

Allelopathic Effect of *Pinus Roxburghii* Bark Extract on *Phalaris Minor*



Botany

KEYWORDS : *Pinus roxburghii*; Allelopathy; Bark extract

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ABSTRACT

A study on allelopathic effect of Pinus roxburghii bark extract on a common weed- Phalaris minor was conducted. The aqueous extracts of different concentrations were prepared and tested for germination and seedling growth of P.minor. The bark extracts showed inhibitory effect on germination and seedling growth of test plant in concentration dependent manner. The role of active principle (s) of allelopathy has been suggested.

1. Introduction

Allelopathy refers to any direct or indirect effect of one plant (and also microorganisms), on the other through the production of chemical compounds that escape into the environment and subsequently influence the growth and development of neighboring plants (Rice, 1984). It is known to occur in many natural and managed ecosystems and plays an important role in regulating plant diversity, organization of plant communities, plant succession, crop productivity, and plant defense (Anaya, 1999; Singh et al., 2001; Castells et al., 2005). It is an important component of crop-weed-tree interactions in agroecosystems and also plays a significant role in forest ecosystems (Wardle et al., 1998; Singh et al., 2001).

Pinus roxburghii Sargent (Chir Pine; family Pinaceae), a native to the Himalaya, is an important forestry tree and is widely planted. The tree is observed to have sparse understorey vegetation, which can be attributed to allelopathy, at least partially.

This paper describes the allelopathic effect of *P. roxburghii* bark extracts on early growth of a common weed, *Phalaris minor* Retz (little seed canarygrass; family Poaceae).

2. Materials and Methods

The bark of *P. roxburghii* was collected from trees growing in a Chir Pine forest of Himachal Pradesh, India, shade dried and pulverized.

Aqueous extracts of bark powder were prepared by soaking 4 gram powder in 100 ml. distilled water (4% w/v) for 18 hours in a conical flask and then filtering it through Whatman no. 1 filter paper. Extracts of concentration 2%, 1% and 0.5% were prepared by further dilutions with distilled water. Pure distilled water served as control. Seeds of *Phalaris minor* were dipped in distilled water for imbibitions. 20 seeds of *Phalaris minor* were placed in 15 cm diameter Petridish, lined with filter paper and moistened with 10 ml of respective solution or distilled water (control). For each treatment, 3 replicates were maintained. The replicates were kept in completely randomized manner. Germination and growth in terms of radicle and plumule length and biomass of seedlings after one week were recorded. Data was analyzed by one-way ANOVA.

3. Results and discussion

At the ecosystem level, allelopathy affects germination rate and seedling growth (Castells et al 2005, Blanco, 2010). In the current bioassay the germination was reduced by 25% in 4% extract whereas in all other treatments the reduction of 12%, as compared to control, was noticed. Aqueous extracts of *P. roxburghii* bark inhibited the radicle and plumule length in all treatments significantly. The maximum growth inhibition was noticed in seedlings treated with 4% extract. The radicle length was reduced by 6%, 35%, 37%, and 68% in 0.5%, 1%, 2% and 4% concentration respectively. Similar trend of inhibition was observed in plumule length growth. The plumule length reduced by 11%, 19%, 26% and 48% in 0.5%, 1%, 2% and 4% extract treatments, respectively. Biomass of seedlings was also more in control as compared to different concentrations of extracts. Here also, a trend of decrease in biomass of seedlings was observed with increase in bark extract concentration.

The results indicate that *P. roxburghii* bark possesses some allelopathic principle(s) that upon release inhibit the growth of *P. minor*. The allelochemicals contained in bark of *P. roxburghii* may be released through leachate and affect the growth of neighboring species in nature. It is an important mechanism of liberation of allelochemicals by the action of rain, dew, mist or fog in aqueous medium. (Turkey, 1966). The nature of active allelopathic principles and their action mechanism need to be investigated further. This would throw light on the allelopathic interaction of *P. roxburghii* with other plant species and microbes under natural conditions.

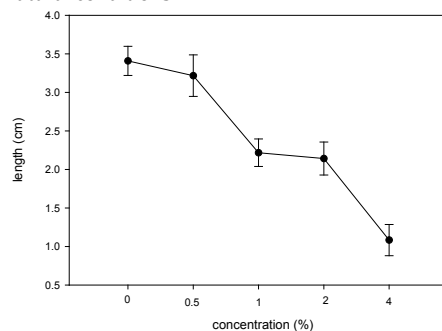


Figure1. The effect of aqueous extracts of bark of *Pinus roxburghii* on radicle length of *Phalaris minor*. The bar represents standard error

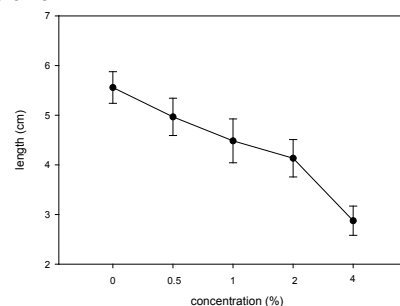


Figure2. The effect of aqueous extracts of bark of *Pinus roxburghii* on plumule length of *Phalaris minor*.

The bar represents standard error

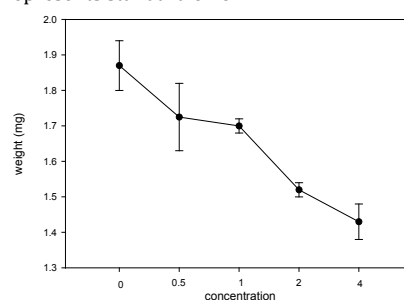


Figure3. The effect of aqueous extracts of bark of *Pinus roxburghii* on seedling weight of *Phalaris minor*. The bar represents standard error

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