. Minimum number of leaves per plant (10.80) were counted in sand. This may be due to minimum plant height and more leaching of plant nutrients, resulting in the poor plant growth and hence produced minimum number of leaves per plant. The data pertaining to irrigation intervals are presented in Table 2. It is evident from the mean values of the results that maximum number of leaves per plant (20.12) were counted in plants irrigated with two days interval. The number of leaves per plant were minimum (15.71) in plants receiving daily irrigation. This may be due to the minimum plant height.

In the light of the results recorded in this experiment, the medium sand + silt + clay irrigated with two days interval was found to be the best among the tested media and irrigation intervals and are recommended for the best growth of *Sophora secundiflora*.

References

- Ahmad, M., S. Rahman and M. Ishtiaq, 1996. Studies on aerial and subterranean plant parts of *Ficus elastica* as affected by different soil media. *Sarhad J. Agric.*, 12: 633-636
- Al-kawaz, S. S. and H. H. Alwai, 1988. The effect of soil media and irrigation interval on the germination and growth of *Prosopis tamarugo* Phill. Seedling in Hamam Al-Ail Mesopotamia. *J. Agric.*, 21: 175-185.
- Baily, L. H., 1963. The standard cyclopedia of horticulture. Volume 3 P-Z, pp: 3192.
- Sheikh, M. I. and S. M. Khan, 1985. Effect of frequency of watering on the survival and growth of fodder trees. *Pak. J. Forestry*, 33 :123-125
- Singh, R. V. and K. C. Sharma, 1985. Effect of soil mix on the growth of *Populus ciliata* in the nursery. *Indian J. Forestry*, 7 : 102 - 105.
- Subhanullah., M. Ishtiaq and G. Rehman, 1997. Effect of different soil media and irrigation intervals on the growth of aerial parts of *Tecoma grandiflora*. *Sarhad J. Agric.*, 13: 243-243