P—32. SEED GERMINATION AND SEEDLING GROWTH IN *PINUS KESIYA* WITH REFERENCE TO ENVIRONMENTAL FACTORS

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Recently studies on seed germination and seedling survival of many pines have been emphasized due to increasing demand of long fibered species for paper and pulp industries. *Pinus kesiya* Royle ex Gord. is a dominant gymnospermous species of Meghalaya growing at high altitude of about 1131 m (lat. 25°—40′ N and long. 91°.31′ E). The seeds show poor germination and growth under natural conditions. The various environmental factors are known to play an important role during initial stages of germination and growth in pines. (Toole et al., 1961 ; Campbell, 1982). The present investigation was conducted to find out the requirements of imbibition, substrate moisture and pH, light and temperature for optimization of seed germination and seedling growth of *P. kesiya.*

Amongst imbibition of seeds at varying temperatures (5—35°C) and periods (0—96 h), a 5° C presoaking treatment for 24 h greatly improved germination and seedling growth. Presoaking of *Pinus* seeds at low temperature has been tried by many workers to improve germination (Toole et al., 1961). The induction of seed germination was probably due to leaching of inhibitors, increase in level of endogenous growth regulators and initiation of phytochrome system.

The unimbibed seeds supplied with acidic water (pH 4, 8-6.8), did not show any significant difference $p < 0.05$) in germination and seedling growth. However, early germination at pH 6.0 and 6.4 and higher total germination at pH 4.8 were recorded. The soil moisture level determines the sprouting of seeds as well as seedling establishment. During the present study, the seeds were subjected to water stress ranging from 0 to —15.0 bars. The seed germination and seedling growth was stimulated at water potential of —2.5 bars whereas higher water potentials were found inhibitory. It has been reported that soil moisture content below field capacity resulted in poor germination of *P. densiflora*, *P. thunbergii* and *Chamaecyparis obtusa* seeds (Satoo, 1966).

Light has been reported stimulatory for pine seed germination (Campbell, 1982). Similar results were obtained during the present study. Amongst different photoperiods (8—20 h) and light intensities (1—10 lux), a 16 h photoperiod of 3.0 lux light was found optimum for seed germination and seedling growth. The red (10 min) and far-red (20 min) irradiations showed stimulatory and inhibitory effects, respectively on seed germination. The reversal effect of R/F/R showed an increase in extension growth whereas R/F/R/F a decrease. A reverse picture was obtained for biomass. It seems that red irradiation initiates

phytochrome system during seed germination. The red light has been reported to increase polysome formation mediated by phytochrome action, specific protein synthesis and mRNA containing poly A^+ in *P. thunbergii* seeds (Yamamoto, 1982).

To assess the temperature requirement of seed germination and seedling growth in *P. kesiya*, constant temperatures from 15—35°C at 5° difference and also their diurnal temperature were tried. A constant temperature of 25°C and diurnal temperature of 35/20°C showed better seed germination and seedling growth, respectively. Both constant temperature and diurnal thermoperiodicity are reported to accelerate the seed germination in pines (Dunlap and Barnett, 1982). It seems that temperature causes change in seed coat constraint giving an impulse to embryo for germination. However, the requirement for each species varies probably due to genetical or physiological factors.

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