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Original Research Paper

Allelopathic Effects of the Plant *Grangia maderaspatena* Forsk. on Seed Germination of Three Varieties of Rice

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ABSTRACT

Allelopathy is the direct influence of a chemical released from one plant on the development and growth of another plant. Chemicals with allelopathic potential exist invariably in all plant tissues including leaves, flowers, stems, rhizomes and roots. Processes such as volatilization, root exudation, leaching and decomposition of plant residues release them into environment. Accumulation of more allelochemicals from weeds in fields causes soil sickness, reduced nitrification and nutrient uptake resulting in loss of crop yield. The present study has been conducted to examine the allelopathic effects of *Grangia maderaspatena* Frosk. on seed germination of three varieties of rice, i.e., Aiswarya, Kanchana and Harsha.

INTRODUCTION

The word allelopathy was coined by Molish in 1937 to describe the chemical interactions among all plants, including stimulatory as well as inhibitory influences. Allelopathy is a form of chemical competition and allelochemicals are present in any part of the plant. These allelochemicals are released in the soil and affect the development and growth of neighbouring plants. William & Hoagland (1982) reported that the allelopathic effects are mainly due to the presence of allelochemicals like polyphenols in the soil released by litter decomposition and leaching.

The emerging weeds are the major problem faced in the transplanted rice fields and it is one of the major factors responsible for yield reduction in crops.

Grangia maderaspatena is a predominant weed of rice fields which compete with crops for water, soil nutrients, light and space, thus reducing crop yields. The reduction in yields of these crops was not due to only competition but also because of allelopathic inhibition of growth and development of these crop plants.

MATERIALS AND METHODS

Mature rice seeds of Aiswarya, Kanchana and Harsha were collected from the paddy fields and thoroughly washed in running tap water and surface sterilized with 0.1% of mercuric chloride followed by washing with distilled water and used for seed germination.

To prepare phytoextract, healthy plants were collected from the paddy fields and thoroughly washed in running tap water and surface sterilized with 0.1% mercuric chloride and then thoroughly washed with distilled water. The whole plant extract was taken as stock solution. From these three different concentrations (25%, 50% and 75%) were made with distilled water. The seeds, moistened with distilled water were considered as control. Twenty five seeds were kept equidistantly on Whatman No. 1 filter paper lined in sterilized Petri dishes. The seeds were moistened with requisite amount of treating solution and kept at room temperature for germination. Radicle emergence was considered as the criteria for seed germination and on each day readings were taken. From these, Germination Value (GV) and Cumulative Germination Percentage (CGP) were calculated.

The germinated seeds from each treatment were then transferred to separate polythene bags containing soil from the field. These bags were supplied with respective concentration of the extract and the seedling growth was noted for 10 days.

Again, fresh seeds were collected from the selected rice varieties and socked with *Pseudomonas fluorescence*, a biofertiliser, for 12 hours and then dried under shade. These dried seeds were kept equidistantly on filter paper in sterilized Petri dishes and supplied with respective concentrations of the weed extract. The Petri dishes were incubated at room temperature and GV and CGP were calculated. The seeds were transferred then to separate polythene bags and the seeding growth was noted.

RESULTS AND DISCUSSION

The phytoextracts of *Grangia maderaspatena* inhibited seed

Table 1: Effect of whole plant extract of *Grangia maderaspatena* on Aiswarya, Kanchana and Harsha rice varieties seeds.

% of the seed extract	No. of seeds treated	Aiswarya		Kanchana		Harsha	
		GV	CGP %	GV	CGP %	GV	CGP %
Control	75	25	33	25	33	25	33
25%	75	16.6	22	18.6	24.8	26	21
50%	75	8	10.6	15.6	20.8	9	12
75	75	4	5	10	13	5	6.6
100	75	2	2.6	4	5	1	1

GV - Germination value, CGP - Cumulative Germination Percentage

germination of rice seeds compared to the control (Table 1, Fig. 1). The highest concentration of seed extract significantly inhibited the seed germination. Harsha seeds were more sensitive than the other seeds. The weed extract also adversely affected the seedling growth of rice seeds and seedlings showed yellowing of leaves and stunted growth. The inhibitory effect increased with increase in concentration of the extract, and again the Harsha rice seeds were more inhibited than the other varieties of rice. Archana Inamdar & Kamble (2009) observed inhibition of seed germination and seedling growth by aqueous extract of *Celosia argentea* in *Vigna mungo* seeds.

Karthiayani Poannammal & Rajesh (2003) observed that the fresh and dry leaf, epicarp and fruit pulp of *Strychnos nux-vomica* significantly suppress the seed germination in sunflower. Padly et al. (2002) observed suppression in germination and seedling growth of *Eleusine coracana* and *Helianthus annus* by yellow leaf leachates of *Eucalyptus globulus*. Aqueous phytoextract of *Parthenium hysterophorus* reduce the seeding growth of the three *Brassica* species (Harminderpal Singh 2005), and he also reported that increase in concentration of aqueous extract has complete failure of seed germination and seedling growth of *Eragrostis* sp. Leaf leachates of *Chrysanthemum morifolium* reduced the germination of lettuce seeds (Kozal & Jukey 1986). Batish Lavanya (2007) observed inhibition of seed germination by aqueous leaf extract of *Chenopodium murale* on wheat. The reduction in wheat growth was due to presence of inhibitory metabolites released by roots of *Chenopodium murale*.

The Seeds treated with *Pseudomonas* showed 100% germination even with 100% weed extract. This shows the anti-allelopathic effects of *Pseudomonas*. Now-a-days this biofertiliser is used extensively by farmers against various plant diseases. It produces fluorescent sidrophores called pyroverdines which suppress the plant disease and aggressive rot colonization by organisms that displace or exclude deleterious rhizosphere microorganisms. Seeds incubated with *Pseudomonas* help in inducing growth and suppression of disease and it can be used against the allelopathic effect of this weed.

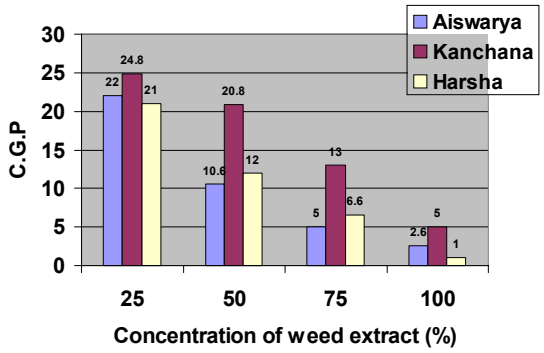

Fig. 1: Effect of whole plant extract of *Grangia maderaspatena* on rice seeds.

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