ISSN XXXX XXXX © 2019 IJESC

Research Article Volume 9 Issue No.2

Allelopathic Effects of Weeds on *Triticum Aestivum*

Mahadev Ashok Shinde[1], Jayesh Tarachand Salve[2]
Assistant Professor[1], Researcher[2]
Department of Botany[1, 2]
Dadapatil Rajale Arts and Science College, India[1]

Abstract:
The term allelopathy, was introduced by Molisch in 1937 and is derived from Greek words allelon of each other and pathos to suffer and mean the injurious effects of one upon the other. "Allelopathy has been defined as the inhibitory or stimulatory effects of a plant or microorganism on other plants through the release of chemical compounds in to the environment. Wheat (*Triticum aestivum*). Crop is deeply rooted in human culture and civilization. It plays a great role in the global economy and food security. Allelopathy is a difficult phenomenon to study Wheat (*Triticum aestivum* L.) is an important crop in the wheat cropping system that is one of the important and major agricultural production systems in south Asia. Weeds are one of the most serious problems in agriculture production. Weeds affect the crops by way of direct competition for resources and also through their allelopathic effects.

Keywords: Allelopathy, Inhibitory or stimulatory substance, Cropping system, Wheat (*Triticum aestivum*), Weeds (*Amaranthus spp*.), Agriculture production, Organic farming.

I. INTRODUCTION

The term allelopathy, was introduced by Molisch in 1937 and is derived from Greek words allelon of each other and pathos to suffer and mean the injurious effects of one upon the other. Allelopathy appears to have been first noted by the Greek philosopher Theophrastus as early as 2300 BC (Weir et.al., 2014) Allelochemicals are present in virtually all plant tissue, including leaves, flower, fruit, roots rhizome, seed and pollen. In the current work the effects of leaf aqeuous extract of certain weeds are studied on seed germination of a common wheat crop.

The concept of allelopathy received attention from a greater audience in 1974 after the publication of the first book on allelopathy in English by Elroy L. Rice. According to him, allelopathy includes both positive and negative effects. Ethiopia barring some stray observation number scientific evidence on the allelopathic effect of major weed species on germination and growth of economically important widely grown crops like wheat is available. Wheat (*Triticum aestivum*). Crop is deeply rooted in human culture and civilization. It plays a great role in the global economy and food security.

"Allelopathy has been defined as the inhibitory or stimulatory effects of a plant or microorganism on other plants through the release of chemical compounds in to the environment." Allelopathic interactions between plants have been studied in both managed and natural ecosystems. Allelopathy is a difficult phenomenon to study Wheat (*Triticum aestivum* L.) is an important crop in the wheat cropping system that is one of the important and major agricultural production systems in south Asia.

Weeds are one of the most serious problems in agriculture production. They are volunteer plants from the wild or semi culture species that are found in food crops despite the will of the people and harm reducing yield. In modern organic farming the problem of weed control in increasing and refusal of chemical resources of protection from them is usually accompanied by a sharp decrease in yields.

II. MATERIALS AND METHODS

Plant materials:
Wheat is one of the world's most commonly consumed cereal grains. Wheat is mainly composed of carbohydrates, but also has moderate amounts of protein. Allelopathic plant species based on a literature review performed as active allelopathic plant species were chosen. Aqueous extracts of leaves of leaves of *Amaranthus tricolor, Amaranthus spinosus, Amaranthus viridis, Alternathera sessiles.* These weeds were washed in distilled water for removing dust and soil particals and then were dried in shade for a weak at 25^0 c.The Stem and leaves were oven dried at 70^0c until a constant weight was obtained. Dry plant materials of these weeds collected, washed, dried and then ground in a wiley mill and weighed of 10 gm each of the weed species.
Preparation of aqueous extracts: 10 gram of air dried leaves and stem of above weeds was grind, and mixed with 100 ml and left for 24 hours at room temperature. Aqueous extract was obtained as filtrate and final volume was adjusted to 100 ml, this gave 100% aqueous extract. Prepare series of different strengths (10%, 15%, 20%, 25% and 30%) were prepared by dilution with D.W.
Germination studies:A germination paper was placed in Petri dishes and on that to seed germination experiments were performed by taking so seed distributed in Petri dish over the surface of germination. Paper of Petri plates were arranged serially with control, 10,15,20,25,30 percent and treatment extracts of weed samples of levels and stem in control 10,15,20,25,30 percent is given regularly. Distilled water is taken as control. The number of germination seeds was counted after 3-4 days of incubation and the data are recorded.

Seedling weight and length: The randomly selected five normal seedlings were used for measuring root and shootlength

were used for recording fresh weight as well as dry weight of seedlings expressed in milligrams and also there length.

Determination of Chlorophylls: Chlorophyll was estimated by Arnons method (1949). 0.5 gm of sample grinds into 5.0 ml of 80% acetone in clean mortar and pestle. It was centrifuged at 5000 rpm for 10 minutes and supernatant was used for read the absorbance at 645 and 663 nm against the solvent (80% Acetone) blank.

Estimation of proteins

Principle:

The blue color is developed by the reduction of the phosphomolibdic phosphotungstic components in the folin ciocalteau reagent by the amino acids tyrosine and tryptophan present in the protein with the alkaline cupric tartarate are measured in the Lowery method. 1 gm material is homogenized with 3ml of 0.1M phosphate buffer (pH 7.0) in pre chilled mortar and pestle the homogenate is centrifuged at 10000 rpm at 4 c for 15 minutes. Take the supernatant for enzyme assay. Pipette out 0.2ml, 0.4ml, 0.6ml, 0.8 ml standard and 0.2ml of sample extracts in other test tubes. Make the volume to 1 ml in all the test tubes, tubes with 1ml of water serve as a blank. Add 5ml of reagent 'C' (alkaline copper solution:-2% sodium carbonate in 0.1N sodium hydroxide 50ml + 0.5% copper sulphate in 1% potassium sodium tartrate 1ml) in all tubes. Mix well and allow to stand for 10 minutes. Then add 0.5 ml reagent 'D' (Follin-calteau reagent). Mix well and incubate at room temperature in the dark for 30 minutes. Blue colour developed. Take the absorbance at 660nm. Draw a standard graph and calculate the amount of proteins in the samples (mg/g of fresh tissue).

III. OBSERVATION AND RESULTS

Effect of extract on Root length, Shoot length, Chlorophyll, Germination and Protein content

Table1. ***Amaranthus viridis*** **Stem extract**

Treatment	Root length (cm)	Shoot length (cm)	Total length (cm)	Chl.a	Chl.b	Total chl	Germi %	Fresh wt.(gm)	Dry wt. (gm)	Protein gm/ml
Contol	10.3	10.0	20.3	10.4	6.33	5.78	75	0.75	0.20	0.100
10	11.3	9.5	20.8	9.47	5.65	5.17	75	0.72	0.12	0.150
15	11.4	12.0	23.4	6.70	3.84	3.52	63.3	0.95	0.25	0.110
20	9.9	11.6	21.5	7.50	4.57	4.17	55	0.78	0.23	0.123
25	9.8	10.1	19.9	8.64	5.20	4.76	70	0.80	0.25	0.140
30	11.5	10.1	21.6	9.90	5.90	5.40	43.3	0.73	0.23	0.180

Form the table1 this clear that the aqueous extract of stem of *Amarathus viridis* shows as concentration is increasing, there is maximum reduction in seed germination and increase in protein content. Seedlings and total chlorophyll and control did not show any Significant changes.

Table 2. ***Amaranthus viridis*** **Leaves extract**

Treatment	Root length (cm)	Shoot length (cm)	Total length (cm)	Chl.a	Chl.b	Total chl.	Germi %	Fresh wt. (gm)	Dry wt. (gm)	Protein gm/ml
Control	11.2	9.6	20.8	5.30	3.30	3.90	78.3	0.74	0.20	1.280
10	11.2	10.2	21.4	4.26	2.46	2.31	75.0	0.65	0.23	1.350
15	12.6	9.1	21.7	7.97	5.04	4.73	63.3	0.61	0.22	1.290
20	11.6	10.6	22.2	6.74	4.14	7.69	63.3	0.70	0.25	1.230
25	12.8	10.9	23.7	10.8	6.95	6.34	73.3	0.72	0.23	1.330
30	8.7	10.0	18.7	6.64	4.04	3.69	76.6	0.77	0.27	1.250

Observation recorded in table 2, it shows that aqueous leaf extract of *Amarathus viridis* shows at 20 and 25 % there is increase in chlorophyll content and at higher concentration root length is reduced. There is no significant change in protein content, seedlings, shoot length and germination as compared to control.

Table 3. ***Amaranthus tricolor*** **Stem extract**

Treatment	Root length (cm)	Shoot length (cm)	Total length (cm)	Chl.a	Chl.b	Total chl.	Germi %	Fresh wt. (gm)	Dry wt. (gm)	Protein gm/ml
Control	9.4	9.9	17.8	6.08	5.39	4.37	90	0.55	0.20	0.100
10	9.9	8.5	18.4	13.3	6.67	6.14	70	0.69	0.25	1.035
15	7.8	7.1	14.9	8.15	4.22	3.87	63.3	0.73	0.75	0.600
20	9.9	8.8	18.7	10.4	5.94	5.44	70	0.59	0.12	0.595
25	10.2	9.5	19.7	5.01	2.25	2.08	58.3	0.69	0.25	0.545
30	6.5	8.0	14.5	8.14	4.54	4.16	45	0.55	0.22	0.170

Table 3 shows that, at highest concentration of *Amarathus tricolor* stem extracts (30) shows significant reduction in seedlings, seed germination as compare to control , but at the conc.10 shows higher protein content.

Table 4. *Amaranthus tricolor* Leaves extract

Treatment	Root length(cm)	Shoot length(cm)	Total length (cm)	Chl.a	Chl.b	Total chl.	Germi %	Fresh wt.(gm)	Protein gm/ml
Contol	7.2	5.5	12.7	9.87	5.90	5.39	63.3	0.60	0.900
10	7.3	9.1	16.4	21.0	12.9	11.8	68.3	0.70	0.930
15	7.08	7.0	14.08	9.14	5.38	5.06	76.65	0.66	0.960
20	6.5	8.44	14.94	12.0	7.10	6.68	65.0	0.48	0.980
25	6.3	6.0	12.3	10.1	6.02	5.66	56.7	0.56	0.990
30	9.74	7.8	17.34	12.3	7.50	7.07	76.7	0.78	1.100

From table 4, *Amarantus tricolor* leaves extract, at highest concentration (30) shows increasing positive effect on seedlings, total chlorophyll, seed germination and protein content of wheat as compare to others so it indicate that positive allelopathic effect of these weeds on the wheat.

Table 5. *Amaranthus spinosus* Stem extract

Treatment	Root length (cm)	Shoot length (cm)	Total length (cm)	Chl.a	chl.b	Total chl.	Germi %	Fresh wt. (gm)	Dry wt. (gm)	Protein gm/ml
Control	10.2	9.84	20.04	14.23	9.23	8.36	85	0.72	0.25	0.110
10	11.0	10.4	21.4	13.61	8.21	7.50	83.3	0.78	0.20	0.145
15	13.4	11.8	25.2	10.75	6.45	5.89	66.65	0.80	0.25	0.135
20	13.4	10.0	23.4	10.60	6.31	5.77	76.65	0.68	0.15	0.130
25	13.6	10.6	24.2	8.08	4.90	4.49	63.3	0.88	0.27	0.120
30	10.6	10.5	21.1	8.90	5.72	5.22	73.3	0.83	0.24	0.110

Study of *Amaranthus spinosus* stem extracts indicates that as concentration is increasing shows reduction in protein content, total chlorophyll, and seedlings as compared to control.there is no significance change in germination and other parameters.

Table 6. *Amaranthus spinosus* Leaves extract

Treatment	Root length (cm)	Shoot length (cm)	Total length (cm)	Chl.a	Chl.b	Total chl.	Germi %	Fresh wt(gm)	Dry wt(gm)	Protein gm/ml
Control	9.0	8.5	17.5	11.28	8,20	6.20	66.65	0.77	0.19	1.230
10	8.8	8.8	17.6	10.28	6.10	5.58	66.65	0.60	0.20	1.270
15	8.7	8.2	16.9	10.03	5.97	6.45	56.65	0.77	0.15	1.130
20	7.6	6.9	14.5	4.23	2.51	2.29	83.3	0.68	0.14	1.260
25	9.6	8.6	18.2	10.35	6.56	6.16	53.3	0.78	0.13	1.280
30	8.6	8.4	17.0	9.87	5.88	5.52	43.3	0.55	0.17	1.400

From table 6 *Amaranthus spinosus* leaves extract shows as increase in concentration there is maximum increase in protein content, but reduction in seed germination as compare to control.

IV. DISCUSSION

Weeds affect the crops by way of direct competition for resources and also through their allelopathic effects. Allelopathic effects have been reported for many species including crop plants, annual and perennial weeds. In many instances, the chemicals leached from the plants have had an allelopathic influence on germination and growth of subsequent crops. The buildup of certain weed species in predominant numbers in field conditions can be attributed to allelopathic activity.Allelopathy involves release of phytotoxic substances from plant residues which often cause inhibition or delay in seed germination and poor crop stand. Allelopathic activity is believed to be joint action of several secondary metabolites. These metabolites exists in all plant tissues, including leaves, flowers, fruits, stem, roots, rhizomes and seeds and allelochemicals are released from plants through volatilization, root exudation, leaching and decomposition of plant residues. *Amarantus tricolor* leaves extract, at highest concentration (30) shows increasing positive effect on seedlings, total chlorophyll, seed germination and protein

content of wheat as compare to others so it indicate that positive allelopathic effect of these weeds on the wheat**.**

V. REFERENCES

[1]. Alessieva, A.P. and Seprafimov (2008). A study of allelopathy effect of Amaranthus retroflexus and solanum nigrum (L).

[2]. Anderson, R.L. (1993). Crops residue reduce jointed goatgrass (*Aegilops cylindrica*) seedling growth.

[3]. Arnon, D.I. (1949). Copper enzyme in isolated chloroplast polyphenol oxidase in Beta vulgaris, *plant physiol* **24**:1-15

[4]. Bonjean, Alain P. and William J. Angus (eds) (2001). The world wheat book: a history of wheat breeding. Andover: Intercept

[5]. Caligari, P.D.S. and P.E. Brandham (eds) (2001). Wheat taxonomy: the legacy of John Percival. London: Linnean Society, Linnean Special Issue.

[6]. Edwards, K.J., Bevan M.W;Hall,N. (2012).“Analysis of the bread wheat genome using whole-genome shotgun sequencing”.

[7]. Heyne, E.G. (ed.) (1987). Wheat and wheat improvement. Madison, Wis. American Society of Agronomy. P. 765.

[8]. Kumar.M. J.J. Lakiang, B.Gopichand,2006. phytotoxic effect of agroforestry tree crops on germination and radical growth of some food crops of mizoarom Lyonia 11, 83-89

[9]. Marcussen, T. (2014). “Ancient hybridizations among the ancestral genomes of bread wheat”. Science. 345 (6194) :1250092.

[10]. Muzik, J.J. (1970). Weed Biology and control. Mc Graw Hill Book Co. N. y

[11]. Sanita Di Toppi,L; Castagna, A.Andreozzi, E; Careri, M., Predieri, G;Vurro,E; Ranieri, A .(2009). “Occurrence of different inter-varietal and inter-organ defence strategies towards supra-optimal zinc concentrations in two cultivars of Triticum aestivum L”. Environmental and Experimetal Botany. 66. Weed technology 7,717-722.

[12]. Signh HP, Batish DR. Kohli Rk (2003). Allelopathic interaction & allelochemicals. New possibilities for sustainable weed management.

[13].WeirT.L., ParkS.-W., Vivanco J.M.(2004) Biochemical and physiological mechanisms mediated by allelochemicals *Curr. Opin. PlantBiol.* 7 472–479 10. 10 16/ j.pbi. 2004 05.007