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ALLELOPATHIC POTENTIAL OF FOUR SPECIES OF *FICUS*

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Aqueous extracts of fresh leaves and litter of 4 species of *Ficus* were tested for their phytotoxicity against 9 crops. Germination and early growth of most of the species was invariably reduced especially in litter extracts whereas some of the test species could not even germinate. Soil collected from beneath all the four *Ficus* species also retarded the germination and radicle growth of the various test species.

Key words: *Ficus* sp., Allelopathy, Natural and agro-ecosystem.

Introduction

Many tree species are reported to have allelopathic effects against the associated species both under natural and cultural conditions [1-7, 9, 12, 14, 19, 20]. The biological significance of allelopathy in natural and agricultural communities is very well discussed by Putnam and Tang [14], Muller [15], Chou [17] and Waller [20].

Ficus palmate Forssk, *F. bengalensis* L., *F. racemosa* L., and *F. religiosa* L. , occur as wild plants, or may be cultivated for shade in Pakistan. Except for *F. bengalensis* all are deciduous shedding their leaves during the winter. Keeping in view the importance of allelopathy and presence of almost bare areas beneath these *Ficus* species, an investigation was initiated to search for their allelopathic potential under laboratory condition.

Materials and Methods

1. Effect of fresh leaves and litter. Fresh leaves (Green) and litter (yellow fallen leaves) were collected from mature trees of *Ficus bengalensis* L., *F. racemosa* L., *F. religiosa* L; and *F. palmate* Forssk and dried in the shade at room temperature (25-30°). Five gm schreded plant material from each of the species was soaked in 100 ml distilled water for 24 hr. at 25° and filtered. These extracts were tested against the seeds of *Brassica campestris, Lens culinaris, Phaseolus vulgaris, phaseolus radiatus, Raphanus sativus, Trifolium alexandrum. Triticum aestivum, Zea mays* and *Setaria italica* as suggested by Ahmad *et. al.* [3]. Hussain *et. al.* [8,10] and Dirvi and Hussain [16].

2. Soil residual toxicity. Soil from beneath and away from the respective *Ficus* sp. was collected , air dried and the litter was removed. These soils were used as the growth medium for the aforementioned test species using standard soilbed bioassay method [11]. Experiment was run in 5 replicates, each containing 10 seeds. The results were statistically analyzed using z and t-tests following Cox [21].

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Results and Discussion

The seed germination of *Brassica* and *Trifolium* was totally inhibited by litter extract of *F. religiosa* while other species showed poor seed germination (Table 1). The radicle growth of *P. vulgaris, P. radiatus, Trifolium, Triticum , Zea* and *Setaria* in fresh leaves extracts was adversely affected. Similarly, the growth of *P. radiatus* and *Brassica, Triticum* and *Zea* decreased in the litter extracts and soil of *P. religiosa.*

The seed germination of *Brassica, Raphanus, Trifollium* and *Triticum* was inhibited to varying degrees by the fresh leaf extracts of *F. bengalensis* (Table 1). Litter extracts caused complete inhibition of seed germination of *Brassica, Raphanus* and *Trifolium* . The germination of *Brassica, P. vulgaris, Trifolium, Zea* and *Setaria* was also inhibited by the *F. bengalensis* soil. The radicle growth of *Brassica, P. radiatus. Raphanus, Trifolium* and *Triticum* was also inhibited to varying degree (3-66%) by the extracts of fresh leaves. The litter extracts also exhibited phytotoxic effects on the growth of all plants except *Lens* (Table 1.) Likewise, the growth of *P. vulgaris, Trifolium, Zea* and *Setaria* was also inhibited in *F. bengalensis* soil.

The seed germination of *Brassica, Trifolium* and *Setaria* was inhibited by the litter extract of *F. racemosa;* while *Triticum* was inhibited by the soil of *F. racemosa* (Table 1). Extracts from fresh leaves of *F. racemosa* retarded the growth of *Lens*, P. *radiatus, Raphanus* and *Trifolium* to varying extent, while litter extracts caused inhibition of growth of all the test species, except *P. vaulgaris* (Table 1). Seedling growth of all the test species, except *Brassica* and *Trifolium* exhibited retarded growth in *F. racemosa* soil.

Litter extract of *F. palmata* reduced the seed germination of *Brassica, Lens, Trifolium* and *Setaria* to varying degrees (4-76%). *Brassica, Raphanus, Trifolium* and *Setaria* seed germination was inhibited by the litter extract. The *F. palmata* affected soils suppressed the growth of *Brassica, Raphanus* and *Zea* (Table 1).

The reduced growth and germination of susceptible test

TABLE 1. ALLELOPATHIC EFFECTS OF FOUR SPECIES OF *FICUS* ON SEED GERMINATION AND RADICLE GROWTH OF SOME CROP PLANTS (ALL VALUES IN PERCENTAGES).

Test species	*F. religiosa*			*F. bengalensis*			*F. racemosa*			*F. palmata*		
	Fresh leaves Extract	Litter Extract	Soil bed	Fresh leaves Extract	Litter Extract	Soil bed	Fresh leaves Extract	Litter Extract	Soil bed	Fresh leaves Extract	Litter Extract	Soil bed
Seed Germination												
Brassica Campestris	100.6	nil**	78.3*	83.1*	nill**	87.5*	131.2	13.1***	108.76	109.31	4.4	127.8
Lens culinaris	102.1	34.0**	87.5*	114.9	80.7*	130.0	119.2	110.6	107.4	123.4	76.7	96.7
Phaseolus vulgaris	98.1	58.8**	96.2	105.9	130.9	70.8*	109.8	113.7	100.0	109.8	101.9	100.0
Phaseolus radiatus	99.1	82.8*	100.0	100.2	100.2	103.7	99.1	100.0	103.4	96.6	100.0	104.2
Raphanus sativus	78.1*	11.2**	95.2	63.3*	nil**	96.1	100.5	93.0	100.0	104.2	14.9	100.0
Trifilium alexandrum	78.3*	nil**	54.5*	12.4**	nil**	70.4*	103.1	57.7*	104.5	82.5	4.1**	104.2
Triticum aestivum	79.4*	20.9**	61.5*	771.22	96.1	100.0	112.8	104.4	85.7*	96.1	91.9	90.0
Zea mays	93.4	60.9*	884.0*	105.6	115.7	86.2*	121.8	113.7	100.0	109.7	97.5	100.0
Setaria italica	51.1*	59.6*	46.7*	102.1	76.6*	63.3*	119.2	68.1*	100.0	136.2	42.5**	94.1
Radicle length												
Brassica campestris	140.3	nil**	85.3*	47.1**	nil*	118.4	110.7	8.2*	106.7	78.2	8.2	88.6
Lens culinaris	140.5	26.1**	107.2	149.5	98.2	143.8	79.5	41.4*	51.2*	185.6	103.6	114.1
Phaseolus vulgaris	83.8*	68.3*	126.2	151.1	12.7**	82.1	157.1	117.1	46.9*	102.5	162.5	127.6
Phaseolus radiatus	69.6*	107.4	136.7	67.0	34.3**	97.8	68.3	68.3*	52.9*	94.2	155.9	109.0
Raphanus sativus	181.5	26.8**	102.1	48.2*	nil**	102.2	41.5*	48.2*	95.2	92.9	24.4	89.6
Trifolium alexandrum	86.4*	nil**	108.1	8.0**	nil**	77.9*	66.0*	16.7**	102.5	58.0*	12.3**	109.0
Triticuma sestivum	16.2**	59.5**	25.9*	3.3**	13.7**	102.6	140.1	55.1*	77.4*	61.5*	98.4	105.9
Zea mays	86.0*	41.2**	78.2*	107.9	41.2*	80.3	145.6	86.4*	59.2*	71.1*	99.6	84.9
Setaria italica	47.9**	86.2*	141.1	100.8	0.7**	79.6*	102.3	11.5**	59.2*	50.0*	42.3*	112.7

* & ** Significantly different from control at P=0.05 and 0.01, respectively.

species in aqueous extracts from fresh leaves or its litter was mainly due to water extractable inhibitors. Aqueous extracts from other trees [1-4, 6,7, 17, 19] have proven allelopathic effects which support the present findings. It was interesting to observe that the litter extract was more inhibitory than the fresh leaves. It might be due to the fact that the kind and amount of inhibitors might have been increased in the overmature fallen leaves. Age specific allelopathic influence have been reported [10,12,14]. Some of the test species could not even germinate in the litter extract showing enhanced toxicity. The litter accumulates around and beneath the trees to ultimately release the phytotoxins. Such affected soils invariably reduced the germination and growth of susceptible species. The potentially otherwise favourable habitat turns undesirable owing to added toxins in the soil underneath many trees [2,6,12-17, 19] and our findings agree with them.

The phytotoxicity was not only depending upon the *Ficus* species and its parts but also upon the test species and parameter measured. Germination and early growth were independently affected by leaf and its litter. Similar observations are well documented [1,3,6,12,13,15,17,18,20] which confirm the findings in our case also.

The present findings indicate that all the four investigated species of *Ficus* have a strong allelopathic potential at least against the test species listed in the present study. However, other factors of the environment and competition offered by these trees for shade or space might also play a important role in reducing the productivity.

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