ALLELOPATHIC EFFECT OF SOME COMMON WEEDS ON TWO IMPORTANT CROPS *ZEA MAYS* L. AND *VIGNA RADIATA* (L.) WILCZEK.

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Abstract: The present study was investigated to determine the effects of some common weeds on two agriculturally important crops *Zea mays* L. and *Vigna radiata* (L.) Wilczek. The weeds, *Cynodon dactylon, Cyperus rotundus, Parthenium hysterophorus* and *Datura metel* were taken. The viable seeds of crops such as *Zea mays* and *Vigna radiata* were taken and soaked in definite time intervals in water extract of weeds. The seeds were allowed to grow and finally the observations were carried out in various parameters. The observed data includes the germination percentage, Shoot length, root length and seedling length. The data represented the seeds are much affected due to allelochemicals found in weeds. The weed *Cyperus rotundus* affected the host plant Maize and reduces the root length considerably. Similarly the crop *Vigna radiata* was much affected by the weed *Datura metel* which reduces the root length considerably.

Index terms: **Allelopathy, weeds, *Zea mays, Vigna radiata,***

I. INTRODUCTION

Agriculture continues to be backbone of the Indian economy as it employs 54.6% of the total work force. The total share of agriculture and its allied sectors to the gross domestic product was 13.9% in 2013-14. India, bestowed with heterogeneous landforms and diverse climatic conditions comprises lofty mountains, reverie deltas, high altitude forests, peninsular plateaus and various other geological formation. Depending upon soil, bioclimate and physiography the country has 20 agro eco regions and 60 agro eco sub regions (Gajbhiye and Mandal, 2006). Each agro ecological regions and crops grown has distinct weed problems. Weeds are the most aggressive, troublesome and undesirable element of the world's vegetation and cause enormous reduction in crop yield, wastages of resources and human energy and also a health hazard to human being. These are out of place plants and not intentionally propagated. Weeds are naturally strong competitors and those weeds that can best compete always tend to dominate and typically produce huge amounts of kernels, assisting their spread and are exceptional at surviving and germinate in disturbed environments. It can be an unusual species or a native species that settles and persists in an ecosystem in which it did not previously exist.

Weeds can inhabit all environments and propagate easily (Kumbhar and Dharmistha, 2016). According to the FAO, from the total losses worldwide caused by the crop pests, the weeds account for 35% of losses in wheat, 28% in vegetables, 29% in fruit species and vineyards, 37% in tobacco, etc. (Barnes and Putnam, 1986). Weed- crop competition and allelopathy are the main interactions, which are of importance between crop and weed. Allelopathy is distinguished from competition because it depends on a chemical compound being added to the environment. A large number of allelochemicals, which are released by plants are stimulatory or have inhibitory effects with crops. Allelopathy is defined as any direct or indirect harmful or beneficial effect of one plant, fungus or microorganism on the other through production of allelochemicals (Rice, 1984). It is complex process. Different classes of chemicals involved in allelopathy such as flavonoids, phenolic compounds, terpenoids, steroids, alkaloids, amino acids and carbohydrates alone or with mixtures and may involve the interaction of different compounds. The mixture sometimes having a greater allelopathic effect than individual compounds alone (Faravani *et al.*, 2008)

Allelochemicals can be present in soil and affect crop plant beside it and those to be plant in succession. Further the effect can varies over a growing season and yield too. Although allelochemicals may be more biodegradable than traditional herbicides, they have many undesirable effects. It affects all functions of plant life including photosynthesis, respiration, mineral nutrition, transpiration, resistance and growth (Rice, 1984). Hence the present study was conducted to examine the allelopathic effect of four weed species extracts on seed germination, seedling growth on two commonly cultivated crops *Zea mays* and *Vigna radiata* were taken.

II. MATERIALS AND METHODS

2.1 SELECTION OF PLANTS

Weeds are continuous to be the main problem in agricultural fields against main crop. The following four weeds such as *Cynodon dactylon* (L.)Pers. *Parthenium hysterophorus* L. *Cyperus rotundus* L. and *Datura metel* L. were found among the main crop *Zea mays* and *Vigna radiata*. The weeds were identified and authenticated from PG and research Department of Botany, Nallamuthu Gounder Mahalingam College, Pollachi.

2.2 PREPARATION OF PLANT EXTRACTS

For the present study four major weeds which is considered to be menace were selected *viz.*, *Cynodon dactylon*, *Cyperus rotundus*, *Parthenium hysterophorus* and *Datura metel* were selected. The entire plants were freshly collected, and cleaned to remove dust and other foreign materials. About 100 Grams of plants were taken and macerated well using distilled water in Mortar and pestle. The well grinded plant extract were filtered and stored under refrigeration. The water extract was used for further studies.

2.3 SEED TREATMENT WITH LEACHATES

The weeds extracts are commonly referred as leachates during allelopathy studies. Healthy seeds selected were surface sterilized in 0.1% mercuric chloride and washed several times with distilled water. The selected seeds of *Vigna radiata* (Mung bean), *Zea mays* were soaked in various time intervals in petridishes containing equal volume of weed extracts of *Parthenium hysteroporus*, *Cyperus rotundus*, *Cynodon dactylon*, *Datura metel*. Three replicates of ten seeds each for each treatment hours except control was placed evenly on one side of the moistened germination sheet. The sufficiently rolled germination sheet after keeping the seeds on germination sheet were kept moistened environment and allowed for germination. Germination count was taken every day until germination was complete and the germination percentage was calculated. The experiment was carried out on the 7th day of inoculation. The following growth parameters like, root length, shoot length and seedling length was observed and tabulated.

2.4 STATISTICAL ANALYSIS

The analysis was carried out in three replicates and standard deviation were calculated and tabulated.

III. RESULTS AND DISCUSSION

Allelopathic effects of selected weeds are studied on two important crops *Zea mays* and *Vigna* radiata. The weeds *Cynodon dactylon*, *Parthenium hysterophorus*, *Cyperus rotundus* and *Datura metel* were considered to be menace on various crop species. In the present study it is observed that variation in growth parameters and germination percentage was affected considerably in the studied species. The similar observations was reported by many workers Einhelling,1996; Pavvez *et al.*,2004; Kil and Shim, 2006.

The root length of *Zea mays* was much inhibited due to effect of weed. The observation was also supported by Kaur *et al.*, 2005 that root length of *Zea mays* was much inhibited due to effect of various weeds

The present study showed the variation in shoot and root length of *Zea mays* against all the studied. The variation in root length was observed to be more predominant in the weed extract of *Cyperus rotundus* followed by *Cynodon dactylon*, *Parthenium hysterophorus* and *Datura metel*. All the studied weeds much affected on root initiation and growth. The similar observation were reported in rice radical growth by Fag and Stewart, 1994 that the inhibition of radicle due to synergistic effect of allelochemicals. Jadhar and Gajhar, 1992 also reported that the effect of allelochemicals produced by the plant, *Acacia auriculiformis* reduces the growth of radicle in rice.

The germination percentage of *Vigna radiata* was drastically reduced by the effect of of *Parthenium hysterophorus* from 100% to 17% when soaking hours was increased. The observation was supported by

Meena *et al*., 2010, and Sahid *et al*.,2006 that the exotic weed *Chromolaena odorata* has reduced the germination of crops like paddy and barnyard grasses. According to Yarina *et al*.,2009 and Oyun 2006 the aqueous extract of weeds was affected the host plant.

The reduction in growth of shoot length was observed in *Vigna radiata* and *Zea mays* in the weeds extract of *Parthenium hysterophorus* and *Cyperus rotundus*. Except the weeds *Datura metel* all the three weeds affects the seedling growth and inhibits the shoot length. The similar observation was reported by Modupe and Joshua, 2014 that the shoot length of Okra reduced when the of aqueous extract of *Sorghum* stem was treated on seeds. Similarly the length of plumule was decreased from 2.10cm to 0.46cm. the reduction in plumule length was reported in the present study was also supported by Meena *et al*.,2010 that different aqueous extracts of leaf, stem and root of *Chromolaena odorata* inhibitory effect on both radicle and plumule lengths on barnyard grasses.

The water extract of *Datura metel* reduced the growth root length of *Vigna radiata* from 9.7 to 2.06cm. Similar findings were reported by Filemone *et al*.,2013 that *Datura stramonium* was having greater reductive activity on root length against many species such as *Cenchrus ciliaris* and *Neonotonia wightii*. The seedling length of *Vigna radiata* from 14.5 to 4.06 by the effect of aqueous extract of *Datura metel*. Similar results are documented by Husna *et al*., 2016 that the growth of *Zea mays* and *Triticum aestivum* was affected by the growth inhibitors produced by the effect of salvia species.

From the above experiments that the variation and irregularities observed in all the parameters of crop seeds on germination, shoot, root length and seedling length by the effect of weeds. These irregularities was reported by Tanveer *et al*., 2008 reported that water extracts have significant effect on growth of *Oryza sativa* L. and it is concluded water extracts of weeds have showed much effect on all the parameters.

Finally it is found that allelopathy activity of water extracts of weeds *Cynodon dactylon*, *Parthenium hysterophorus*, *Cyperus rotundus*, *Datura metel* have powerful inhibition effect on germination and growth parameters of various crop species *Zea mays* and *Vignaradiata*.

Seeds germianation studies in using germination sheet

Germinated seeds of *Zea mays*

Germinated seeds of *zea mays* and *Vigna radiata*

Germinated seeds of *Vigna radiata* Seeds

Table 1. showing variation in average germination percentage, shoot length, root length and seedling length of *Zea mays* in different soaking time weed extracts.

S. No	Crop	Weed	Soaking hours	Germination (%)	Shoot length (cm)	Root length (cm)	Seedling length (cm)
1	*Zea mays*	*Cynodon dactylon*	Control	100	3.5	18.5	22.0
2			2	97	3.75 ±0.288	13.5 ±1.322	17.3 ±1.607
3			4	97	3.73 ±0.461	16.8 ±3.329	20.56 ±3.789
4.			6	93	4.46 ±1.361	15.5 ±3.970	20.03 ±4.921
5		*Parthenium hysterophorus*	Control	100	4	21.5	25.5
6			2	97	4 ± 1	14.3 ±2.516	18.3 ±3.055
7			4	100	4.6 ±1.154	13.2±0.929	17.93 ±1.289
8			6	100	4.5 ±0.5	19 ±1.802	23.5 ±2
9		*Cyperus rotundus*	Control	100	4.1	19.2	23.3
10			2	97	3.6 ±0.577	17.8 ±1.527	21.5 ±2
11			4	97	3 ±0.866	13.4 ±3.385	16.43 ±3.982
12			6	97	3.8 ±0.763	10.7 ±4.981	14.6 ±5.237
13		*Datura metel*	Control	100	3.8	14.2	18.0
14			2	97	3.16 ±1.154	11.3 ±7.942	14.5 ±9.096
15			4	97	2.7 ±1.021	11.3 ±9.616	14.03 ±10.623
16			6	100	3.4 ±1.153	13 ±1.096	16.4 ±10.086

Table 2. showing variation in average germination percentage, shoot length, root length and seedling length of *Vigna radiata* in different soaking time of weed extracts.

S. No	Crop	Weed	Soaking hours	Germination (%)	Shoot length (cm)	Root length (cm)	Seedling length (cm)
1	*Vigna radiata*	*Cynodon dactylon*	Control	100	5	12	17.0
2			2	97	4.8±1.443	6.8 ±2.020	11.6 ±3.403
3			4	97	3.8±0.288	7.8 ±3.617	11.6 ±3.785
4.			6	93	3.7±0.264	7.3 ±3.214	11.03 ±3.082
5		*Parthenium hysterophorus*	Control	100	4.5	7.8	12.3
6			2	97	3.8±0.288	6.1 ±1.001	9.96 ±1.285
7			4	100	4.16±0.461	7.1 ±3.685	11.3 ±5.838
8			6	100	3.8±0.577	7.5 ±3.041	11.3 ±4.932
9		*Cyperus rotundus*	Control	100	5.1	8.9	14.0
10			2	97	3.8 ±0.288	7.8 ±1.892	11.6 ±2.081
11			4	97	3.7 ±0.461	11.9 ±1.950	15.7 ±2.364
12			6	97	4.6 ±0.577	8.5 ±1.322	10.8 ±5.923
13		*Datura metel*	Control	100	4.3	9.7	14.5
14			2	97	3.8 ±1.154	9.6 ±0.288	13.5 ±1.322
15			4	97	2.0 ±0.450	3.26 ±0.251	5.3 ±0.7
16			6	100	5 ±2	2.06 ±0.404	4.06 ±2.400

IV.CONCLUSION

The study clearly exhibits the effect of weeds on the two study *Zea mays* L. and *Vigna radiata* (L.) Wilzcek. The allelochemicals produced by the weeds affects seed and reduces growth ultimately it reduces the yield and productivity. The study proposes the importance of weed eradication to increase the profit of farmers. Hence the present study proposed to extend the importance of non hazardous environmentally safe bioherbicide for eradication of weeds.

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