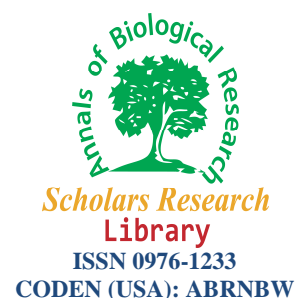




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Allelopathic effect of two common weeds on seed germination, root-shoot length, biomass and protein content of jowar

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ABSTRACT

The present study reveals that the allelopathic potential of two most common weeds viz. *Alternanthera sessilis*, [L.] R.Br., and *Cynodon dactylon*, [L.] Pers. in jowar fields of our area. The aqueous leaf extracts (25, 50, 75 & 100% Conc.) of above said weeds are examined for seed germination, root-shoot length, biomass and protein content of jowar. The drastic change occurs in seed germination. After 72 hours of germination, 75% concentration of both weed extracts causes 100% germination. 75 and 100% concentrations of *A. sessilis*, [L.] R.Br., extracts shows maximum root-shoot length and same trend occurs in 25 and 75% concentration of *C. dactylon*, [L.] Pers. in root and shoot length respectively. The change in biomass is not noticeable. The protein content is highly affected by treatment of weed extracts and stimulated more than two and three times than control by *A. sessilis*, [L.] R.Br., and *C. dactylon*, [L.] Pers. respectively.

Key words: *Sorghum vulgare*, Pers., *Alternanthera sessilis* [L.] R.Br., *Cynodon dactylon* [L.] Pers., allelopathy, germination, root-shoot length, biomass, protein.

INTRODUCTION

A plant produces some chemical compounds and release out into environment which are called as allelochemicals. These allelochemicals shows positive or negative effects on seed germination, growth and development of other plants [1,2,3]. The stimulatory or inhibitory effect of one plant to another plant was first time reported by Hans Molisch and termed these affects as allelopathic effects [4].

Jowar [*Sorghum vulgare*, Pers.] is utmost important crop in our region. *Alternanthera sessilis* [L.] R.Br. and *Cynodon dactylon* [L.] Pers. are most common weeds in jowar fields in our area of Pune District, Maharashtra, India. The present work has done to investigate allelopathic affects of these two weeds on seed germination, root shoot length, biomass and protein content of jowar.

MATERIALS AND METHODS

The experiments were conducted under laboratory conditions at Botany Department, Tuljaram Chaturchand College, Baramati, Dist. Pune, Maharashtra, India. The healthy weeds viz. *A. sessilis* [L.] R.Br. and *C. dactylon* [L.] Pers. were collected from jowar fields in Baramati. 10g fresh leaves of these two weeds were homogenized in 10ml distilled water. Then it was filtered through Whatman No. 1 filter paper and volume was made to 100ml with distilled water. This solution was treated as stock solution. 25, 50, 75 and 100% concentration of stock solutions were prepared for treatment. Jowar seeds of uniform size were selected and were kept in petriplates containing 25, 50, 75 and 100% concentrations of weed extracts for 12 hours. Simultaneously control was made using distilled water. 12 hours treated 25 jowar seeds were kept in sterile petriplates [9 cm in diameter] over filter paper at room

temperature. The filter paper was moistened with 10 ml distilled water and distilled water was supplied to the seedlings uniformly, as and when required. The germination of seeds was observed upto 72 hours and root shoot length was measured upto 192 hours at an interval of 24 hours. After 192h of germination, the biomass of seedlings was measured as well as 216h after germination seedlings were used to protein estimation by the method of Lowry *et al.* [5].

RESULTS AND DISCUSSION

The effect of the aqueous extracts of *A. sessilis* [L.] R.Br. and *C. dactylon* [L.] Pers. on the seed germination and seedling growth of jowar are shown in Table No. 1. From the results, it is very cleared that the treatment of aqueous extracts caused great stimulatory effect on seed germination than that of control. After 72 hours of germination 75% Conc. of both the weed extracts shows 100% germination, while 50% Conc. of *A. sessilis* [L.] R.Br. and 100% Conc. of *C. dactylon* [L.] Pers. also shows similar results (Table 1). The growth of root and shoot of jowar was also affected by the treatment of weed extracts (Table 1). In case of *A. sessilis* [L.] R.Br. 75 and 100% Conc. caused highest root and shoot length than control after 192h of germination. At the same time 25 and 50% Conc. causes inhibitory trend. On the contrary, all the extracts of *C. dactylon* [L.] Pers. caused increasing trend of root and shoot length than that of control and maximum stimulation occurs in root at 25% Conc. and in shoot at 75% Conc. Effect of test weed extracts on biomass of jowar seedling is depicted in Table 1. All extracts of test weeds do not caused significant change in biomass of jowar seedlings. The 216h old jowar seedlings were used for protein estimation. Both the weed extracts caused significantly stimulation in protein content of jowar seedlings than control. Maximum stimulation caused by 75% Conc. (Table 1).

Lot of study carried out on Allelopathy on cereal plants and emphasizes useful as well as harmful effects. Stimulation in radicle growth of kidney bean by treatment of 1 ppm concentration of mimosine was reported by Towata and Hongo [6]. Favouring results in seed germination of *Solanum* and *Capsicum* by allelopathic effect of leachates of *Parthenium* was reported by Dhawan *et al.* [7]. According to Oudhia *et al.* [8] the treatment of aqueous exatracts of root, stem and leaf tissues of *Lantana camera* shows great stimulation in seed germination of rice. The effect of aqueous extract of *Portulaca oleracea* L. on *Sorghum vulgare* Pers. was studied by Dhole *et al.* [2] and found stimulatory effect towards seed germination, root-shoot length and seedling growth. Mubeen *et al.* [9] reported stimulatory effect on seed germination and seedling growth of rice by the allelochemicals of jowar and sunflower. Randhawa *et al.* [10] suggested that *Sorghum* water extract at higher concentration suppressed the germination, root and shoot growth of *Trianthema portulacastrum*. According to Sazada Siddiqui *et al.* [11] *Prosopsis juliflora* aqueous leaf extract inhibit the seed germination and reduce radicle length of wheat. Kayode and Ayeni [12] found the germination and growth of maize is greatly inhibited by treatment of aqueous extracts of rice and jowar. The reduction in germination and growth of lettuce because of effect of allelochemicals of *Parthenium hysterophorus* L. was indicated by Wakjira *et al.* [13]. Zhang *et al.* [14] examined the seed germination of *Delonix regia*, *Tsoongiodendron odorum* and *Elaeocarpus sylvestris* and reported significantly inhibition by treatment of *Eucalyptus spp.* Prohibiting allelopathic effect of aqueous extract of leaf, stem and root of *Sorghum bicolour* on seedling growth of *Vigna radiata* L. was shown by Moosavi *et al.* [15]. Mohammed *et al.* [3] studied that allelopathic potential of aqueous extracts and powder of *Ammi majus* [Khella], *Guiera senegalensis* [Ghobaish] and *Salix spp.* [Safsaf] on germination and seedling growth of two *Sorghum bicolour* L. cultivars and investigate the reduction of total germination percentage and seedling growth. Allelopathic effects of *Cassia tora* on seed germination and growth of mustard was studied by Eva Sarkar *et al.* [16] and they reported negative effect of aqueous extracts of *C. tora* on seed germination and root-shoot development of mustard. The moderate reduction in seed germination, root-shoot elongation and biomass of *Vigna radiata* L., *Dolichos biflorus* L., *Vigna unguiculata* L. was found by Manonmani *et al.* [17] due to treatment of aqueous extract of *Tridax procumbens* L. The allelopathic effect of aqueous extracts of *Amaranthus hybridus*, *Parthenium hysterophorus*, *Datura stramonium* and *Argemone mexicana* leaf, stem and root parts on seed germination, seedling growth and biomass production of wheat cultivars HAR-1685 and Durum wheat studied by Dessalegne *et al.* [18] and noticed that the test plants leaf and stem extracts consistently cause considerable reduction on percent seed germination and growth of wheat.

From the present investigation it can be concluded that, the aqueous leaf extracts of *A. sessilis*, [L.] R.Br., and *C. dactylon*, [L.] Pers. causes significant seed germination, root-shoot length and protein content in jowar seedlings. So, present study provides the evidence of allelopathic potential of these weeds.

Table 1 : Effect of aqueous extracts of *Alternanthera sessilis*, [L.] R.Br. and *Cynodon dactylon*, [L.] Pers. on seed germination, seedling growth, biomass and protein content of jowar

Time [after germination]	Plant species	Germination percentage				
		Treatments				
		Control	25 %	50 %	75 %	100 %
24 h	A	45	30	49	50	38
	C	40	38	49	52	42
48 h	A	81	82	90	89	82
	C	65	80	76	84	73
72 h	A	90	86	100	100	90
	C	73	100	93	100	100
Root length [cm]						
48 h	A	0.89±0.28	0.82±0.18	1.02±0.17	1.05±0.14	1.13±0.18
	C	0.94±0.66	1.14±0.60	0.92±0.22	1.16±0.20	0.95±0.06
72 h	A	1.64±0.26	1.56±0.26	1.62±0.25	2.21±0.37	2.14±0.39
	C	1.22±0.81	2.27±0.69	2.02±0.41	2.31±0.20	2.02±0.23
96 h	A	2.09±0.22	2.13±0.28	2.13±0.42	3.22±0.83	2.63±0.34
	C	1.65±1.03	2.94±0.29	2.46±0.79	2.91±0.17	2.54±0.18
120 h	A	2.38±0.38	2.41±0.22	2.22±0.49	3.60±1.19	3.23±0.46
	C	1.19±1.06	3.57±0.33	3.02±1.17	3.2±0.43	3.24±0.70
144 h	A	2.21±0.59	2.66±0.34	2.34±0.62	3.66±1.39	3.16±0.74
	C	1.75±1.28	3.18±0.79	3.13±1.45	3.6±0.30	3.03±0.20
168 h	A	2.78±0.94	2.71±0.53	2.54±0.54	4.02±1.67	3.43±0.76
	C	2.04±1.40	3.92±0.86	3.24±1.65	3.36±0.27	3.68±1.06
192 h	A	2.86±0.82	2.75±0.15	2.46±0.91	4.18±2.11	3.72±0.30
	C	2.81±1.90	5.09±0.65	3.95±1.40	4.08±0.13	4.11±1.12
Shoot length [cm]						
48 h	A	0.29±0.05	0.23±0.05	0.30±0.06	0.30±0.05	0.36±0.05
	C	0.30±0.18	0.32±0.12	0.30±0.05	0.32±0.05	0.27±0.01
72 h	A	0.55±0.10	0.50±0.08	0.56±0.10	0.89±0.37	0.72±0.07
	C	0.45±0.25	0.71±0.34	0.63±0.22	0.88±0.33	0.72±0.21
96 h	A	1.06±0.23	0.90±0.12	0.92±0.13	1.56±0.47	1.21±0.17
	C	0.84±0.30	1.32±0.58	1.03±0.12	1.24±0.31	1.14±0.26
120 h	A	1.93±0.54	1.43±0.43	1.64±0.17	2.73±0.74	1.92±0.20
	C	1.27±0.61	1.83±0.65	1.9±0.48	2.02±0.45	1.85±0.22
144 h	A	2.50±0.52	2.35±0.53	2.56±0.20	2.75±0.92	3.0±0.35
	C	1.92±1.12	2.62±0.81	2.6±0.67	3.12±0.74	2.35±0.50
168 h	A	3.7±0.43	3.61±0.49	3.82±0.53	5.06±0.91	4.08±0.42
	C	2.4±1.47	3.51±1.09	3.64±0.79	3.91±0.17	3.22±0.86
192 h	A	4.66±0.84	4.22±0.98	4.19±0.32	6.16±0.81	5.37±0.18
	C	3.58±1.69	5.08±1.02	4.64±1.09	5.28±0.61	4.73±1.02
Biomass [g]						
192 h	A	0.9	1	1	1.2	0.9
	C	1	0.9	1	1.1	0.9
Protein content [mg/g of fresh weight]						
216 h	A	19.2	21.6	22.8	26.8	19.6
	C	19.2	22.0	30.4	53.6	24

A : *Alternanthera sessilis*, [L.]R.Br., C : *Cynodon dactylon*, [L.]Pers.**Acknowledgements**

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