Germination of Himalayan alpine and temperate Potentilla

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MS received 5 January 1979; revised 15 October 1979

Abstract. Seed germination of 11 species and four ecotypes of one species of Potentilla, collected from Himalayan alpine and temperate climates has been studied under light and temperature conditions. Germination is generally favoured by high temperature and continuous light but the magnitude of response varies from one species to another. The ecotypic variations or the parental environment does not influence germination.

Keywords. Seed; germination; Potentilla; taxonomical importance.

1. Introduction

Physical parameters of an environment such as light and temperature determine the success or failure of a species in a particular locality which in turn depends mostly on the germinability of the seeds of a particular species. This is evident from the fact that the different populations of the same species vary in their temperature and light requirements for germination (Stearns and Olson 1958; McNaughton 1966; McWilliams et al 1968). Seed germination of the same species may also vary with the time of collection (Cavers and Harper 1966) and parental environment (Koller 1962; Evenari 1965; Karssen 1970; Juntilla 1971; Kigel et al 1977). Whittington (1973) has shown that germination characteristics are partially under genetic control and once adapted the germination pattern of the species does not change. Considerable work has been done on the germination behaviour of alpine plants, other than those from the alpine region of Himalaya (Amen 1966; Bliss 1958; Bonde 1965 a, b and the references cited by these reviewers). It has been concluded that most of the alpine species do not show intrinsic dormancy and that germination in most of these is better in light than in darkness. We have undertaken studies on the functional dynamics of plants at different altitudes in Garhwal Himalaya mostly dominated by members of the families of compositea, rosaceae, polygonaceae and leguminosae. Seeds of dominant plant species from different altitudes were collected in the alpine and temperate zone of this area. It was considered worthwhile to study the temperature and light requirement for seed germination of these species as it might prove useful to understand the mechanism of adaptation. Family rosaceae in this area is represented mainly by differe-
rent species of genus *Potentilla*. This paper deals with the germination behaviour of these species under two light and temperature conditions.

2. Materials and methods

Seeds of different species of *Potentilla* were collected from different localities situated between 2,500 m to 3,600 m altitude in Garhwal Himalaya. As the period of maturity varied from species to species, the seeds were collected between September and October 1977. These were then dried in the open air for one week, and stored in polythene bags in the laboratory under natural light and temperature conditions. The temperature during storage varied from 12 to 20°C. The duration of storage in different species was between 2-3 months.

Five replicates per treatment with 100 seeds in each replicate of *P. atrosanguinea*, *P. albifolia*, *P. leuconota* and all the four ecotypes of *P. fulgens* and in the case of *P. sibbaldi* and *P. polyphylla* 250 seeds in each replicate were studied for germination. In *P. microphylla* and *P. nepalensis* only 150 seeds and in *P. fruticosa* 100 seeds were sown per replicate whereas, three replicates of 25 seeds each were observed under each environmental condition in case of *P. ambigua*. Seeds were kept in petridishes (8 or 14 cm dia) on one layer of Whatman No. 1 filterpaper. Distilled water was used as a germination media. Petridishes containing seeds were placed for germination at 10 and 25°C temperatures either in continuous light or darkness in BOD incubators. Seeds were observed daily for radicle emergence and counts of such seeds were taken regularly for 10 days. Seeds kept for germination in dark were taken out in dim light for 5 min after every 24 hr to record germination. In some species where germination did not take place for 10 days at 10°C both in continuous dark as well as light, leaving one replicate in the same condition. The rest were transferred to the incubator fixed at 25°C with light conditions similar to those received at 10°C for 10 days. In such cases germination records were taken for another 10 days.

3. Results and discussion

The germination behaviour of different species of *Potentilla* is shown in table 1. In continuous dark only 7 species showed germination and the rest did not germinate either at 25 or 10°C. In general, the observations reported here reveal the fact that all the species germinate at higher temperatures and under continuous light with considerable variations in the percentage germination and the time taken for germination. None of the species seems to have a long intrinsic dormancy. This supports the earlier results on the seeds of North American alpine and southern hemisphere alpine plant species (Amen 1966; Bliss 1958; Mooney and Billings 1961; Bond 1965 a, b). The interesting point which emerged from this study is the differential response to lower temperature as well as continuous darkness at higher temperature. *P. atrosanguinea* germinates both under 25 and 10°C under continuous light as well as darkness although there was delay in germination at 10°C. In *P. sibbaldi* although the germination was very high both in continuous light and darkness at 25°C, at 10°C only a few seeds germinated under continuous