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Alleloparthic Effect of Phyllanthus Maderaspatensis, Extracts on Germination and Seedling Growth of Jowar

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Abstract: ***Phyllathus maderaspatenss a dominant weed in Jowar fields of Rayalaseema region, refluenced the germination ad seedling growth of Jowar. The Allelopathic influence revealed that the gradation inactivity like leaf + inflorescence > stem > root extracts lf (0, 10, 100, 200 dilutions) were found to be more potent to Jowar Higher concentrations significantly inhibited the biomass of seedlings. However in lower concentrations the rate of inhibition was reduced and the inhibitory effect was found to be concentration dependent.***

Keywords Phyllathus maderaspatensis, Allelopathy, Jowar, Aquenous extract, seed germination, seedling growth, inhibition.

1. Introduction

Weeds are ubiquitours and their effect creates enormous losses, which must be borne by all consumers. The foremost damage of weeds is on farm as detriment to cropping systems.[1] coined the word "allelopathy" to describe both beneficial and detrimental chemical interactions of plants and micro-organisms. In recent years plant ecologists have focused primarily on the harmful interactions and most of the workers now use their term the sense implied by [2].

The chemical interactions between weeds and crop plants are a promising area by research which signifies the allelopathic potentialities of different weeds and crop plants. The intensive exploration studies on weed flora in crop fields of Jowar reveal that the weeds occupy prominent place in the rain fed crop fields of Kurnool District. Among the weeds present, phyllanthesis, maderaspatensis is ecologically significant. The dominant weed in the crop fields of Rayalaseema hence, selected for the present study. Further, the seeds of jowar crop germinated easily under laboratory conditions and also for maintenance of samples at different stages.

From the earlier reports it is well evident that both weeds and crops exert allelopathic property that inhibits the germination and growth of crops and weeds respectively. It is in this context the attempts were made to study the possible allelopathic interactions between certain weeds and crops.

2. Materials and Methods

In the present study one crop and one weed analyzed to study the weed crop association.

2.1 Study Area

In Kurnool district four areas with district soil types like red, black, cotton loamy and missed soils were selected weed survey was conducted in the Jowar (Rabi) and Redgram (Kharif).

2.2 Enumeration of Weed Flora

Three fields for each crop plant were selected and in each field ten quadrates of one square meter were laid out randomly each time and observations were made at regular intervals of 20 days to record the abundance, density and percent frequency of the species by [3]. Based on IVI studie[4] phyllanthus, maderaspatensis was regarded as dominant weed and hence selected for present study. Laboratory experiments were conducted to study the allelopathic effect.

3. Aqueous extract preparation

The field grown phyllanthus were collected, surface sterilized with 0.1% mercuric chloride, washed with distilled water and were air dried. Root, Stem, Leaf and inflorescence parts were separated and chopped into fine pieces. The extracts were prepared by taking 10g of chopped part from every plant organ in 100ml distilled water in sterilized beakers. This was kept for 72hrs at 10-15 c. Aqueous extracts thus obtained were filtered through Whatman no.1 filter paper and the volume made up to 100m[9].This aqeous solution was labeled as pure extract (stock solution).A part of this stock solution was further diluted (0,10,100,200 times)with distilled water to get 1:0,1:10,1;100,1:200 preparations of solutions.

4. Petri Plate Studies

Jowar crop found to be rainfed fields in Rayalaseema area especially in Kurnool dist and this was considered as experimental crop plantThe seeds were procured from the Andhrapradesh agricultural dept-kurnool. Raichur variety of jowar surface sterilized with 0.1% mercuric chloride solution for 30 sec and were then rinsed with distilled water and placed in serilized petridishes of 10 cm diameter which were lined with double layer of filter papers. The extract solutions of various dilutions were used as moistening agent for germinating seeds and distilled water served as control. The petridishes were kept under the light intensity of approximately 150WM and at atemparature of 27c+_3. The extract solutions were replaced every day by fresh solutions. The results of all the parameters are the average of three

replicates of three experiments conducted on different days. The following parameters were studied:

5. Physical Parameters

- **Seed germination**: Rate of germination was determined after 24h of sowing in jowar after emergence of radical.
- **Seedling growth**: Morphological data including the length of root and shoot was measured at different time intervals 3, 5 and 7 day.
- **Biomass production**: The seedlings were washed in distilled water and boltted dry with filter paper and cotyledons, roots and shoots were harvested. For the estimation of biomass 3-5 and 7day old seedlings were taken Their fresh weights were recorded .The plant material was dried at 60c in hot air oven for 48h and dry weights were recorded. Dry weights were subtracted to get fresh weights.

6. Results and Discussion

The present data pertaining to different parameters agree with the reports of[10],[12]. The data revealed that higher concentrations (1:0, 1:10) of all extracts of Phyllanthus maderaspatensis significantly inhibited germination in jowar crop by 3 day. However the percent germination was not affected at lower concentrations (1:100, 1:200) of all weed extracts. The degree of inhibition was gradually alleviated with increasing days of incubation [5]. The effect of phyllanthus on jowar revealed that shoot and leaf+inflorescence extracts were found to be more potent than root [8].The degree of inhibition was in the following order leaf+inflorescence>stem>root. The aqueous extracts were inhibitorier to the germination and inhibition was concentration dependent [11]. The higher concentrations of all extracts significantly reduced the root and shoot lengths in jowar[9]. The order of toxicity is root>stem>leaf+inflorescence. The lower concentrations does not show much inhibition on root length of jowar[6]. However the shoot length increased by 1:10concentration in leaf+inflorescence part of jowar. The data reveal that there is a significant increase in shoot biomass at lower concentrations. Higher concentrations decreased biomass of root and cotyledon [7]. Shoot extract found to be inhibitorier than all other extractions.1:0 concentration drastically decreased the biomass.It can be assumed that a correlation exists between the seedling growth and biomass production [7].

Table 1: Effect of aqueous extracts of *Phyllanthus maderaspatensis* on the per cent germination of Jowar

S. No	*Dilution Factor*	*Time of exposure to the crude extract (in days)*								
		Root			*Stem*			*Leaf & inflorescence*		
		3	5	7	3	5	7	3	5	7
1	Control	11.0a	12.0a	12.6a	11.0a	12.0a	12.0a	8.6b	10.0b	12.0a
2	1:0	8.0c	10.6b	11.6b	8.3c	9.3c	9.6c	7.6c	9.0c	9.3c
		(-27.2)	(-13.5)	(-14.5)	(-24.2)	(-22.2)	(-19.4)	(-11.5)	(-10.0)	(-22.2)
3	1:10	10.6b	11.3b	11.6b	10.6b	11.3b	11.6b	7.6c	8.6c	10.0b
		(-13.5)	(7.07)	(-14.5)	(-3.03)	(-5.55)	(-2.77)	(-11.5)	(-13.3)	(-16.6)
4	1:100	10.3b	12.0a	12.0a	10.0b	11.6a	12.0a	9.3a	11.0a	12.0a
		(-6.06)	(0.0)	(0.0)	(-9.09)	(-2.77)	(0.0)	(7.69)	(10.0)	(0.0)
5	1:200	11.0a	12.0a	12.0a	12.0a	12.0a	12.0a	9.6a	11.0a	12.0a
		(0.0)	(0.0)	(0.0)	(9.09)	(0.0)	(0.0)	(11.5)	(10.0)	(0.0)

Means within a column followed by the same letter are not significantly different ($P < 0.05$) from each other according to DMR test. Values in paranthesis represent per cent change over control

Table 2: Effect of aqueous extracts of *Phyllanthus maderaspatensis* on Root length and Shoot length of jowar seedlings

Plant Extract	*Dilution Factor*	*Time of exposure to the crude extract (in days)*					
		Root Length			*Shoot Length*		
		3	5	7	3	5	7
Root	Control	3.10d	5.96d	6.76c	1.73d	2.90c	3.43c
	1:0	0.83a	1.00a	3.96ab	0.30a	1.20a	1.30a
		(-73.1)	(-83.2)	(-41.3)	(-82.6)	(-58.6)	(-62.1)
	1:10	1.20b	4.33	4.93b	1.16b	2.10b	3.96b
		(-61.2)	(-27.3)	(-27.0)	(-32.6)	(-27.6)	(15.5)
	1:100	2.60c	5.70c	9.80d	1.53c	2.73c	4.20d
		(-16.1)	(-4.46)	(44.8)	(-11.5)	(-5.74)	(22.3)
	1:200	2.90d	5.90d	9.93d	1.70d	3.10d	4.33d
		(-6.45)	(-1.12)	(46.7)	(-1.92)	(6.89)	(26.2)
Stem	Control	5.20c	6.30c	11.2e	2.90d	3.26d	3.76c
	1:0	2.13a	3.33a	3.66a	0.93a	1.03a	1.23a
		(-58.9)	(-44.7)	(67.2)	(67.8)	(68.3)	(-67.2)
	1:10	5.00b	5.93b	6.83b	2.06b	2.76c	4.10d
		(-3.84)	(-1.65)	(-38.9)	(-19.5)	(15.3)	(8.84)
	1:100	5.16c	6.0c	8.16c	2.33c	2.76c	4.10d
		(-0.64)	(0.55)	(-27.0)	(-19.5)	(-15.3)	(8.84)
	1:200	5.16c	6.8c	8.70d	2.50c	2.6b	3.03b
		(-0.64)	(13.2)	(-22.3)	(-13.7)	(-21.4)	(-14.1)
Leaf+Inf	Control	5.16d	7.20c	9.56c	3.10c	3.46b	2.76b
	1:0	2.10a	2.23a	3.76a	1.70a	2.36a	1.10a
		(-59.3)	(-68.9)	(-60.6)	(-45.1)	(-31.7)	(-60.2)
	1:10	4.50b	5.10b	6.40b	2.50c	3.76c	2.90b
		(-12.9)	(-29.1)	(-33.1)	(12.9)	(8.65)	(4.81)
	1:100	4.73cb	9.50d	10.7d	2.60b	3.43b	2.96b
		(-8.38)	(31.9)	(12.1)	(-16.1)	(0.96)	(7.22)
	1:200	5.66e	7.40c	9.06c	3.20c	3.50b	2.66b
		(9.67)	(2.77)	(-5.22)	(3.22)	(0.96)	(-3.61)

Means within a column followed by the same letter are not significantly different ($P < 0.05$) from each other according to DMR test. Values in parenthesis represent per cent change over control

7. Conclusion

In the present investigation, aqueous extracts, prepared from shoot,leaf+inflorescence exhibited maximum inhibition than root. The aqueous extracts which are the sources for allelochemicals may produce maximum inhibition at the germination of crop plants. Allelopathic potential may vary with the phase of development of the plant growing around

it. Many angiospermic plants were reported to retard the germination and growth of their neighboring species. As with the response of seed germination, the inhibitory effect of different extracts on seedling elongation was also found to be concentration dependent. The gradual decrease in cotyledonory biomass and root biomass indicates the adaptability of seeds to the toxic effect of allelochemicals. The present observation underlines the fact that the jowar crop raised intensively in semi arid agricultural fields of Kurnool dist need the semi protection mechanism towards allelochemicals of p.maderaspatensis. .Both Weeds and Crop plants exert Allelopathic properties incorporating allelopathy into Agricultural management systems might reduce the use of synthetic herbicides, cause less pollution and diminish the hazards of autotoxicity. In future we hope that allalochemicals may act as natural herbicides and replace the high cost synthetic herbicides associated with environmental damage.

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