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Allelopathic Influences of *Marsilea minuta* on the Germination and Growth of Paddy Cultivars

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The inhibitory effect of aqueous unboiled extracts of leaves, rhizomes and roots of *Marsilea minuta* L. was tested on germination and growth of seedlings by paddy cultivars ADT 31 and IR-50. Both varieties were affected by the extracts. Root tip burning from the top was also recorded. The inhibitory effect of leaves, rhizomes and roots was in the following order : leaf > rhizome > root.

Key Words - *Marsilea minuta* Allelopathy Allelochemics Phenolic acids ADT-31 IR-50.

Much work has been done on allelopathy (Alsaadavi *et al.*, 1982; Rice, 1979; Dubey, 1973). Weeds influence growth and productivity of crop plants. Rice (1979) showed that many species of weeds produce allelochemics that inhibit many crop plants. In addition, the weeds inhibit the growth of crop plants since they compete with them for moisture, nutrients etc. Leaves, inflorescences, flowers and seeds may undergo decay within a few weeks (Hennis *et al.*, 1964; Rice, 1974; Klingman & Ashton, 1975).

The leachate escaping from weed-parts, enter into the soil and exert an allelopathic influence on the germination and growth of subsequent crop (Naqvi & Muller, 1975; Rice, 1979).

***Marsilea minuta* L. is an obnoxious weed found in large numbers in paddy fields of Tamil Nadu. In the present study an attempt had been made to study the allelopathic effect of *M. minuta* on germination and growth of paddy cultivars.**

MATERIALS & METHODS Paddy cultivars, ADT 31 and IR-50 were used. Germination tests were conducted in petriplates with aqueous extracts of leaves, rhizomes and roots of *M. minuta*. Fresh leaves, rhizomes and roots 10 g. were separately macerated in 100 ml of distilled water in a Waring blendor. The extract was filtered and the filtrate used to study its effect on germination and growth of paddy cultivars. The assays were conducted in triplicate and germination was recorded daily while the final root and shoot length was recorded after 4 days.

To study the inhibitory effects of *M. minuta* on the growth of paddy, seeds were shown in pots (30 cm diameter) containing loamy soil amended with cow dung. When sufficient number of seedlings emerged, they were thinned to 10 per pot. Soil dressing of weed extracts was applied 10 days after sowing and this was followed on alternate days for the next 10 days. For each dressing, 100 ml was used with a total of 5 applications per treatment. Adequate controls, which received water without the extract, were maintained for 30 days. Irrigation was provided as and when needed.

The height of plants was measured. Chlorophyll was extracted from the leaves and estimated (Arnon, 1949). Starch was extracted and estimated (Clegg, 1956). Dry weight of the plant was also estimated.

Phenolic acids of leaves, rhizomes and roots of *M. minuta* were extracted (Das & Rao, 1964). Bray & Thorpe's (1954) method was employed to estimate phenols.

RESULTS & DISCUSSIONS Germination of paddy cultivars ADT-31 and IR-50 was influenced by the aqueous extracts of leaf, rhizome

and root of *M. minuta* (Table 1). Leaf extract was more inhibitory than those from rhizomes and roots. IR-50 was affected more than ADT-31 by the aqueous extract of *M. minuta*. The least inhibitory effect on germination was caused by the root extract. Both radicle and plumule development were inhibited by the extract.

Table 1 Inhibitory Effects of *M. minuta* on Germination and Growth of Paddy Cultivars

Cultivar	Extract	% inhibition over control		
		Germination	Radicle length	Plumule length
ADT-31	Leaf	50	47	41
	Rhizome	40	34	34
	Root	20	21	33
IR-50	Leaf	70	58	58
	Rhizome	55	40	47
	Root	25	28	37

Extract was tested at 10% concentration

The paddy cultivars, treated with aqueous extracts of *M. minuta* were shorter than the control plants (Table 2). Chlorophyll starch and dry weight were less in paddy cultivars treated with aqueous extracts of the leaves of *M. minuta*. The inhibitory effect might be due to the presence of simple phenolic acids. Phenolic acids were high in the leaves (43 μg/g) than in rhizomes (41 μg/g) and roots (34μg/g). Aqueous extracts of leaf, rhizome and root of *M. minuta* were inhibitory to the germination and growth of paddy cultivars IR-50 and ADT-31. Indeed weeds exert allelochemic effects on crop plants (Rice, 1974 and 1979; Bansal *et al.*, 1981 Lall & Savongdy, 1981). The inhibitory effect of leaves, rhizomes and roots differed and could be attributed to high phenolic acids in leaves.

Table 2 Inhibitory Effects of *M. minuta* on Growth and Biochemical Constituents of Paddy Cultivars

Cultivar	Extract	% inhibition over control			
		Plant height	Dry weight	Total Chorophyll	Starch
ADT-31	Leaf	22	11	41	35
	Rhizome	20	10	27	17
	Root	10	6	8	10
IR-50	Leaf	26	16	40	45
	Rhizome	20	14	30	17
	Root	16	12	16	13

Extract was tested at 10 % concentration

REFERENCES

ALSAADAVI I S & E L RICE 1982 Allelopathic effect of *Polygonum aviculare* L I vegetational patterning, *J Chem Ecol* 8 99-109.

ARNON D I 1949 Copper enzymes in isolated chloroplasts. Polyphenoxydase in *Beta vulgaris*, *Plant Physiol* 24 1-15.

BANSAL G L, S C MODGAL & K K SINGH 1981 Allelopathic effects of aqueous extracts of some weeds on two wheat cultivars, *Proc 8th Asian Pacific weed Sci* pp 325-327.

BRAY H G & W V THORPE 1954 Analysis of phenolic Compounds of interest in metabolism, *Meth Biochem Anal* 1 27-52.

GLEGG K M 1956 The application of the anthrone reagent to the estimation of starch in cereals, *J Sci Food Agric* 7 40-44.

DAS V S R & J V S RAO 1964 Phenolic acids of plant *Allium cepa*, *Curr Sci* 33 471-472.

DUBEY P S 1973 Phytotoxicity of weeds to Crop I *Effect on germination Cults* 39 556-558.

HENNIS Y, H TAGGARI & R VOLCANT 1964 Effect of water extracts of Carob pods, tannic acid and their derivatives on the morphology and growth of Microorganisms, *Applied Macrobiology* 12 204-209.

KLINGMAN G L & F M ASHTON 1975 Weed Science, A Wiley, New York pp 431.

LALI M & H O SAVONGDY 1981 Allelopathic effect of purple nutsedge on the growth of pearl millet, *Proc 8th Asian Weed Sci* 317-320.

NAQVI M H & C H MULLER 1975 Biochemical inhibition (allelopathy) exhibited by Italian rye grass (*Lolium multiforum* L), *Pakistan J Bot* 7 139-147.

RICE E L 1974 Allelopathy,Academic Press, New York

RICE E L 1979 Allelopathy - An update, *Bot Rev* 45 15-109.