

Allelopathic Effect of *Phyllanthus maderaspatensis* Residues on Seed Germination of Jowar and Redgram

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Abstract

Phyllanthus maderaspatensis is a dominant weed of Jowar fields in Rayalaseema region influenced percent germination of Jowar. Seeds of (*Sorghum vulgare*) Jowar (*Cajanus cajan*) Redgram were sown in root and shoot residues of *P.maderaspatensis* for different time intervals in pot studies to understand their impact on percent germination. Seeds grown in higher concentrations (100g) significantly inhibited percent germination. Root residue was found to be more toxic.

Key words:- *Phyllanthus*, Allelopathy, Residues, Jowar, Redgram.

Introduction:- From time immemorial Agriculture is the most important avocation and an inevitable requisite for the existence of mankind. At certain stages of human development it is used to be the only known means of living. Even today in the highly developed industrial countries agriculture play a major role as a supplier of raw materials for industries and commerce apart from its basis role in providing food, clothing, shelter. Therefore the welfare of a nation to a large extent is dependent upon the prosperity of agriculture.

20th century saw massive changes in Agricultural practices particularly in agricultural chemistry. Agricultural chemistry includes the applications of chemical fertilizers, insecticides and fungicides, soil make up, Analysis of agricultural products. The pesticides used for control of agricultural pests have caused many problems. Studies have shown a great potential of allclochemeicals in pest control, thus, these may minimize or eliminate the use of present pesticides.

Study area:- Rayalaseema Region which comes under scarce rainfall zone of the state comprises Kurnool, Kadapa, Anantapur and Chittoor Districts, Kurnool is the rain fed region which was chosen for present study. In Kurnool district four areas with distinct soil types like red, black cotton loamy and mixed soils were selected. Weed survey was conducted in crop fields of Jowar and Redgram.

Eneumeration of weed flora:- Three fields for each crop plant is selected and in each field 10 quadrates of 1 sq meter were laid out randomly each time and observations were made regularly at an interval of 20 days to record density, frequency and abundance by Bran Blanquette method.

Materials and Methods:- In the present study crops and weeds were analyzed to study the weed crop associations *phyllanthus maderaspatensis*(Nalla usjiri) is the dominant weed in Jowar *Celosia* is the

dominant weed in Redgram. Experimental studies were conducted between weed crop association. Jowar and Redgram crop plants were subjected to root and shoot residues of phyllanthus to evaluate allelopathic potentiality.

Pot Studies:-For the pot studies earthen pots (6.5x5.5) size containing 1 Kg of red soil, 100g of black soil, 50g and 100g of coarsely ground root and shoot parts of phyllanthus mixed under natural photo period of about 12-14 hrs with a temperature of 28+4^{OC} in the botanical gardens. A control was maintained without weed parts (e,50,100). The pots were irrigated once daily with distilled water. The pots were left for degradation or decomposition for 15 days. Maximum care was taken to ensure that the amount of water was slightly less than field capacity.

Crop seeds collected from Agricultural Dept. of Andhra Pradesh, Kurnool were surface sterilized with .01% mercuric chloride and seeds were sown 20 for each pot. The result of all parameters (average of 3 replicates) conducted on difference days were systematically recoded and statically analyzed.

Seed germination:-Percent germination was recorded in root, shoot residues of P.maderaspatensis for different time intervals in pot studies to understand their impact on percent germination of Jowar and Redgram on 3rd, 5th and 7th day.

Results and Discussion:-Seeds grown in higher concentrations (100g) significantly inhibited percent germination is 100>50>control. The toxicity effect alleviated at the end of 7th day phyllanthus root residue inhibited the germination on of Jowar and Redgram than shoot extract. Root residue was found to be more toxic. Redgram was effected by shoot extract both in (50,100g) the inhibitory effect was observed to be concentration dependant which was alleviated at the end of 7th day of sowing. Pronounced effect was observed in Jowar with root and shoot residue of P. maderaspatensis only shoot residue expressed the effect on redgram.

Table 1

Effect of residue of Phyllanthus maderaspatensis on the percent germination of Jowar.

Conc. of the residue	Root			Shoot		
	3	5	7	3	5	7
C	7.0a	15.0a	19.0a	12.0b	15.0b	19.0a
50g	4.0b (-42.8)	9.0b (-40.0)	18.0a (-52.6)	14.0a (-16.6)	17.0a (-13.3)	19.0a (0.0)
100g	2.0c (-71.4)	4.0c (-73.3)	10.0b (-47.3)	3.0c (-75.0)	9.0c (-40.0)	16.0b (-15.7)

Table 2

Effect of residue of *P-maderaspatensis* on the percent germination of Redgram.

Conc. of the residue	Root			Shoot		
	3	5	7	3	5	7
C	12.0a	18.7a	20.0a	12.0b	19.0a	20.0a
50g	5.0c (-58.3)	8.0c (-57.1)	12.0c (-40.0)	13.0a (-8.33)	15.0bc (-21.0)	20.0a (0.0)
100g	6.0bc (-50)	9.0bc (-51.7)	14.0b (-30.0)	11.0 (-8.33)	14.0c (-26.3)	18.0b (-10.0)

Means with in a column followed by the same letter are not significantly different ($P < 0.05$) from each other accordingly to DMR test.

(Values in paranthesis represent percent change over control)

Allelopathic potential may vary with the phase of the development of the plant growing around it. Many Angiospermic plants were reported to retard the germination and growth of their neighboring species (Bate-smith and Metcalfe 1957, muller 1965, 1966, 1969, Turkey, 1970, Rice 1974)

Incorporation of weed residues in to soil reduced the seed germination of Jowar and Redgram which is in accordance with the reports of Altieri and Dol (1978). Suseelamma and Venkata Raju (1993 and 1994) Ramakrishna (1996) Oudhia(2000).

The allelochemicals might have been released during the decomposition of residues and they inturn reduced the germination. The residues of phyllanthus incorporated into soil and allowed for 15 days exerted significant inhibitory effect on germination of crop plants the variation being species dependent.

Effect of *Phyllanthus Maderaspatensis* Root residue on Jowar and Redgram



A,C,E Jowar 3,5,7th day B,D,F Redgram 3,5,7th day



Effect of Phyllanthus Shoot residue on Jowar and Redgram

A,C,E Jowar 3,5,7th day B,D,F Redgram 3,5,7th day

Conclusion:- Phyllanthus maderaspatensis is a dominant weed in Jowar fields, Celosia argentia is a dominant weed in Redgram fields. This is identified by IVI studies. Experimental pot studies were carried out in crops and seed allelopathic interactions. Residues of (*P.maderaspatensis*) root and shoots were tested on Jowar and Redgram crop seeds to evaluate percent germination and effect of allelochemicals. The residues of weed plants which are the sources of allelochemicals may produce maximum inhibition at the germination phase of crop plants. Since water is primarily required for the germination the water soluble allelochemicals enter into the seed along with imbibed water and bring about the harmful effects(Mercey Bulah et al 1989). The inhibitory pattern exerted by the residues could be due to inhibition of germination and the effect increased with increase in concentration. In the present investigation root residues of phyllanthus was found to be more toxic than shoot. Percent germination of Jowar shows pronounced effect than redgram.

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