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Allelopathic effect of aqueous extract of five selected weed species on seed mycoflora, seed germination and seedling growth of *Sorghum vulgare* Pers. (Jawar)

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ABSTRACT

In present investigation the allelopathic effect of five weed species viz. *Ameranthus tricolor* L., *Euphorbia heterophylla* L., *Physalis angulata* L., *Alternanthera sessilis* L. and *Portulaca oleracea* L. etc. were collected from Jawar fields from Nanded District. The effect of aqueous crude extracts on seed germination and seedling growth were studied. The aqueous extract of *Portulaca oleracea* L. was found to be stimulatory effect towards seed germination root length, shoot length and seedling growth of Jawar. *Physalis angulata* L. had shown inhibitory effect while *Ameranthus tricolor* L., *Alternanthera sessilis* L., *Euphorbia heterophylla* L. having moderate inhibitory effect. Distilled water was used as control. The result is demonstrated the allelopathic potential of five different weeds in same Jawar field and suggested that those weeds may affect Jawar seed germination and seedling growth due to inhibitory or stimulatory effect of allelochemicals which are present in the aqueous extract of weeds.

Keywords: Allelopathic effects, different weeds, *Sorghum vulgare* Pers., seed germination, seedling- emergence.

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INTRODUCTION

The weeds are very common, dominant and spread in any crop fields. They spread like wildfire and grow abundantly in the crop fields and harm to the main crop. The weeds are unwanted, undesirable and common plant that competes with the crops for water, nutrient and sunlight [6,7]. Some weeds interfere with crop plants through allelochemicals which reduce the crop growth and crop development [2,3,10,11] and ultimately weeds also may directly reduce yield or profits by harvesting operation or period, reduce the crop quality and weeds left uncontrolled many different insects and diseases and produce the seed or rootstocks which destroyed fields and effect the future crops. But some weeds stimulatory affect the crop plant. The weeds variety a great source of secondary metabolites called as allelochemicals and these chemical responsible for the other plant growing and phenomenon known as allelopathy [8]. Allelopathy is defined as the direct harmful or beneficial effect of one plant on another through the production of chemical compounds that escape into the environment [4]. Therefore the urgent need to the detail study of unwanted plants of the crop field and their proper utilization particularly in the welfare of the crop plants. The objective of this study was therefore to determine the effect of extract of weed on seed mycoflora, seed germination and seedling growth of Jawar crop.

MATERIAL AND METHOD

The laboratory experiment had conducted in Department of Botany, Yeshwant Mahavidyalaya, Nanded to determine the allelopathic effect of weed species on seed germination and seedling growth of Jawar crop. Weeds were collected in Jawar field for this experiment in summer season 2008.

Species characters:

***Amaranthus tricolor* L.**

Family –Amarathaceae ,

Common name - Tandulga.

Erect herbs, stem angular, glabrous. Leaves ovate, acute, petiole long, green or in Cultivated time forms tinged with pink or entirely dark red. Flower in axillary or dense clusters in lower leaf axile. Inflorescence spikes bracts and bracteoles broadly ovate. Perianth lobe 3, stamen -3, style-3, fruit erect flask shaped. Seed discoid and shining brown.

***Euphorbia heterophylla* L.**

Family: Euphorbiaceae

Common name - Dudhi



Bushy herbs, dichotomously branched stem, terete, smooth, green. Leaves green alternate, opposite below, entire lobed, acute, serrate, sparsely hairy, base acute, petiolate, floral leaves similar or entire and lanceolates, much smaller than the stem leaves. Cyathia numerous 6-10, in terminal cluster, shortly pedicelled. Inflorescence corymbose cymes. Male florets 12-15, bracteolate, female florets laterally pendulous, fruit globose, glabrous.

***Physalis angulata* L.**

Family-Solanaceae,

Common name- Popti

Annual erect, soft, much branched herbs, stem prominently angular glabrous often rooting at the lower nodes. Leaves simple alternate ovate margin serrate, toothed, acute, petiolates. Flower yellow, axillary, solitary, calyx lobe -5, connect at the base, acute triangular. Corolla-5- fused- gamopetalous, color pale yellow, triangular ovate, stamens-5 unequal exerted yellow/blue some time violet. Ovary bicarpellary, bilocular, ovate numerous, axile placentation, berries glabrous. At the ripe condition berry become orange yellow colored, entirely enclosed by the persistent calyx. Seed many granulate.

***Alternanthera sessilis* L.**

Family – Amarathaceae,

Much branched erect or ascending herbs, glabrous rooting at nodes, leaves linear lanceolate to elliptic-oblong, sessile, acute at base, entire, flower small, white in axillary spikes, long rachis densely white hairs. Bracts and 2-bracteoles, ovate calceolate, acuminate glabrous. tepals ovate-lanceolate, shortly acuminate, white or pinkish 1-nerved or obscurely 3-nerved at base, stamens -3, staminodes 2, Pseudo staminodes minute or very obscure. Fruit obreniform, deeply emarginated, glabrous, brown with thickened margin.

***Portulaca oleracea* L.**

Family –Portulaceae,

Common name: Ghol

Prostrate annual Succulent herbs. stem reddish green, swollen at nodes. Leaves simple, alternate, fleshy, succulent, oblong-ovate, spatulate. Flowers bright yellow in terminal or axillary clusters. Sessile, calyx-2 and unequal, corolla-5-polypetalous, ovule numerous, free central. Fruit capsule ovoid, seed numerous, dull black.

Collection of plant Materials:

The fresh weeds of W1, W2, W3, W4 and M5 in its vegetative stage were collected from jawar fields. The collected plants are identified by using "The Flora of Marathwada" [9] Flora of Bombay presidency [5]; Flora of Maharashtra [1]. We have also made herbarium and stored in



Herbarium Section of Department of Botany, Yeshwant Mahavidyalaya, Nanded (M.S.). The collected weed separated in the form of root and leaves air dried in shade for a week and prepare powdered. The powder of the waste weed biomass were separately packed in polyethene bags and store at room temp before used for experiment.

Experiments:

From preliminary screening it was found that root and leaf extracts had the strongest allelopathic effect on seed mycoflora. Seed germination therefore first selected these 2 plant part of the weeds (root and leaves) for the detail experiment. 100 ml water with Ten gram of powered and extracted separately by Soxhlet method and a series of solution with different strengths (2, 4, 6, 8, and 10%) were prepared by dilution of 100 ml extract. Ten seeds of jawar were kept for germination in sterilized Petri-dishes lined double with blotting paper and seed soaked with 10 ml of different concentration of aqueous extract of (2 to 10%) each treatment had 10 time repeated (Total Number of test seeds $10 \times 10 = 100$) . one treatment was run as control with distilled water only . the Petri-dishes were incubated under laboratory condition (room temperature) for one week, equal volume of d/w was added in the dishes when moisture content of the blotting paper declined. After seven day incubation number of germinated seed was counted and the root length, shoot length were measured and observed the seed mycoflora.

Same procedure followed to evaluate allelopathic effect of different weeds on seed mycoflora, seed germination and seedling growth of jawar crops.

RESULT AND DISCUSSION

Effect of extract of waste weed biomass on seed mycoflora of Jawar-

From the result it is observed that the seed treated in root and leaf extract of *Portulaca oleracea* showed much reduced incidence of mycoflora and the seed soaked in the root, and leaf extract of *Alternanthera sessilis* L showed more incidence seed borne fungi. More than 50% of *Aspergillus* spp. is observed particular in *Aspergillus niger* and *Aspergillus flavus* than other fungi like *Penicillium*, *Curvularia*, *Alternaria*, etc. as compare to the seed soaked in sterile distilled water.

Effect of extract of waste weed biomass on seed germination of Jawar:

From the result it is observed that except in *Portulaca oleracea* L. , there was complete absent of seed germination of test species in 8 and 10% aqueous extract (table no. 1) *Sorghum vulgare* PERS. L. was completely inhibited seed germination at >2% and >4% root extract of *Physalis angulata* L. and *Alternanthera sessilis* L (Table no.1.) while in Table no. 3.it is observed that except in *Portulaca oleracea* , there was complete absent of seed germination of

test species in 8 and 10% aqueous leaf extract of *Ameranthus tricolor* L. , *Euphorbia heterophylla* L. , *Physalis angulata* L. and *Alternanthera sessilis* L .

Effect of extract of waste weed biomass on seedling growth of Jawar:

Among the plant species there was highest growth of shoot and root length in root and leaf extract of *Portulaca oleracea* L. (Table no. 2 & 4) the result showed that different concentration of aqueous both root and leaf extract of weed species treated with Jawar seeds, it is observed that root length some what larger than the shoot length as compared to control.(Table no. 2 & 4).

Table No.1:Seed germination percentage of Jawar crop under different concentration of aqueous Root extract of different weed plant species. The figures in table indicate percentage reduction in seed germination from control.

Sr.No.	Plant species	% of seed germination					
		Plant extract concentration	2 %	4%	6%	8%	10%
1.	<i>Ameranthus tricolor</i> L.	71	13	04	-	-	92
2.	<i>Euphorbia heterophylla</i> L	66	20	04	-	-	100
3.	<i>Physalis angulata</i> L.	49	-	-	-	-	100
4.	<i>Alternanthera sessilis</i> L	43	06	-	-	-	95
5.	<i>Portulaca oleracea</i> L.	67	75	78	83	92	90

Table No.2: Measurement of root length and shoot length of Jawar seeds among different concentration of root extract of weed plant species.

Treatment	W1	W2	W3	W4	W5
Root length (cm.)					
Control	12.5	10.6	15.9	13.4	08.2
2%	1.9	2.3	0.3	0.8	7.2
4%	1.4	1.7	-	0.5	6.4
6%	0.6	1.2	-	-	6.5
8%	-	-	-	-	6.9
10%	-	-	-	-	6.1
Shoot length(cm.)					
Control	6.3	7.5	11.1	12.4	6.4
2%	1.6	2.1	0.2	0.7	5.6
4%	1.1	1.5	-	0.5	5.4
6%	0.7	0.9	-	-	4.5
8%	-	-	-	-	4.8
10%	-	-	-	-	5.2

Ameranthus tricolor L. (W₁), *Euphorbia heterophylla* L. (W₂), *Physalis angulata* L. (W₃), *Alternanthera sessilis* L.(W₄) and *Portulaca oleracea* L. (W₅)

Table No.3:Seed germination percentage of Jawar crop under different concentration of aqueous leaves extract of different weed plant species. The figures in table indicate percentage reduction in seed germination from control.

Sr.no.	Plant species	% of seed germination					
		2 %	4%	6%	8%	10%	control
1.	<i>Ameranthus tricolor L.</i>	70	56	08	-	-	100
2.	<i>Euphorbia heterophylla L.</i>	76	53	15	-	-	100
3.	<i>Physalis angulata L.</i>	49	27	10	-	-	92
4.	<i>Alternanthera sessilis L</i>	75	40	06	-	-	95
5.	<i>Portulaca oleracea L.</i>	80	76	81	76	78	90

Table No.4: Measurement of root length and shoot length of Jawar seeds among different concentration of leaves extract of weed plant species.

Treatment	W1	W2	W3	W4	W5
Root length (cm.)					
Control	11.5	9.4	13.7	12.2	7.3
2%	2.5	2.1	2.4	4.8	3.2
4%	2.0	1.4	2.1	2.5	5.1
6%	1.3	0.7	1.5	0.8	4.1
8%	-	-	0.7	-	4.5
10%	-	-	-	-	4.9
Shoot length(cm.)					
Control	5.6	6.2	9.3	10.6	5.2
2%	2.3	1.9	2.0	3.9	5.1
4%	1.6	1.4	1.8	2.1	5.7
6%	0.7	0.8	1.2	0.9	5.4
8%	-	-	0.6	-	5.6
10%	-	-	-	-	5.2

Ameranthus tricolor L. (W₁), *Euphorbia heterophylla L.* (W₂), *Physalis angulata L.* (W₃), *Alternanthera sessilis L.*(W₄) and *Portulaca oleracea L.* (W₅)

CONCLUSION

The *Portulaca oleracea L.* root and leaf stimulatory effect of seed germination and seedling growth and inhibitory effect of seed mycoflora of Jawar crop. But among the four weed species *Ameranthus tricolor L.* *Euphorbia heterophylla L.* *Physalis angulata L.* *Alternanthera sessilis L.* had more inhibitory effect on jawar seed germination and seedling growth and stimulatory effect of seed mycoflora as compared to *Portulaca oleracea L.* The leaf extracts of *Physalis angulata L.* some what medium effect of seedling growth. However, more Research needed to confirm the allelopathic potential of weed species on seed germination and seedling growth of Jawar in a natural environment.



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