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INFLUENCE OF ROOT AND SHOOT EXTRACTS OF SOME DESERT PLANTS ON SEED GERMINATION OF *CALLIGONUM POLYGONOIDES* LINN.AND *LASIURUS SINDICUS* HENR.

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Delayed and inhibitory effect on germination percentage was observed in *Calligonum* and *Lasiurus* when treated with shoot and root aqueous extracts of desert species. The *Capparis decidua* extracts were more toxic and showed 100% germination inhibition. The degree of inhibition was directly proportional to the concentration of the extracts.

Keywords: Allelopathy; Germination; Aqueous extract; *Calligonum*; *Lasiurus*.

Introduction

Chemical compounds leached from plants may affect adjecent plant and thus play a role in allelopathy. The ecological significance of allelopathic influence have been pointed out by Whittakar and Fenny(1971); Datta and Roy (1974), Chatterji (1975), Mohanot and Soni (1977), Rao *et al.* (1979) and Datta and Chatterji (1980). *Calligonum polygonoides* Linn. populations in arid zone of Rajasthan is of considerable importance because of its high fuel value. *Lasiurus sindicus* Henr, is most common and dominant grass often forming extensive pasture land for considerable area in arid region. *Calligonum* and *Lasiurus* are good sand binder against soil erosion.

Studies on allelopathic phenomenon in desert plant communities are necessary to understand their pattern of distribution, early establishment and dominance. The present study reports the influence of aqueous extracts of the shoot and root of some desert species on seed germination of *Calligonum* and *Lasiurus*.

Materials and Methods

The seed of *Calligonum polygonoides* Linn. and *Lasiurus sindicus* Henr. were collected from Bichhwal and C.A.Z.R.I.

(Bikaner). Tender roots and shoots from mature plants of *Aerva tomentosa* (Burm f.) Juss.; *Calligonum polygonoides* Linn.; *Capparis decidua* (Forsk) Edgew; *Crotolaria burhia* Buch-Ham ; *Lasiurus sindicus* and *Leptadenia pyrotechnica* (Forsk) Decn. were collected in May.

Aqueous extracts of root and shoot were made directly by soaking 6g each of dried plant material in 100 ml of glass distilled water. These were kept for 48 hours at a temperature of 20°± 1°C (*Calligonum*) and 36 ±1°C (*Lasiurus*). The extracts were filtered and made upto 100 ml by adding more distilled water. This was known as stock solution 6:100 (A), further dilut ions i.e. 3:100 (B) and 1:100 (C) were prepared from the stock solutionsat the time of treatment of the seeds before germination.

Seeds of *Calligonum* and *Lasiurus* were soaked seperately in different extracts for 12-48 hours at room temperature. Next day the soaked seeds were surface sterilised with 0.1% mercuric chloride solution for five minutes, washed twice with distilled water and kept for germination over moist filter paper in Petri dishes under laboratory condition. The filter papers were kept moistened with approximately 20 ml of respective extracts. A control experiment was set using distilled water. Observations on germination were continued upto 30 days at intervals of five days for *Calligonum* and 96 hours at intervals of 24 hours for *Lasiurus*. During the germination the temperature was 20 ±1°C for *Calligonum* and 36 ±2°C for *Lasiurus*.

Seed germination inhibition (%) was calculated by using the following formula ;

Seed germination inhibition (%)= $100\ X(N-\frac{n)}{N}$ where N is germination (%) in control and n is germination (%) in treatments.

Results and Discussion

Calligonum polygonoides Linn.— It is observed from the data that the initiation of germination was delayed in aqueous extracts of all concentrations of the different plants as compared to that of control. After 5th day of soaking, percentage germination was 3.0 in control, whereas initiation of germination was observed from 7th day of soaking in aqueous extracts at all levels of concentrations. The final percentage germination was inhibited in shoot and root extracts of the plants (Table 1). Shoot extracts were observed to be more inhibitory than the root extracts. The root and shoot extracts at different concentration 6:100, 3:100 and 1:100 (A, B & C) of *Capparis decidua* showed strong (100%) inhibitory effect. The least inhibitory effect was observed by root and shoot extract (A) of *Lasiurus*.

Lasiurus sindicus Henr.—The initiation of germination in *Lasiurus* was also delayed in aqueous extracts at all levels of concentrations (Table 2). Seed germination started after 12 hours of soaking in control and it was delayed

Table 1. Seed germination of *Calligonum polygonoides* under the influence of aqueous extracts of different plant components of five common weeds. (Mean of four replicates)

Weeds	Plant Part	Conc.	Germination (%) in Days 10	20	30	Seed germination inhibition (%) by Extracts.
Crotolaria burhia	Root	A	6	23	39	48.5
		B	7	39	54	22.8
		C	22	42	66	5.7
	Shoot	A	2	4	6	87.1
		B	8	35	42	40.0
		C	13	43	48	31.4
Leptadenia pyrotechnica	Root	A	—	1	21	70.0
		B	—	10	22	68.5
		C	11	48	69	1.4
	Shoot	A	—	1	5	92.8
		B	4	22	31	57.7
		C	9	37	49	30.0
Aerva tomentosa	Root	A	—	—	—	100.0
		B	1	10	19	72.8
		C	11	39	61	12.8
	Shoot	A	—	1	5	92.8
		B	2	9	20	71.4
		C	17	47	59	15.7
Lasiurus sindicus	Root	A	—	2	37	47.1
		B	5	43	65	7.1
		C	15	49	66	5.7
	Shoot	A	—	9	27	61.4
		B	4	45	57	18.5
		C	23	51	65	7.1
Capparis decidua	Root	A/B/C	—	—	—	100.0
	Shoot	A/B/C	—	—	—	100.0
	Control		19	53	70	

Concentration : A=6:100; B=3:100; C=1:100, —=Seeds not germinate.d

Table 2. Seed germination of *Lasiurus sindicus* under the influence of aqueous extacts of different plant components of five common weeds.
(Mean of Four replicates)

Weeds	Plant Part	Conc.	Germination (%) in Hours 24	48	72	96	Seed germination inhibition (%) by Extracts.
	Root	A	15	34	41	45	47.05
		B	27	57	63	64	24.70
		C	52	75	80	82	3.52
Crotolaria burhia	Shoot	A	8	35	43	46	45.88
		B	20	57	66	68	20.00
		C	62	73	73	73	14.11
	Root	A	8	24	54	62	27.05
		B	15	64	67	70	17.64
		C	57	74	80	80	5.88
Leptadenia pyrotechnica	Shoot	A	4	15	31	42	50.58
		B	19	45	58	61	28.23
		C	68	81	82	82	3.52
	Root	A	17	31	38	41	51.76
		B	29	69	79	80	5.88
		C	65	77	80	84	1.17
Aerva tomentosa	Shoot	A	7	8	18	19	76.64
		B	18	40	53	53	34.64
		C	47	72	81	81	4.70
	Root	A	21	35	49	51	40.00
		B	24	60	69	76	10.58
		C	67	82	83	86	(-) 1.17
Calligonum polygonoides	Shoot	A	9	32	41	47	44.70
		B	23	62	74	75	11.18
		C	69	81	83	83	2.35
	Root	A	—	—	1	1	98 82
		B	—	9	14	35	58.82
		C	68	76	79	79	7.05
Capparis decidua	Shoot	A	—	—	—	—	100 00
		B	—	—	—	1	98.82
		C	32	61	72	72	15.29
	Control		56	78	84	85	

Concentration : A=6:100; B=3:100; C=1:100. —=Seeds not germinate.

3/4hours in all plant extracts. The root and shoot extracts 6:100(A) of *Capparis decidua* showed maximum inhibitory effect on percentage germination. The least inhibitory effect was observed by root extract (A) of *Leptadenia pyrotechnica*. The shoot extracts were found to be more inhibitory than the root extracts except in *Crotolaria*.

A critical analysis of the data revealed that the degree of inhibition was directly proportional to the concentration of the extract. The influence, exerted by the substances leached out from one plant, on the growth of other plants, particularly the inhibitory effect has come to be known as "allelopathy" (Chatterji, 1975). It appears that all the allelopathics are water soluble and are mostly phenolic in nature (Schreiner and Reed, 1908). Phenolic compounds may be inhibitory, ineffective or stimulatory in their biological activities (Kefeli and Kadyrov, 1971). The effects of root and shoot extracts of *Capparis decidua* indicated the presence of a potent growth retarding factor of allelopathic implication for *Calligonum* and *Lasiurus*. The study of plant communities in relation to *Capparis* might be of practical imporatance for understanding their allelochemic interactions.

The mechanism of stimulation/inhibition may thus be due to :

1. The same substance inhibits inhigh concentration and stimulates in low concentrations.
2. The inhibitor is transferred into a stimulator by a slight chemical change during germination.

Further studies on allelopathic phenomena in desert plant communities are therefore, necessary to understand their pattern of distribution, early establishment and dominance.

Reference

Chatterji U N 1975, *Ind. Jour. Pl. Physiol.*28 91

Datta S C and Roy S P 1974, *Sci. and Cult,* 40 47.

Datta S C and Chatterji A K 1980, *Comp. Physiol Ecol.* 5 54.

Kefeli V I and Kodyrov C S 1971, *Ann. Rew. Pl. Physiol.* 22 185,

Monnot K and Soni S R 1977, *Comp. Physiol Ecol.* 2 97.

Rao J V S, Ram Monan Rao K and Murthy S S 1979, *Trop. Ecol,* 20 5.

Schreiner O and Reed H S 1908, *Bot. Gazt.* 45 73.

Whittaker R H and Fenny P P 1971, *Science* 171 757.