

## Allelopathic Effects of *Chenopodium Album L.* on *Brassica Juncea (L.) Czern*



Science

**KEYWORDS :** Allelopathy, *Brassica juncea (L.) Czern.*, *Chenopodium album L.*

Patel J.R.

Researcher, R.R. Mehta college of Science and C.L. Parikh College of Commerce, Palanpur (N.Guj.) India

Dabgar Y.B.

Principal, R.R. Mehta college of Science and C.L. Parikh College of Commerce, Palanpur (N.Guj.) India

### ABSTRACT

*The present paper deals with allelopathic potential of *Chenopodium album L.* on germination and seedling growth of *Brassica juncea (L.) Czern.* The present research work done under laboratory experiment in research lab. of Biology Department, R. R. Mehta College of Science, Palanpur. Four concentration (2%,4%,6%,10%) of aqueous extracts of *Chenopodium album L.* of leaf, stem and root were used. The seeds of *Brassica juncea (L.) Czern.* were placed in petridishes containing the leaf, stem, root extract, and distilled water (control medium). Percent seed germination was taken after a week and then shoot and root length was recorded. The result revealed that higher concentration (10%) of *Chenopodium album L.* extract, reduced the seed germination of *Brassica juncea (L.) Czern.* While 100% seed germination obtained in DW. root and shoot length of *Brassica juncea (L.) Czern.* were also significantly suppressed at higher concentration (6% and 10%) of *Chenopodium album L.* while lower concentration (2% and 4%) of the extract promoted shoot length of *Brassica juncea (L.) Czern.**

### Introduction

The term allelopathy was first introduced by Molisch (1937) which refers to chemical interactions among plants, including those mediated by microorganisms (Weston, 2005). More recently Weston defined allelopathy as an important mechanism of plant interference mediated by the addition of plant-produced secondary products to the soil rhizosphere (Weston, 2005). These secondary metabolites are located throughout the plant and are present in various plant tissues such as stems, leaves, roots and others. Allelopathic secondary metabolites are typically released into the soil rhizosphere under appropriate conditions, although they can also be passed through the air as volatiles. Allelopathic compounds can be released into the soil by a variety of mechanisms that include decomposition of residues, root exudation, and volatilization (Weston, 2005). These compounds then come in contact with neighboring plants, which can then stimulate, or more typically negatively impact the growth of these neighboring plants. Although these compounds are not restricted to plant-plant interactions, they can also interact with other organisms. Lovett looked at allelopathy as the complex of subtle communications between plants and also between plants and other organisms (Einhellig, 1995).

Allelopathic species can indirectly affect their growth rate by manipulating microbes in their surrounding rhizosphere, and altering the plant-microbe interaction. Biorational alternatives are gaining increased attention for weed control because of concerns related to pesticide usage and dwindling numbers of labeled products, particularly for minor use crops (Weston, 1996). In certain cropping situations allelopathy may have the potential to be integrated into a weed management plan in order to reduce the use of synthetic herbicides, as well as provide other added benefits from the allelopathic crop. Allelopathic crops can be incorporated into weed management plans as crop rotations, living mulches, or as residue cover crop. Genetic engineering could be a useful tool in order to create cultivars that produce greater amounts of allelopathic compounds for weed suppression in agriculture.

Allelopathy is a potential field of research all over the world. Few researchers consider only the deleterious interactions as allelopathy, while, the latest thinking includes allelopathy to both harmful and beneficial interactions between the plants (Rizvi et al., 1986). In agriculture, the inhibitory effect of weed species on germination and growth of crops has been attributed to phytotoxic chemicals released from the leaf litter and roots. Further, Rice (1974) observed that many species of weeds produced toxins that are inhibitory to other weeds and often to themselves. In this context, a study was undertaken to elucidate the effect of *Chenopodium album L.* on germination behavior, root and shoot growth of the *Brassica juncea (L.) Czern.*

### Materials and Methods

The allelopathic effects of different concentration of aqueous extracts of root, stem and leaf of *Chenopodium album L.*, the germination percentage and seedling growth of *Brassica juncea (L.) Czern.*

The aqueous extracts of the leaf, stem and root were prepared by digesting 10gm of air dried *Chenopodium album L.* material in 100ml distilled water for 24h at 25°C±5°C. It was filtered through whatmann filter paper no.1 of the volume of filtrate made to 100ml (Dhawan and Narwal, 1994). Different dilution of the extracts i.e., 2%, 4%, 6%, and 10% were prepared from this stock solution. Seeds of mustard (*Brassica juncea (L.) Czern.*) were soaked in different concentration of the extracts. For control, seeds were soaked only in distilled water.

In each petri dish containing a whatman no.1 filter paper kept at bottom, 10 seeds were arranged on top of the filter paper in each petri dishes. The petri dishes were covered with glass covering. They were incubated for 5 days. The whole set of experiment was kept undisturbed at a room temperature of 25°C±5°C.

### Results and Discussion

Effects of seed germination in *Brassica juncea (L.) Czern.* by different concentrations of various parts of *Chenopodium album L.* extracts were studied. In leaf extract of *Chenopodium album L.* 99% seed were germinated in DDW (control medium) while various concentration of *Chenopodium album L.* like 2%, 4%, 6% & 10%, the seed germinated were 97%,85%,82%,80% respectively. In stem extract various concentration of *Chenopodium album L.* like 2%, 4%, 6% & 10%, the seed germinated were 97%,92%,87%,82% respectively. while in root extract various concentration of *Chenopodium album L.* like 2%, 4%, 6% & 10%, the seed germinated were 98%,96%,92%,87% respectively (Table-1). Results indicate that on increasing the concentration of the extract of various parts like leaf, stem and root to 10%, a reduction in the seed germination were noticed (Table-1). Of the different parts of the extract tried, the leaf extract was found to be influencing a greatest decrease compared root and stem extract after 5th days.

**Table 1:- Germination of seed on 5<sup>th</sup> day.**

EXTRACT	CONCENTRATION				
	control	2%	4%	6%	10%
LEAF	99%	97%	85%	82%	80%
STEM	100%	97%	92%	87%	82%
ROOT	98%	98%	96%	92%	87%

Effects of seedling growth in *Brassica juncea* (L.) Czern. by different concentrations of *Chenopodium album* L. extracts were studied. Different results were observed after 10th and 15th days. In *Brassica juncea* (L.) Czern. 1.68cm root length and 3.13cm shoot length was reported in DDW. While in various concentration of leaf extracts of *Chenopodium album* L. like 2%,4%,6% & 10% root length were reported 1.29cm, 0.95cm,0.67 and 0.23cm respectively after 10th days. While shoot length were reported 3.01cm, 2.18cm,1.15cm and 1.01cm in 2%, 4%, 6% & 10% respectively in leaf extract after 10th days. Similar result was observed after 15th days (Table-2)

In *Brassica juncea* (L.) Czern. various concentration of stem extracts of *Chenopodium album* L. like 2%,4%,6% & 10% root length were reported 1.45cm, 0.47cm,0.57 and 0.29cm respectively after 10th days. while shoot length were reported 3.09cm, 2.47cm,1.33cm and 1.04cm in 2%, 4%, 6% & 10% respectively

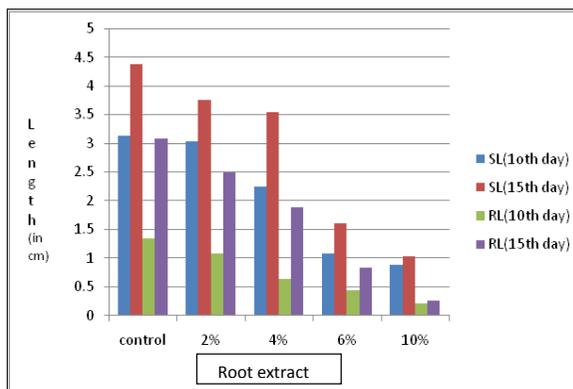
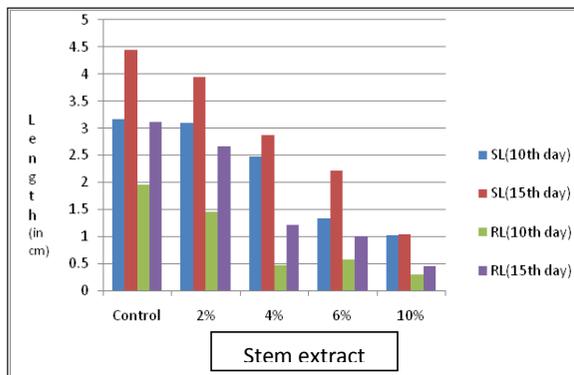
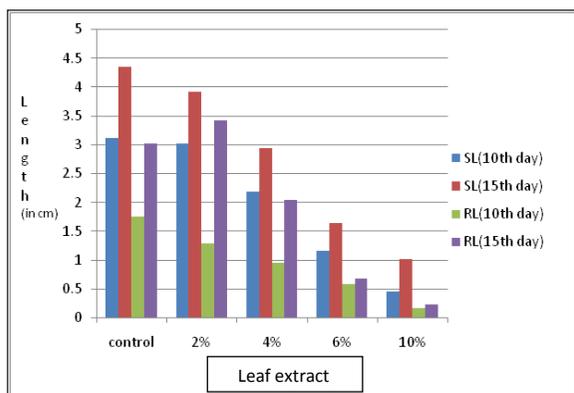
in stem extract after 10th days. Similar result was observed after 15th days (Table-2) In *Brassica juncea* (L.) Czern. various concentration of root extracts of *Chenopodium album* L. like 2%, 4%, 6% & 10% root length were reported 1.09cm, 0.64cm,0.83 and 0.27cm respectively after 10th days. while shoot length were reported 3.04cm, 2.25cm,1.61cm and 1.04cm in 2%, 4%, 6% & 10% respectively in stem extract after 10th days. Similar result was observed after 15th days (Table-2)

In the present study comparative study of the extracts from different parts of the weed, leaf extracts resulted maximum promotes in the germination of the seed of *Brassica juncea* (L.) Czern. plant (Table-1). Extracts from fresh *Chenopodium album* L. plant root, stem, leaf extracts showed inhibiting effects on seedling growth in mustard plant. At the highest extracts concentration (10%), all aqueous extracts significantly reduced, root and shoot length compared with control (Table-2).

Table 2:- Seedling growth of *Brassica juncea* (L.) Czern.

Seedling growth (mean value ) SL=Shoot length, RL=Root length (in cm.)															
	Leaf extract					Stem extract					Root extract				
	control (cm.)	2% (cm.)	4% (cm.)	6% (cm.)	10% (cm.)	control (cm.)	2% (cm.)	4% (cm.)	6% (cm.)	10% (cm.)	control (cm.)	2% (cm.)	4% (cm.)	6% (cm.)	10% (cm.)
SL (After 10 <sup>th</sup> day)	3.11	3.01	2.18	1.15	0.45	3.17	3.09	2.47	1.33	1.02	3.13	3.04	2.25	1.09	0.88
SL (After 15 <sup>th</sup> day)	4.35	3.91	2.93	1.63	1.01	4.45	3.95	2.88	2.22	1.04	4.38	3.75	3.54	1.61	1.04
RL (After 10 <sup>th</sup> day)	1.75	1.29	0.95	0.57	0.16	1.95	1.45	0.47	0.57	0.29	1.34	1.09	0.64	0.45	0.21
RL (After 15 <sup>th</sup> day)	3.02	3.41	2.03	0.67	0.23	3.12	2.66	1.21	1.01	0.45	3.08	2.49	1.89	0.83	0.27

Figure 1: Seedling growth of *Brassica juncea* (L.) Czern. on 10<sup>th</sup> and 15<sup>th</sup> day by various concentration of leaf, stem and root extract of *Chenopodium album* L.



**Conclusion**

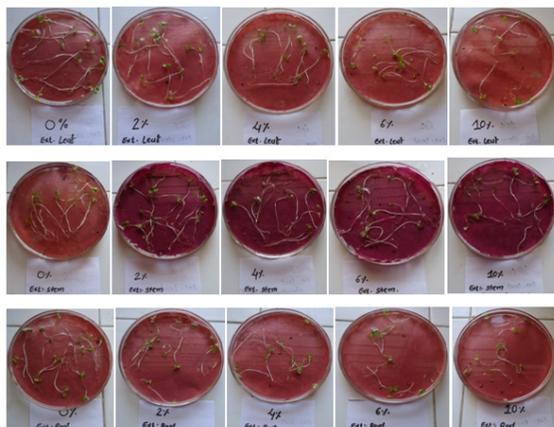
After enumeration of the weed species in the crop fields a close association between crop and

weed species is find out. It was reported that in *Brassica juncea* (L.) Czern. field the *Chenopodium album* L. weed species is dominant and growing luxuriously. On the 5th day regarding seed germination on *Brassica juncea* (L.) Czern.a reduction compared to control when different parts of the extracts of the weed at different concentration were used. Aqueous extract of the leaf showing most inhibitory effect on root and shoot length of the *Brassica juncea* (L.) Czern.

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**Plate:1 Effect of various concentration of leaf, stem and root extract of *Chenopodium album* L. on *Brassica juncea* (L.) Czern.**



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