

## Allelopathic potential of *Argemone mixicana* L. on Germination and Growth of *Cassia senna* and *Corchorus olitorus* L.

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### Abstract

*An experiment was carried out to study the effect of Argemone mexicana aqueous extract on seed germination and early growth of Cassia senna and Corchorus olitorus. The experiment was set up as a completely randomized design with three replications. The results indicated that the different concentration of the aqueous extract (5%, 10%, and 15%) affect the germination, shoot and root length and shoot fresh and dry weight negatively, the reduction in these parameter increased as the concentration of Argemone mexicana increased.*

**Keywords:** Allelopathic potential, *Argemone mixicana* L., *Cassia senna*, *Corchorus olitorus* L.

### INTRODUCTION:

Allelopathy is commonly defined as any direct or indirect effects by one plant including microorganisms, on another production of chemical compound that escape into environment (Rice, 1984). Allelochemical refers to secondary metabolites produced by plants and by products of primary metabolic processes. Many of these compounds are phytotoxic and have potential as herbicides. Weeds are unwanted and non-economic plants that compete with crops for water, nutrient and sunlight. Allelopathy is a natural and an environment friendly technique which may be a unique tool for weed control and increase

crop yields. *Corchorus olitorus* is one of the main vegetable which is consumed by Sudanese people, but weeds are sometimes decreased the quantity and quality of this vegetable. *Cassia senna* is one of the medical plant, which is used as a medicinal plant by the Sudanese people *Argemone mexicana* is annual herb native of west India and Mexico, was spread in many areas over the world, even in the eastern Sudan (Erkuit area). Sharma and Nathawat (1987) demonstrated that a reduction of germination and growth of some crop plants as treated with *Argemone mexicana*. Suwal *et al*, (2010) noticed phytotoxic suppressive action of water extract of *Chromolaena odorata* germination and seedling growth of rice and barnyard grass. Also Zohaib *etal*, (2014) reported that rice germination and seedling growth were significantly suppressed by application of the water extracts of *Melilotus indica* compared with control. The objective of the present study was to assess the potential of aqueous leaf extract of *Argemone mexicana* on the germination and growth characters of *Cassia senna* and *Corchorus olitorus*.

## **MATERIALS AND METHODS:**

Preparation of the Aqueous extract solution: The leaves of *A.mexicana* plant were collected from Erkuit area in eastern Sudan, which is one of the wildlife protected areas in Serengeti Eco system, this area has been invaded by *A.mexicana*. The leaves were washed thoroughly with distilled water and air dried at room temperature for seven days, then the leaves chopped and crushed in a mixture girder into powdery form. A certain amount of the powder, 5g ,10g,15 g were transferred to labeled bottles, then 100 ml of sterile, deionized distilled water were added to each bottle. The mixture was shaken and the bottles were left for 48 hrs. at room temperature then filtered to get extract of 5%, 10%, 15%, (w/v), and the distilled water as a control treatment.

The seeds of *Cassia senna* and *Corchorus olitorus* were washed three times in running tap water to remove any impurities and afterwards surface sterilized with 1% Hgcl<sub>2</sub> for 10 min, then washed four times with sterilized distilled water. The germination test was carried out in sterile petri dishes 12 cm in size, and a whatman's no 1 filter paper was placed on the petri dishes. The extract of each concentration was added to each petri dish of

respective treatment daily in a mount just enough to wet the seeds. The control was treated similarly with distilled water. Twenty seeds were in the petri dishes containing whatman's filter paper. The petri dishes in five replication. The treatments were set in a complete randomized design in a room temperature for a period of 10 days. The criteria for seed germination is to emergence of the radicle. The germination seeds were recorded daily.

## **RESULT AND DISCUSSION:**

The percentage of the seed germination of *Cassia senna* and *Corchorus olitorus* were recorded significantly by the different concentration of the aqueous extract of *A.mexicana* (table 1). The inhibition percentage increased as the concentration of aqueous extract increased, these results are supported by the finding of *Sharma* and *Nathawat* (1987) who found a reduction in germination of some crops as treated with *A.mexicana*.

Table (2) indicated a significant difference ( $p=0.05$ ) between treatments in shoot and root length of *Cassia senna* as treated with *A.mexicana* aqueous extract. The inhibition percentage increased from 37.14% at T2 (5%) to 73.37% and 82.85% at T3 (10%) and T4 (15%) respectively. Similar results were reported by *Ismail* and *Siddique* (2011), who found that seeding length and weight of *Oryza sativa* was suppressed by residues of *Cyperus iria* in soil. These results concurred with the results of *Hamid, etal* (2008) who observed the inhibitory allelopathic effect of soil incorporated residues of *Hordeum spontaneum* on seedling length and dry weight of *Triticum aestivum*.

The shoot fresh weight and dry weight expressed a significant difference between treatments and control. The shoot fresh weight decreased from 0.063 g at control to 0.055, 0.043, and 0.019 g at T2 (5%), T3 (10%), and T4 (15%) respectively.

**Table 1.** Allelopathic effect of *Argemone mexicana* aqueous Extract of germination of *Cassia senna* and *Corchorus olitorus*

Treatment	Cassia senna		Corchorus olitorus	
	Germination %	Inhibition %	Germination %	Inhibition %
T1 (control)	7.66	-	-	-
T2 (5%) (w/v)	6.33	-17.36	8.33	-13.76
T3 (10%) (w/v)	5.33	-30.41	6.33	-34.47
T4 (15%) (w/v)	4.66	-36.42	5.66	-41.40
LSD	0.02	-	0.05	-

**Table 2.** Allelopathic effect of *Argemone mexicana* aqueous Extract on shoot and root length of *Cassia senna*

Treatment	Shoot length (cm)	Inhibition %	Root length (cm)	Inhibition %
T1 (control)	8.75	-	5.50	-
T2 (5%) (w/v)	5.50	-37.14	4.60	-27.27
T3 (10%) (w/v)	2.33	-73.37	3.10	-43.63
T4 (15%) (w/v)	1.50	-82.85	2.40	-56.36
LSD	0.02	-	-	-

However the inhibition percentage of *Cassia senna* increased from 63.63% T2 (5%) to 72.72% to 76.36% at T3 (10%) and T4 (15%) respectively. In this respect, El Rokik *etal* (2010), found that the dry weight of foliage of *Cyperus rotundus* was inhibited and inhibition varied significantly with different rate of mango leaf powder.

Table 4 showed a significant decrease in shoot length and root length of *Corchorus olitorus* as treated with *A.mexicana* aqueous extract. The inhibition percentage of shoot length increased from 14.28 % at T2 (5%) to 43.34% and 66.58%at T3 (10%) and T4 (15%) respectively. However, the root length inhibition increased as concentration of aqueous extract increased 58.62% at concentration of 15% at treatment T4, these results are supported by the results of Fikeryesus *etal*.(2011) who found that the extract of *Eucalyptus camalduleniss* inhibited the root elongation of tomato. Also Gulzar *etal*. (2014) found that the root length of *Chenopodium album*, *Melilotus alba* and *Nicotiana plumbaginifolia* decreased as the concentration of *Cassia sophera* increased. The shoot fresh and dry weight of *Corchorus olitorus* exhibited a significant decreased from control T1 to treatment T2 (5%), T3 (10%) T4 (15%). Similar results were reported by Zohaib *etal*.(2014) who found that 2,5% and 5% aqueous extract of *Medicago polymorpha* reduced shoot length and dry biomass of rice. Also the work of Hegab *etal*.(2016), who found a

reduction in shoot fresh weight of corn and higher level of Datura residue (1%, 1.5%, w/w) .

**Table 3.** Allelopathic effect of *Argemone mexicana* aqueous Extract on shoot fresh and dry weight of *Cassia senna*

Treatment	Shoot fresh Weight (g)	Inhibition %	Shoot dry Weight (g)	Inhibition %
T1 (control)	0.063	-	-	-
T2 (5%) (w/v)	0.055	-20.63	0.004	-63.63
T3 (10%) (w/v)	0.043	-36.50	0.003	-72.72
T4 (15%) (w/v)	0.019	-84.12	0.002	-76.36
LSD	0.00	-	-	-

**Table 4.** Allelopathic effect of *Argemone mexicana* aqueous Extract on shoot and root length of *Corchorus olitorus*

Treatment	Shoot length (cm)	Inhibition %	Root length (cm)	Inhibition %
T1 (control)	20.30	-	5.80	-
T2 (5%) (w/v)	17.40	-14.28	4.20	-27.58
T3 (10%) (w/v)	11.50	-43.34	3.30	-43.10
T4 (15%) (w/v)	6.80	-66.50	2.40	-58.62
LSD	0.63	-	0.04	-

**Table 5.** Allelopathic effect of *Argemone mexicana* aqueous Extract on shoot fresh and dry weight of *Corchorus olitorus*

Treatment	Shoot fresh Weight (g)	Inhibition %	Shoot dry Weight (g)	Inhibition %
T1 (control)	0.33	-	0.013	-
T2 (5%) (w/v)	0.31	-6.06	0.011	-15.30
T3 (10%) (w/v)	0.30	-9.09	0.010	-23.07
T4 (15%) (w/v)	0.23	-30.30	0.010	-23.07
LSD	0.00	-	0.000	-

The suppression in fresh and dry weight of *Cassia senna* and *Corchorus olitorus* may be attributed to the decrease in shoot and root length of the seedlings which was induced by the allelochemicals found in *A.mexicana* aqueous extract. The phytochemical which was released by the *A.mexicana* aqueous extract may decrease the water and nutrient absorption through roots and consequently affect plant processes such as photosynthesis and respiration and the whole growth.

## CONCLUSION:

The result of this study indicated that *A.mexicana* aqueous extract reduced the growth of *Cassia senna* and *Corchorus olitorus*, however field studies are needed to evaluate the allelopathic role of *A.mexicana* on the preceding crops.

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