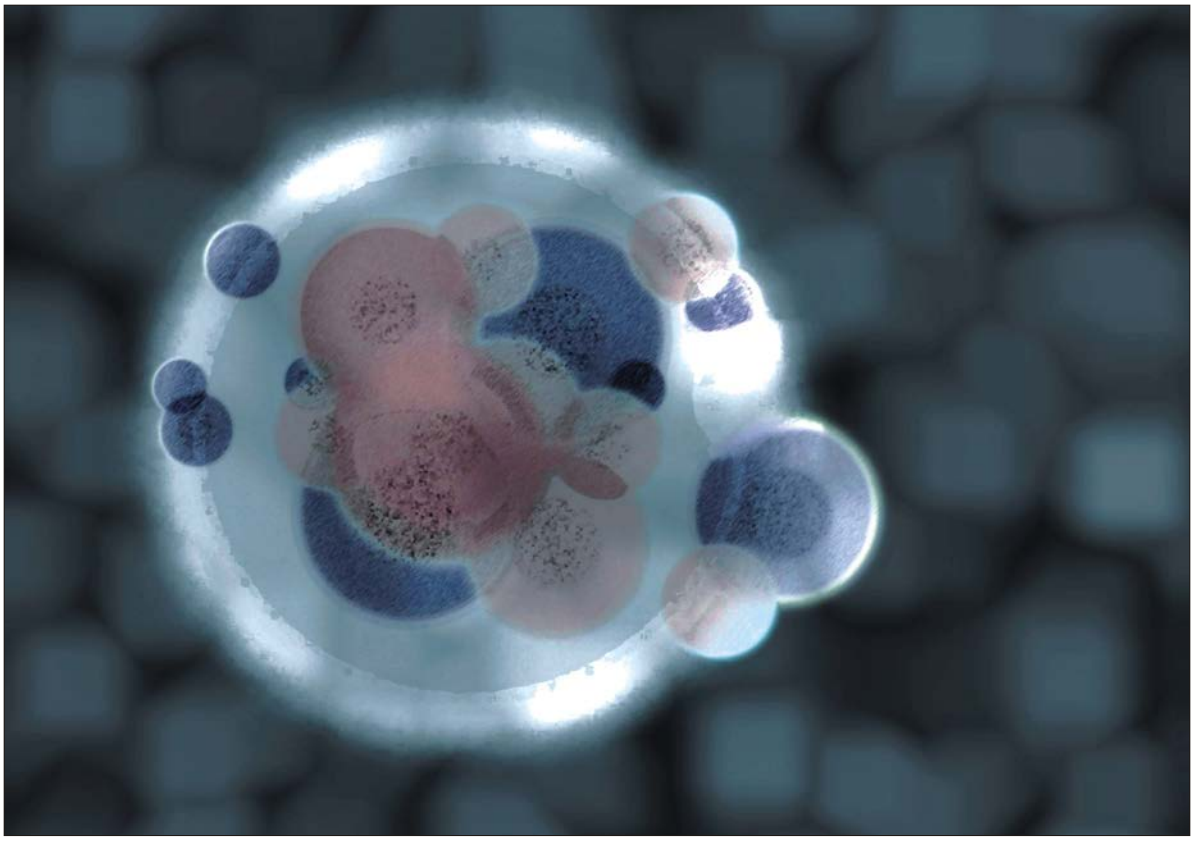

Journal of Biological Sciences

ISSN 1727-3048

science alert

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OnLine Journal of Biological Sciences 1 (6): 438-439, 2001

Effect of seed of sweet clover (*Melilotus indica* L.) weed and NaCl on seedling growth of rice

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Abstract: Seeds of sweet clover in combination with 0.4% NaCl significantly decreased the germination and had severe inhibitory effects on shoot and root lengths of rice. Root length was affected more than the shoot and the effect of NaCl was accentuated on the presence of weed seed.

Key words: Sweet clover, NaCl, growth, rice

Introduction

Weeds pose a serious problem in crop production in Pakistan (Alam, 1996). Weeds growing among crop plants adversely affect yield and quality of the harvest and increase production costs, resulting in economic losses. Many crop and weed residues have allelopathic effect on growth and development of plants through the production of chemicals or plant-growth inhibiting substances that escape into the environment (Bhowmik and Doll, 1984). Plants may influence each other growth by means of root exudates or leachates from decomposing residues and incorporated in growth medium. Interference from weed species is often due to competition and allelopathy. Allelopathic effects have been reported for more than 90 weed species (Rice, 1984).

Sweet clover (*Melilotus indica* L.) is a very common weed with 45-93 cm height and also known as yellow annual sweet clover, small flowered melilot, senji or sour clover (Alam, 1996). It is grown under irrigation in many Asian countries and in the southern Australia, Argentina and Tasmania. It is an annual or sometimes biennial plant with mainly yellow flowers in spike-like racemes.

Due to bad irrigation practices, salinity is a rapidly growing problem in Pakistan. It is estimated that about 6.30 million hectares of lands have already become saline and increasing at 109 h daily (Jones and Gorham, 1986). The presence of weed seed and salinity together may be more hazardous to the growth of crops than weed seed and salinity alone. Under saline conditions, the growth and development of crop plants are adversely affected.So the project was planned to study the effects of weed seed and NaCl salinity on the germination and seedling growth of rice.

Materials and Methods

Weed seeds of sweet clover were collected from mature plants. They were cleaned and dried. A 0.08% agar gel was prepared in distilled water and supplemented with the levels of 0.0, 0.2 and 0.4% NaCl. 50 ml of the agar media was poured into a series of glass bowls for seed plants. A similar set, but without weed seed, was also prepared to determine NaCl effect, and the bowls with only 0.8% agar were considered as control. Wheat seeds (cv. Pavon) were surface sterilized with 1% sodium hypochlorite for 3 minutes and then rinsed with water. Ten healthy seeds per bowl were planted on the surface of the solidified and salinized agar contained in each bowl in a circle with the embryo side up and pointing inwards. In case of weed seeds, the seeds (0.5 g/bowl) were also carefully placed around the seeds in each bowl. The bowls were then covered with petri-dishes and kept in a randomized design at 28° C. The experiment was terminated after 5 days of growth. Germinated seeds and their shoot and root lengths were measured and their dry weights were also recorded. The samples were statistically analyzed by DMR test to see the treatment effects.

Results and Discussion

Placement of weed seeds of sweet clover in the immediate vicinity of wheat seeds alone or in combination with 0.2% NaCl did not show any effect on seed germination (Table 1). However, weed seed plus 0.4% NaCl decreased 24.7% germination percentage as compared to control. But it did not differ significantly with 0.4% NaCl and 0.2% NaCl + weed seed. Weed seed did not germinate during the course of the experiment. The absence of germination may either be due to hard testa or chemical inhibitors from the test crop. The seeds of many plant species, including wheat and rice often fail to germinate promptly after being exposed to stress conditions. Phytotoxic substances have been found in weed extracts and crop seeds (Elmore, 1980). Suzuki and Waller (1987) found that caffeine is present in the seed coats of tea (*Camellia sinensis* L.) inhibited growth of germinating tea seeds. Gressel and Holm (1964) noted that water extract of seed of crabgrass (*Digitaria sanguinalis*) inhibited seed germination of several crop plants. Hussain and Nasrin (1985) reported that seed of harmal (*Peganum harmala*) reported germination of mustard and persian clover. Pericarp extract of mesquite inhibited the germination of radish seeds (Goel *et al.*, 1989). Weed seed extract from ten species affected the germination of tomato (Reth and Hurle, 1986). Similarly, aqueous extract from weed seed of *Bothriochok pertusa* reducd the germination of millet, lettuce, mustard, tomato, chilli (Hussain *et al.*, 1987). McKee *et al.* (1971) did not find any effect of crownvetch seed leachates on the germination and seedling growth of 48 different crops. The *H. laciniatum* seeds inhibited the

Table 1: Effect of seed of sweet clover (*Melilotus indica* L.) weed and NaCl on germination and seedling growth of rice

Treatment	Germination (%)	Shoot length (cm)	Root length (cm)
Control (no weed seed, no NaCl	97 a	3.71 *a	9.17 a
Weed seed alone	93 a (-4.12)	-2.25 bc (39.36)**	-0.40 c (95.64)
0.2% Nacl alone	100 a (+3.09)	2.97 ab (-19.95)	9.63 a (+5.02)
0.2% Nacl + weed seed	83 ab (-14.43)	2.03 bc (-45.29)	0.56 c (-93.90)
0.4% NaCl alone	80 ab (-17.53)	2.30 bc (-38.01)	5.61 b (-38.83)
0.4% NaCl + Weed seed	73 b (-24.74)	1.58 c (-57.42)	0.44 c (-95.21)

* Means in columns followed by same letters do not differ significantly at 5% level by DMRT

* Values in parentheses indicate percent increase (+) or decrease (-) over control

the germination of salix pentandra seeds and to some extend the germination of radish (Junttila, 1975). Milk thistle (*Silybum marianum*) seed did not inhibit the germination of wheat seed (Chaghtai *et al.*, 1988). Leather and Einhellig (1986) reported, that seed germination is not a good criterion, as it is easily affected by several internal and external factors, which may interact differently upon the conditions under which, the experiment was performed.

The weed seed of sweet clover alone, 0.2% NaCl + weed seed, 0.4% NaCl and + weed seed had similar inhibitory effects on shoot growth and reductions in shoot length were 39.4, 45.3 38.0 and 57.4%, respectively as compared to control. The differences in shoot growth due to application of weed seed alone, 0.2% NaCl + weed seed and with 0.4% NaCl were non-significant. In case of root, the effect of weed seed alone, and in combination with 0.2 and 0.4% NaCl significantly reduced the root length by 95.6, 93.9 and 95.2%, respectively compared to control. The root growth was affected more than the shoot. This may be due to the fact that they were in direct contact with the allelochemicals, which may not have been translocated rapidly to the shoot and root. Other workers have noted that extract of weed caused injury, if the extract was in contact with or present in the immediate vicinity of the plant roots (Alam and Azmi, 1989).

It is obvious that the seeds of sweet clover do contain leachable allelochemicals, which have more profound effect on roots than shoot. Literature suggests that different parts of sweet clover contain large quantities of coumarin, 0-coumarin and melilotic acid as the major active compounds (Zhang, 1987).

It is therefore, concluded that seed of sweet clover alone or in combination with NaCl significantly reduced the growth of rice seedlings. Root length was affected more than the shoot and it is very important to uproot this weed at the early stage of its emergence.

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