

# Allelopathic Potential of *Celosia* and *Euphorbia* Leaf Extracts on yield per Plant (gm) in Mungbean, Chickpea and Sorghum

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**Abstract** In modern and sustainable agriculture and yield improvement without damaging the ecological resources, allelopathy is the better option for crop physiologists. The results of the present investigation have indicated that *Celosia* and *Euphorbia* leaf extracts may help to improve the yield in mungbean, chickpea and sorghum.

The bioprospecting ability of leachates or residues of different allelopathic plants and weeds, analysis of various yield parameters is highly essential. Positive or negative influence on these yield attributes in different crops will be judged through yield parameters.

The concentrations 1:1, 1:2, 1:3 and 1:4 of leaf extracts of *Celosia* and *Euphorbia* are highly rich in various essential macro and microelements, bioactive compounds like terpenoids, steroids, flavonoids, pungent and bitter essential oils and phenols etc. *Celosia* and *Euphorbia* leaf extracts 27.56%, 29.63% in mungbean 31, 96%, 30.62% in chickpea and 29.50%, 30.82% in sorghum positive influence showed with lower 1:4 concentration. and negative effect with higher concentration 1:1 treatments was observed in mungbean (-6.50%, -4.99%), chickpea (-3.59%, -8.73%) and sorghum (-0.59%, -9.855) respectively. All these might have caused the significant improvement in yield of mungbean, chickpea and sorghum.

**Key Words**---Allelopathy, *Celosia*, *Euphorbia*.

## I. INTRODUCTION

FOR sustainable agriculture and yield improvement without damaging the ecological resources, allelopathy is the better option for crop physiologists. The results of the present investigation have indicated that *Celosia* and *Euphorbia* leaf extracts may help to improve the yield in some crops like mungbean, chickpea and sorghum.

The correct idea about the bioprospecting ability of extracts, leachates or residues of different allelopathic plants and weeds, analysis of various yield parameters is highly essential. Positive or negative influence on these yield attributes in different crops will be judged through yield parameters.

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The (1:1), (1:2), (1:3) and (1:4) concentrations of leaf extracts of *Celosia* and *Euphorbia* are highly rich in various essential macro and microelements, bioactive compounds like terpenoids, steroids, flavonoids, pungent and bitter essential oils and phenols etc. Positive influence with lower concentration and negative effect with higher concentration treatments was observed in this investigation. All these might have caused the significant improvement in yield and yield parameters in mungbean, chickpea and sorghum acting in combination or individually.

Narwal (2004) advocated the use of allelopathy for enhancing agricultural production without or with least deterioration of soil health and other natural resources.

## II. MATERIALS AND METHODS

In the present investigation allelopathic studies in some dominant weeds like *Celosia argentea* and *Euphorbia hirta* from semiarid agroecosystem of Bhende (BK), Salabatpur, Vadala and Pachegaon of Newasa Tahasil, District Ahmednagar were carried out by using test crops like mungbean, chickpea and sorghum.

### A. Collection of weed samples

The leaf samples of *Celosia argentea* and *Euphorbia hirta* were collected at maturity stage at random, and used for physiological, biochemical analysis, weedicidal and antimicrobial activity. The leaves were cleaned and shade dried and were used for analysis of various organic and inorganic constituents. The selected sites, season of collection etc. were kept constant throughout the period of investigation.

### B. Method for the preparation of extracts

The shade dried mature leaf samples of *Celosia argentea* and *Euphorbia hirta* (20 gms) were mixed in 150 ml of distilled water and homogenized for 30 min. The extract was squeezed through muslin cloth and filtrated through Whatman filter paper No. 1. Final volume of the filtrate was made 200 ml with distilled water. The stock solutions of extract (10 % w/v) were transferred in to amber colored bottles and refrigerated to avoid their degradation and deterioration. These extracts were used for foliar treatments after making desired concentrations.

### C. Applications of extracts

The leaf extracts of *Celosia argentea* and *Euphorbia hirta* of desired concentrations ranging from 1:1, 1:2, 1:3, 1:4 were applied foliarly (100ml/row) on the field grown plants of mungbean, chickpea and sorghum after 10 DAS. Distilled water sprayed plants maintained as control. The application of extracts was continued up to 50 % flowering / anthesis stage at an interval of seven days for mungbean and chickpea, while fifteen days for sorghum. The volume of extract for foliar application was kept sufficient and constant with the increase in size of plants.

### D. Field experiments of test crops

Field experiments of test crops were conducted on the research farm of the Department of Botany, University of Pune, Pune 411 007. Above mentioned test crops were grown in *kharif* and *rabi* seasons by following recommended methods under uniform conditions. All the experiments were carried out in triplicate FRBD designs. The size of raised bed was 2 X 2 M and each plot was having 25 to 30 no. of plants of mungbean per treatment throughout the experiment upto harvesting. The distance between two plants was 15 cm and distance between two rows was 45 cm. Adjacent plots were

separated by keeping the distance of one meter. The inter culture practices and irrigation were as per the recommended methods. Plant protection measures were followed as and when required.

The seeds of sorghum were sown in ridges and furrows. Each treatment was in triplicate and in FRBD design. The distance between two plants was 30 cm and the distance between two rows was 60 cm. Recommended practices of inter cultivation, irrigation and plant protection were followed. Each treatment was separated by a distance of one meter.

The seeds of chickpea were sown on raised beds of 2 X 2 M, and each plot was having 30 no. of plants per treatment throughout the experiment up to harvesting. The distance between two plants was 45 cm and the distance between two rows was 60 cm. The adjacent plots were separated by one meter. The inter cultivation and irrigation was as per the recommended practices. Plant protection measures were followed as and when required.

## III. RESULTS AND DISCUSSION

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TABLE. 1.1  
EFFECT OF *CELOSIA* AND *EUPHORBIA* LEAF EXTRACTS ON YIELD PER PLANT (GM) IN MUNG BEAN, CHICKPEA AND SORGHUM

Mung bean				PIODC	
Leachate conc.	<i>Celosia</i>	<i>Euphorbia</i>	Mean	<i>C. argentea</i>	<i>E. hirta</i>
Control	12.30	12.42	12.36	0.00	0.00
1:4	15.69	16.10	15.90	27.56	29.63
1:3	13.60	13.43	13.52	10.57	8.13
1:2	12.96	13.01	12.99	5.37	4.75
1:1	11.50	11.80	11.65	-6.50	-4.99
Mean	13.21	13.35	<b>13.28</b>		
Source	SEM	CD at 5%	CD at 1%		
Weeds	0.89	2.63	ns		
Concentrations	0.56	1.67	2.28		
Between Interaction	0.51	1.52	ns		
Chickpea				PIODC	
Leachate conc.	<i>Celosia</i>	<i>Euphorbia</i>	Mean	<i>C. argentea</i>	<i>E. hirta</i>
Control	15.79	15.56	15.68	0.00	0.00
1:4	20.84	20.33	20.58	31.96	30.62
1:3	19.44	17.20	18.32	23.11	10.55
1:2	16.68	15.53	16.10	5.61	-0.21
1:1	15.22	14.20	14.71	-3.59	-8.73
Mean	17.59	16.56	<b>17.08</b>		
Source	SEM	CD at 5%	CD at 1%		
Weeds	0.37	1.10	ns		
Concentrations	0.23	0.69	0.95		
Between Interaction	0.21	0.63	ns		
Sorghum				PIODC	
Leachate conc.	<i>Celosia</i>	<i>Euphorbia</i>	Mean	<i>C. argentea</i>	<i>E. hirta</i>
Control	20.87	20.79	20.83	0.00	0.00

1:4	27.04	27.20	27.12	29.56	30.82
1:3	24.25	25.79	25.02	16.19	24.04
1:2	22.71	21.16	21.93	8.80	1.79
1:1	20.75	18.74	19.75	-0.59	-9.85
Mean	23.12	22.74	<b>22.93</b>		
Source	SEM	CD at 5%	CD at 1%		
Weeds	0.63	1.86	ns		
Concentrations	0.40	1.18	1.61		
Between Interaction	0.36	1.07	ns		

#### Seed/grain yield per plant in test crops

The results computed in table 1.1 revealed that the foliar applications of *Celosia* and *Euphorbia* aqueous leaf extracts were highly effective for increasing seed yield per plant in mungbean (27.56 % and 29.63 %), chickpea (31.96 % and 30.62 %) and sorghum (29.56 % and 30.82 %).

However higher concentration treatments (1:1) of *Celosia* and *Euphorbia* aqueous leaf extracts were inhibitory in mungbean (-6.50 % and -4.99 %), chickpea (-3.59 % and -8.73 %) and sorghum (-0.59 % and -9.85 %). All the results were statistically significant at 5 % and 1 % CD.

#### Discussion

To have the correct idea about the bioprospecting ability of extracts, leachates or residues of different allelopathic plants and weeds, analysis of various yield parameters is highly essential. Positive or negative influence on these yield attributes in different crops will be judged through yield parameters. Positive influence with lower concentration and negative effect with higher concentration treatments is well documented in allelopathy literature.

The research workers like Cheema et. al. (2002) and Irshad and Cheema (2004) reported increase in grain yield, spike length, grains per spike in wheat and increase in grain yield, number of tillers, number of spikelets per panicle and 1000 grain weight in rice at lower concentration treatments of sorghum. Similarly Tripathi et. al. (2000) also recorded significant increase in number of grains per pod, weight of 100 grains and total grain weight in mungbean, when treated with seedling sap of maize and leaf as well as root extracts of *Dalbergia*. Singh et. al. (1980) reported improvement in yield of chickpea due to leachates of various plants. Sukul and Chaudhari (2001) reported improvement in all yield parameters of rice due to applications of crude extracts of *Lantana*. Similarly Dhumal and Bhalerao (2004) noted that length of earhead, number grains per earhead and 1000 grain weight was highly improved in sorghum due to foliar application of lower concentration of extracts of ferns. They claimed that fern extracts will be the potential candidate for bioprospecting. Yamada et. al. (2002) reported significant increase in number of pods per plant, seed yield per plant in mustard due to leaf extracts of *Lantana*, *Woodfordia*, *Chenopodium* etc.

However Singh et. al. (2001) and Gogoi et. al. (2002) reported reduction in grain yield of soybean due to different weeds like *Phalaris*, *Ageratum* and *Chinopodium* and reduction in number of grains per panicle, 1000 grain weight

and total yield in rice due to aqueous extracts of *Ageratum*, *Borreria* and *Eleusine*. Patil et. al. (2004), Bernet et. al. (2003) reported reduction in yield of sorghum, wheat and mustard due to allelopathic effects of sunflower. Bajwa (2004) reported that aqueous extracts of *Parthenium* inhibited the diameter of capitulum in sunflower. Misra (2006), and Urai-Pengpis (1996) reported similar trend in rice, sorghum, peanut, horsegram, blackgram, soybean at higher concentration treatments of *Phalaris*, *Chenopodium*, *Helianthus*, *Wedelia* etc. Prasad and Priyadarshini (2006) reported decrease in yield attributes due to leaf extracts of *Parthenium* in turnip.

The results of the present investigation are in line with the above workers. Various reasons have been given for positive or negative influence of extracts and leachates of various weeds on yield attributes in agricultural crops. Dhumal and Bhalerao (2004), Bhalerao (2003), Jadhav (2006), Vaidya, (2007) claimed that various types of stimulatory allelochemicals, PGRs like substances and mineral nutrients might be helping for improving the yield attributes at lower concentration treatments in sorghum, strawberry, chickpea, mungbean, wheat etc. Similar explanation was given by Tripathy et. al. (2000).

As proposed by Raj and Tripathi (1984) the adverse impact of allelochemicals on photosynthesis, carboxylating enzymes, chlorophyll contents, accumulation of carbohydrates and proteins, source-sink relationship etc. may be the reason for decreased yield and yield parameters at higher concentration treatments.

The allelopathy workers like Monimoto et. al. (2001), Bogatek et. al. (2002), indicated that various yield attributes in agricultural crops are highly influenced by leachates, extracts and residues of allelopathic plants. All the above explanations may be the reasons for increase or decrease in yield parameters of mungbean, chickpea and sorghum. The leaf extracts of *Celosia* and *Euphorbia* are highly rich in various essential macro and microelements, bioactive compounds like terpenoids, steroids, flavonoids, pungent and bitter essential oils and phenols etc. All these might have caused the significant improvement in yield and yield parameters in mungbean, chickpea and sorghum acting in combination or individually.

For sustainable agriculture and yield improvement without damaging the ecological resources, allelopathy is the better option for crop physiologists. The results of the present investigation have indicated that *Celosia* and *Euphorbia* leaf extracts may help to improve the yield in some crops like

mungbean, chickpea and sorghum. Narwal (2004) advocated the use of allelopathy for enhancing agricultural production without or with least deterioration of soil health and other natural resources.

#### *Analysis of yield parameters of test crops*

The yield parameters like number of branches, number of pods, length of pod, length of ear head, diameter of ear head were measured at the time of harvesting from randomly selected ten plants from each treatment and control. The average values was recorded in tables. The number of grains per pod / ear head and weight of 1000 grains were measured after recovering the grains from randomly selected 100 pods of mungbean, 1000 pods of chickpea and 25 ear heads of sorghum.

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