Development of Ecological Sound Proof Wall by the germination of plant species at different Environmental Condition

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생태방음벽에 개발에 사용되는 식물종의 성장에 관한 연구

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Abstract

Effect of temperature, pH and soil depth on germination of *Dianthus chinensis, Dianthus barbatus, and Perennial pennant* were investigated in growth chamber and soil condition at the ratio of 7:3 (natural soil and organic soil) in laboratory condition. the optimum temperature for seed germination was recorded for 20℃- 25℃. Maximum germination was observed for *Dianthus barbatus* (76%) where as in soil condition *Perennial pennant* (51%) showed maximum germination at 1 cm soil depth. Similarly, optimum pH for seed germination was at pH 6 in all the species. So in lower pH (at pH4) seed germination was inhibited. Germination of these selected species at different environmental condition help to construct the ecological sound proof wall to mitigate the noise especially in urban areas.

1. Introduction

Successful establishment of plant species is often dependent on the timing for germination resulting from seed responses to environmental cues. Seeds often respond to a combination of different environmental factors such as light, temperature, soil moisture that are most favourable to their establishment. Temperature is a major factor that influences germination. Plant species have various temperature ranges over which their seeds will germinate, so very high and very low temperature may causes the effects on seed germination. Although, some species shows better germination performances at constant temperatures, others are favoured by alternate temperature, which are a condition that more closely resembles the natural environment. It is also well established that many seeds are sensitive to light. Many species respond to the environment with optimal growth and development according to light they receive [1]. The pH of the soil can control the distribution and abundance of plants. The germination of seeds may be directly related to the depth at which seeds are shown [2].Burial at shallow soil depth resulted in greater germination than seeds broad cast on the soil surface. However, excessive seed burial may effect seed germination and prevent seedling emergence. Generally, both seed germination and seedling emergence decreased with increasing seedling depth. The aim of this study was to investigate and evaluate the effects of pH, soil depth and constant but with different temperature on the germination of these selected seed species. Germination of these species are very important to make ecological sound proof wall.

2. Materials and Method

Germination test

Germination of *Dianthus chinensis, Dianthus*

barbatus, and *Perennial pennant* were determined by placing 100 seeds in 9-cm (diameter) petri dishes containing two layers of What man no.1 filter paper, moistened with 5 ml distilled water. Thereafter, the dishes were incubated in growth chamber to observe the effect of temperature on seed germination. The germination was determined at 15℃, 20℃, 25℃,and 30℃, at a constant humidity (40 %)and alteration of photoperiod (12 hrs light and 12 hrs dark) through out the study. Each species were tested in three complementary dishes. The moisture level of filter paper was maintained by adding distilled water as require. Germination seeds were removed every three days over a 14 days incubation period. The seeds were considered to have germinated when their radicals had >2mm long.

Effect of pH on seed germination

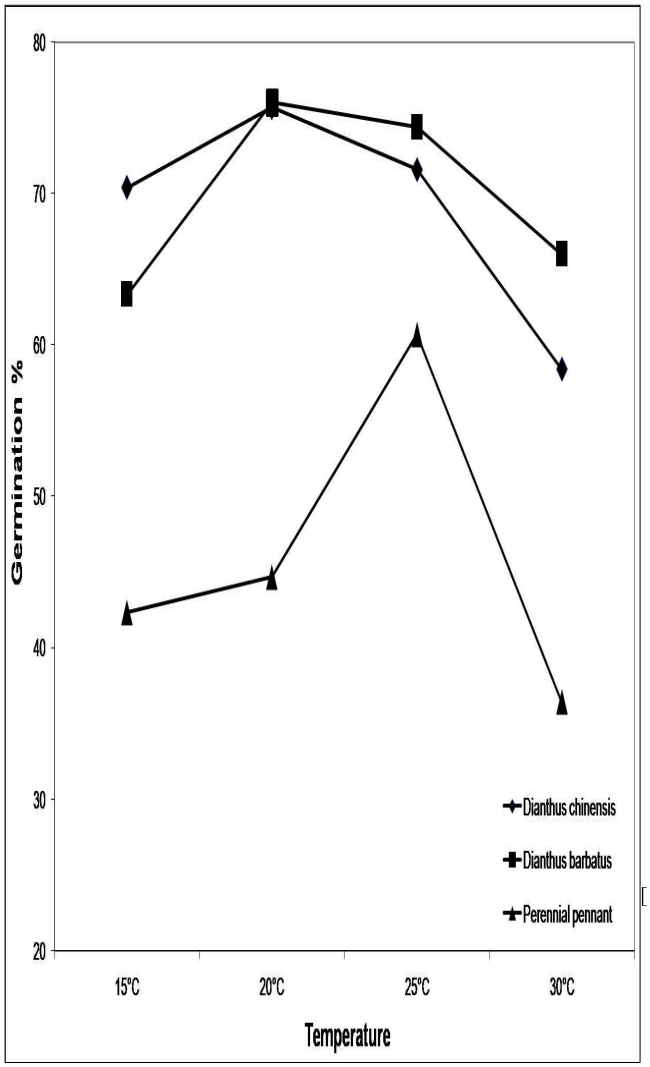
The influence of pH on the germination of given seed were studied by using pH meter ranging from 4- 8, adjusted by the addition of either HCL or NaOH

Effect of soil depth on seed germination

A laboratory experiment was performed in order to study the effect of burial depth on seed germination and seedling emergence. Four seedling depths were used including: 1 cm, 2 cm, 4 cm and, 6 cm. Hundred (100) seeds were placed in plastic pots (15cm width×17cm height) containing the mixture of garden soil and organic soil at the ratio of 7:3. The drainage outlet made at the bottom of each pot. Each test was carried out in duplicate manner and the pots were watered immediately after seed sown and daily there after. Total germination was recorded after 4 weeks of experiment.

3. Result and Discussion

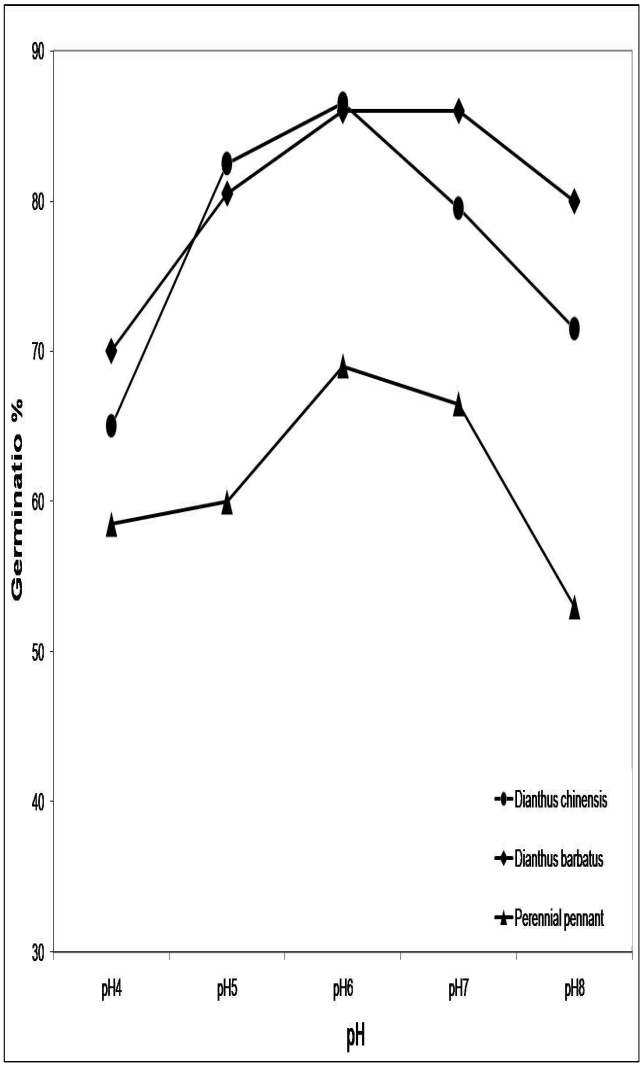
The germination of tested seed was observed both in growth chamber and soil condition as described in materials and methods. In growth chamber maximum



[Fig. 1]Germination of seed at different temperature

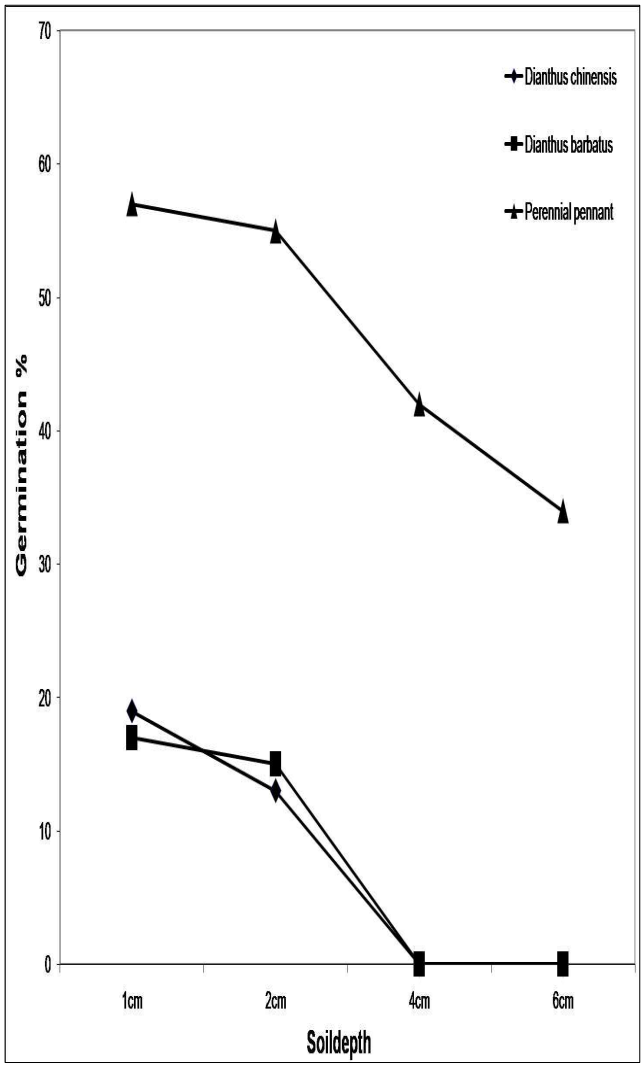
germination was recorded for *D. barbatus* (76%)at 20℃. In case of *P.pennant* germination was found increased with increasing temperature. The highest germination was found at 25℃. This result clearly indicated that germination was greatly influenced by temperature in which below 20℃.and more than 30℃ was not suitable for the germination. the highest germination percent was observed at pH 6. Among all the species, *D. chinensis* showed the highest germination at pH 6 and the least germination was observed at pH 4. In all the cases the germination was decrease by decrease in pH. According to [3] average suitable pH values for general plant growth were 6.5 - 7.5. Seedling depth had a greater influence on seedling density. Our result showed that optimum depth for selected species was 1-2 cm soil depth. Below 2 cm soil depth seed germination was

found decreased it was because of low penetration of light and the influences of several other factors.For *D. chinensis* and *D. barbatus* showed quick



[Fig. 2] Germination of seed at different pH

germination in soil than *P.pennant* but large proportion of seedling had died during the experimental period. The causes of higher mortality of seedlingwas unknown. However, *P.pennant* showed germination in all soil depth and also expected that it may germinate below 6cm. The reason was that seeds of *P.Pennant* was comparatively bigger than two tested species. A bigger seeds means more energy reserve and hence, greater vigor and higher chances for emergence of seedlings from deeper locations[4].



[Fig. 3] Germination of seed at different soil depth

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