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RESEARCH ARTICLE

Effect of *Tridex Procumbens* Aqueous Plant Extract on Seed Germination of Certain Pulses

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ABSTRACT

In the present study allelopathic effect of *Tridex procumbens* aqueous extract on the seed germination of three pulses *(Cicer arietinum, Cajanus cajan and Pisum sativum)* was studied. The results shows directly proportion to the concentration of plant extract. If plant extracts concentration increases the percentage of germination decreases. The maximum germination percentages were found in control followed by 5% to 100% aqueous extract. The maximum in germination was found in *C. cajan* 100% (other pulses both are same germination 90%) and minimum *C. arietinum, P. sativum* both are same 20% & *C. cajan* 50% germination. The root length and shoot length also showed the inhibitory effect. Maximum inhibitory effect was observed in (830.34 % shoot & 957.47% root over control) of *C. cajan* and minimum inhibitory effect was observed in (260% shoot & 266% root over control) of *C. arietinum*.

Keywords- *Tridex procumbens, Cicer arietinum, Cajanus cajan & Pisum sativum*, Allelopathy, germination.

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INTRODUCTION

Weeds are undesirable plants. Plant which interfere human activity in crop and non-crop areas are considered as weed. They compete with the main crops for nutrients and other resources and reducing the yield. *Tridax procumbens L.* is a common medicinal herb used by ethno medical practitioners, belonging to the family *Asteraceae*. It is commonly known as 'Ghamra' and in English popularly called 'coat buttons'. The plant is native of tropical America and naturalized in tropical Africa, Asia, and Australia. *T. procumbens* is widely distributed in India up to 2400 m above sea level (Yadava 1998 & Wen-Hao Chen et al. 2008).The leaves of the plant are used as raw feed to cattle and food additive by humans as well (Yadava 1998).

T. procumbens is a semi prostate, annual, creeper herb with stem ascending to 30-50 cm in height, branched, sparsely hairy and rooted at nodes. Leaves are simple, opposite, serrate or dentate, acute, fleshy, pubescent, exstipulate, lanceolate to ovate in shape with 3-7 cm long, irregularly toothed margin with wedge shaped base, shortly petioled and hairy on both surfaces (fig-1). *Tridax procumbens Linn* is a common grass found in the tropics. Traditionally, it is used for the treatment of bronchial catarrh, dysentery, malaria, diarrhea, high blood pressure and to check haemorrhage from cuts, bruises and wounds and to prevent falling of hair. It possesses Anti diabetic (Durgacharan *et al.* 2008), Anti-bacterial (Chitra pai et al. 2011), Anti plasmodial (Rappiah et al. 2011), Anti hepatotoxic, Anti-oxidant (Reddipalli et al. 2008) and Antimicrobial properties (Sneha et al. 2010). From ancient literature it is evidence that the various parts of the plants were used in Siddhha, Ayurveda and Unani medicines for the treatment of diseases of human being.

The term allelopathy, was introduced by Molisch in 1937, and is derived from the Greek words allelon ‘of each other’ and pathos ‘to suffer’ and mean the injurious effect of one upon the other (Rizvi et al. 1992). *“Any process involving secondary metabolites produced by plants, micro-organisms, viruses, and fungi that influence the growth and development of agricultural and biological systems (excluding animals), including positive and negative effects”* (Torres et al. 1996). This plant is rich in minerals such as iron, copper, manganese, sodium and zinc and other trace minerals such as magnesium, phosphorous, potassium, selenium and calcium (Bhagirath & David 2008). The aqueous extract contains phytochemicals such as alkaloids, steroids, carotenoids, flavonoids (catechins and flavones), saponins and tannins (Sunil et al. 2012, Ikewuchi Jude et al. 2009, Navin Anand et al. 2014).

Fig-1: *T. procumbens* plant.

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Systematic classification

Kingdom: Plantae
Sub-kingdom: Tracheobionta
Division: Magnoliophyta–Dicotyledons
Class: Magnoliopsida
Sub-class: Asteridae
Order: Asterales
Family: Asteraceae
Genus: Tridax
Species: procumbens L.

***Cicer arietinum*-** This is a more important pulse in India. It is native of South Europe, now commonly grown in Madhya Pradesh, Uttar Pradesh, Punjab, Maharashtra, Rajasthan and Bihar. It is commonly known as Gram. The flour of *dal* is known as *baisan* Gram is also used as cattle feed. It makes a nutritious feed for Human and animals.

***Cajanus cajan*-** This was first domesticated in Asia or Africa, and is now widely cultivated in the tropics and sub tropics. It is particularly grow in the East Indians, India and West Indies. In India, it is chiefly grow in M.P., Bihar, A.P. Maharashtra, U.P. and Karnataka. Immature and ripe seed are used human food as a good source of protein. The leaves and twigs are used for fodder.

***Pisum sativum*-** The common pea (*Pisum sativum)* is native of South Europe but now cultivated chiefly in Punjab, Uttar Pradesh, Delhi and Himachal Pradesh and all over India. It is commonly known as Garden pea. The seed also used for human consumption in the form of pea meal or split peas. The peas used as pulses, and they are good source of proteins

C. arietinum, C. cajan and *P. sativum* belong to family Fabaceae. The legumes are next in importance to cereals as sources of human food. They contain more protein materials than any other vegetable product. The pulses are important part of food in India where the majority of the population is vegetarians. Carbohydrates and fats are also present in legumes. The protein occurs as aleuronic grains in the same cells with starch grains.

The purpose of this study was to determine the possible allelopathic effect of *T. procumbens* weed on seed germination and seedling growth of some leguminous seeds.

Fig-2: *C. arietinum* seeds.

Fig-3: *C. cajan* seeds.

Fig-4: *P. sativum* seeds.

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Plant material-

The plants of *T. procumbens Linn*. were collected from, University campus and road side in front of University and identification by Dr. Ravindra Singh HOD, Department of Biological Science MGCGV Chitrakoot Satna (M.P.) India.

OBJECTIVES OF THE STUDY-

1. To determine the effect of plant aqueous extract on seed germination.
2. To assess the tolerance limit of seeds to aqueous plant extract.

MATHEDOLOGY

T. procumbens plants were used to make the aqueous extract. Firstly the leaves were washed thoroughly with tap water and dried in the wind. After two hour 1kg plant leaves were grind and filtered and finally make the volume 1 liter with distilled water. This is our stock solution. After that 5%, 25%, 45%, 65%, 85%, 100% solutions were using stock solution. 10 seeds in triplicate of *C .arietinum*, *C. cajan* and *P. sativum*, were placed in separate petridish for germination in different concentration of solution. The germination test was carried out in sterile petridish of 12cm. in size placing Whatman number 3 filter papers on petridish. The extract of each concentration was added to each Petridish of respective treatment daily to wet the seeds. The controls were treated with distilled water.

Germination test and seedling growth was done in normal room temperature condition. The experiment was extends over a period of 12 days to allow the last seed germination. The germination was recorded on daily basis.

$$\text{Germination Percentage} = \frac{\text{Number of seeds germinated}}{\text{Total Number of seed sown}} \times 100$$

RESULT

The seed germination of different crops *C. arietinum*, *P. sativum*, *C. cajan* was affected by aqueous extract of *T. procumbens* result shows significant decrease in percentage germination. In general, the rate of germination delayed and decreased with the increase of aqueous extract concentrations at each observation. The results were revealed that aqueous extract application significantly reduced the seed germination over control in applied treatment (Table-1).

Table-1: Effect of *T. procumbens* aqueous plant extract on seed germination of selected pulses.

S. No.	Concentration in %	Germination % in *C. arietinum*	Germination % in *C. cajan*	Germination % in *P. sativum*
1	Control	100	100	100
2	5	90	100	90
3	25	80	100	80
4	45	70	90	70
5	65	60	80	60
6	85	40	60	40
7	100	20	50	20

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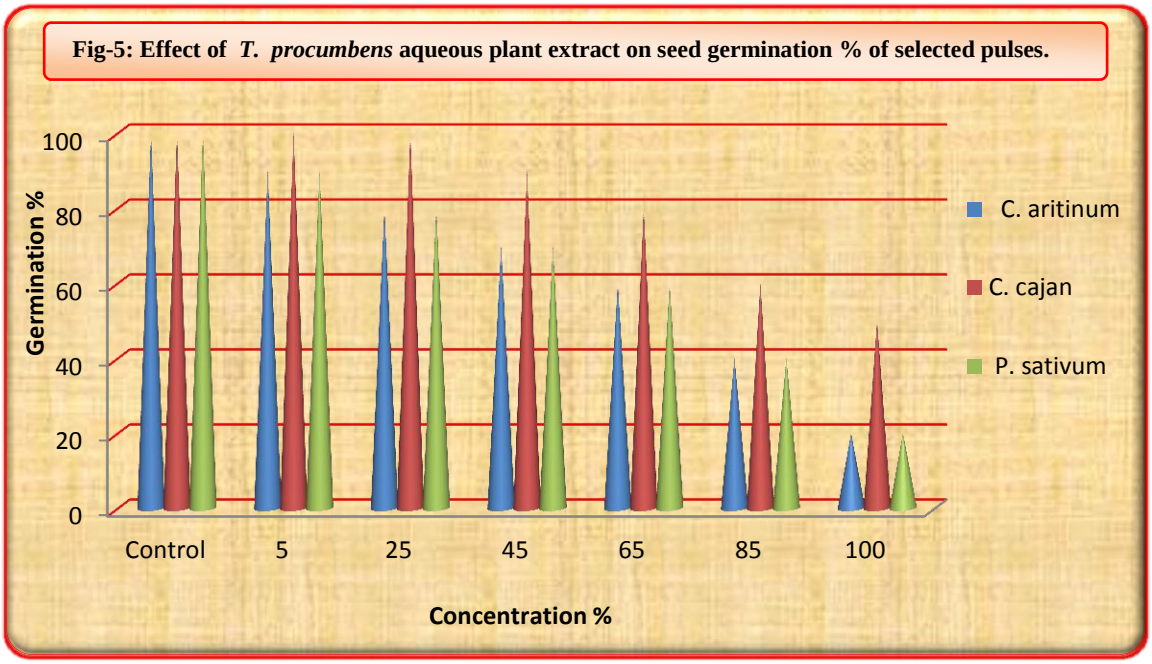

Fig-6: Effect of *T. Procumbens* aqueous plant extract on seed germination of *C. arietinum*.

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Fig-7: Effect of *T. procumbens*, aqueous plant extract on seed germination of *C. cajan*.

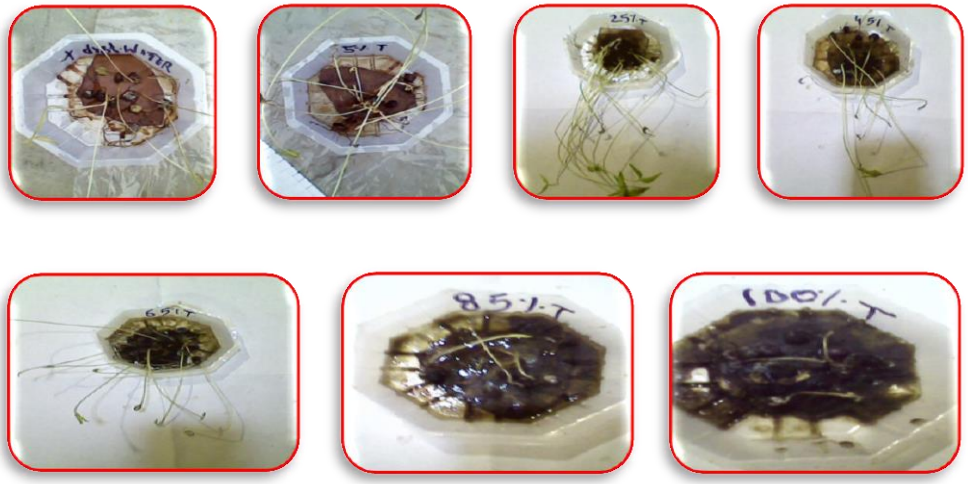
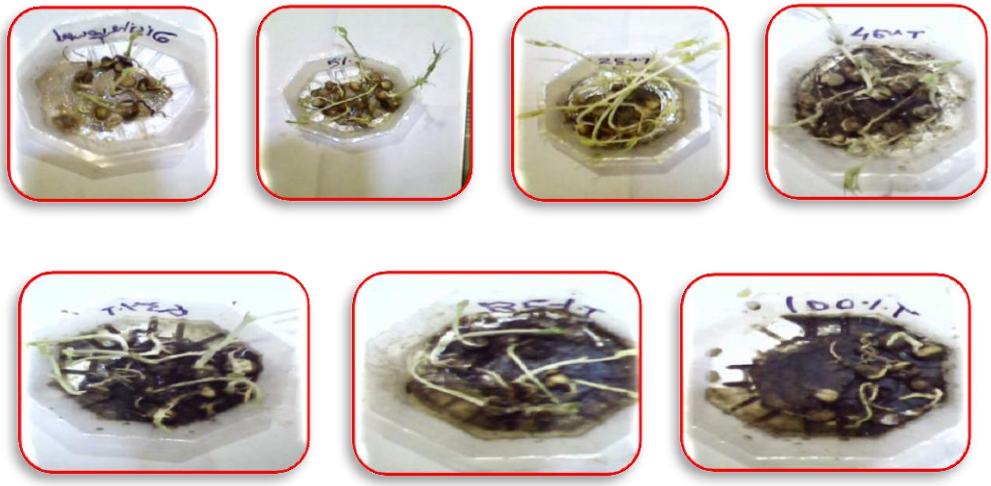


Fig-8: Effect of *T. procumbens* aqueous plant extract on seed germination of *P.sativum*.



Germination % of *C. arietinum*: The maximum germination percentages were found in control followed by 5% to 100% aqueous extract. The maximum in germination was found in 90% and minimum in 20 % concentration.

Germination % of *C. cajan*: The maximum germination percentage were found in control followed by 5% to 100% aqueous extract. The maximum in germination was found in100% and minimum in 50% concentration.

Germination % of *P. sativum*: The maximum germination percentages were found in control followed by 5% to 100% aqueous extract. The maximum in germination was found in 90% and minimum in 20% concentration.

Decrease % of shoot and root in *C. arietinum*: Maximum percentage decrease

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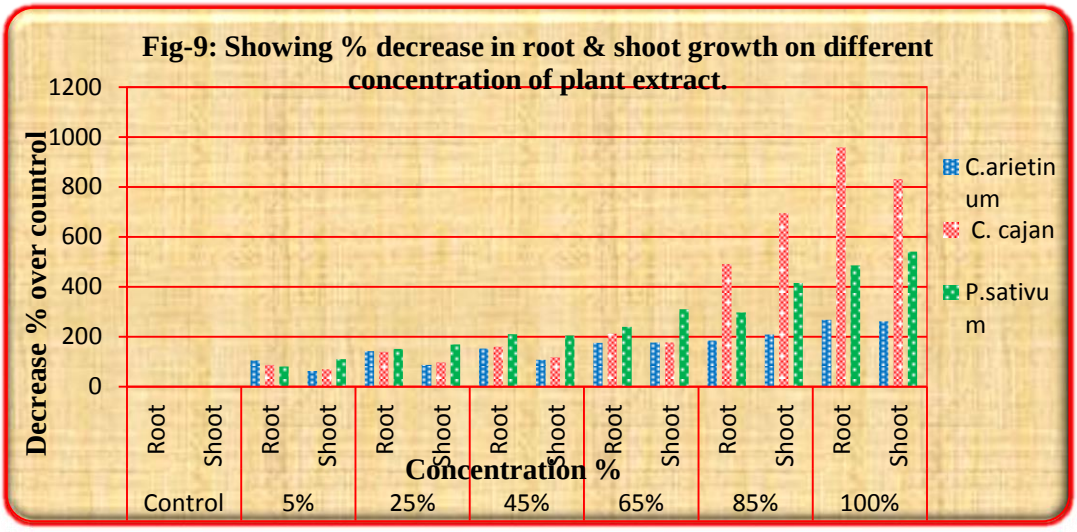
of *C. arietinum* over control found in *T. procumben* (100% conc.) 260% (shoot), 266% (root) and minimum percentage decrease (5% conc.) 61.79% (shoot), 104.39% (root) .

Decrease % of shoot and root in *C. cajan*: Maximum percentage decrease of *C. cajan* over control found in *T. procumben* (100% conc.) 830.34% (shoot), 957.47% (root) and minimum percentage decrease (5% conc.) 67.98% (shoot), 85.69% (root) .

Decrease % of shoot and root in *P. sativum*: Maximum percentage decrease of *P. sativum* over control found in *T. procumben* (100% conc.) 539.79% (shoot), 484.66% (root) and minimum percentage decrease (5% conc.) 109.1% (shoot), 79.97 %(root) .

Table-2: Effect of *T. procumbens* plant aqueous extract on plant growth (cm.).

S. No.	Treatment	Parts	Average length (cm) in *C.arietinum*	% Decrease over control	Average length (cm) in *C. cajan*	% Decrease over control	Average length (cm) in *P.sativum*	% Decrease over control
1	Control	Root	6.65	-	8.33	-	7.27	-
		Shoot	10.66	-	19.43	-	10.31	-
2	5%	Root	6.37	104.39	9.72	85.69	9.09	79.97
		Shoot	17.25	61.79	28.58	67.98	9.45	109.1
3	25%	Root	4.7	141.14	6	138.83	4.57	150.08
		Shoot	12.45	85.62	20.12	96.14	6.15	167.64
4	45%	Root	4.4	151.11	5.23	159.27	3.47	209.51
		Shoot	10	106.6	16.64	116.76	5.06	203.75
5	65%	Root	3.81	174.5	3.94	211.42	3.05	238.36
		Shoot	6.05	176.19	11.09	175.2	3.34	308.68
6	85%	Root	3.63	183.19	1.7	490	2.45	296.73
		Shoot	5.14	207.39	2.8	693.72	2.49	414.05
7	100%	Root	2.5	266	0.87	957.47	1.5	484.66
		Shoot	4.1	260	2.34	830.34	1.91	539.79



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DISCUSSION AND CONCLUSION

The study revealed that the aqueous plant extract significantly suppressed the germination and the severity of effect was to proportional to the extract concentration. The maximum seed germination percent was shown in the control where no extract use in all the plant receptor. The highest inhibitory effect (20 %) was recorded in *C. arietinum* & *P. sativum* at 100% concentration, while lowest (90 %) was recorded in *C. arietinum* & *P. sativum* at 5% concentration Table-1. The decrease percent over control (root 957.47 % highest) at *C. cajan*, (root 79.97 % lowest) at *P. sativum* and (shoot 830.34 % highest) at *C. cajan* (shoot 61.79 % lowest) at *C. arietinum* in all legume seeds table-2. Maximum inhibitory effect was observed in (830.34 % shoot & 957.47% root over control) of *C. cajan* and minimum inhibitory effect was observed in (260% shoot & 266% root over control) of *C. arietinum.* See fig-9. Increased concentration of extracts resulted in decreased germination percent, root & root length of all seeds.

The "inhibitory" chemical is released into the environment where it affects the development and growth of neighboring plants. Allelopathic chemicals can be present in any part of the plant. They can be found in leaves, flowers, roots, fruits, or stems. They can also be found in the surrounding soil. Target species are affected by these toxins in many different ways. The toxic chemicals may inhibit shoot/root growth, they may inhibit nutrient uptake, or they may attack a naturally occurring symbiotic relationship thereby destroying the plant's usable source of a nutrient. Many researcher and scientist during studies are found Leaf extracts of selected legumes were reported to have inhibitory effect on seedling growth of maize and rice (Akobundu, 1986). The leaf extract solution not only reduced the germination (Sahoo et al. 2007) but also reduced the rate of germination and may cause complete failure of germination (Rice, 1984). Various other studies conducted elsewhere also revealed allelopathic suppression in soybean, maize and chilli (Sahoo et al. 2010). *Melia azaderach*, *Morus alba* and *Moringa oleifera* leaf leachates inhibited the germination, radicle and plumule growth of soybean (Kumar et al. 2009).

Recent searches indicates that allele chemicals were universally present in plants and one of the most important physio-biochemical functions of them is defense against its enemies (Gavazzi et al. 2010) and suggests that early removal of these weeds, from the field is essential in order to avoid the losses in terms of poor germination and seedling vigour.

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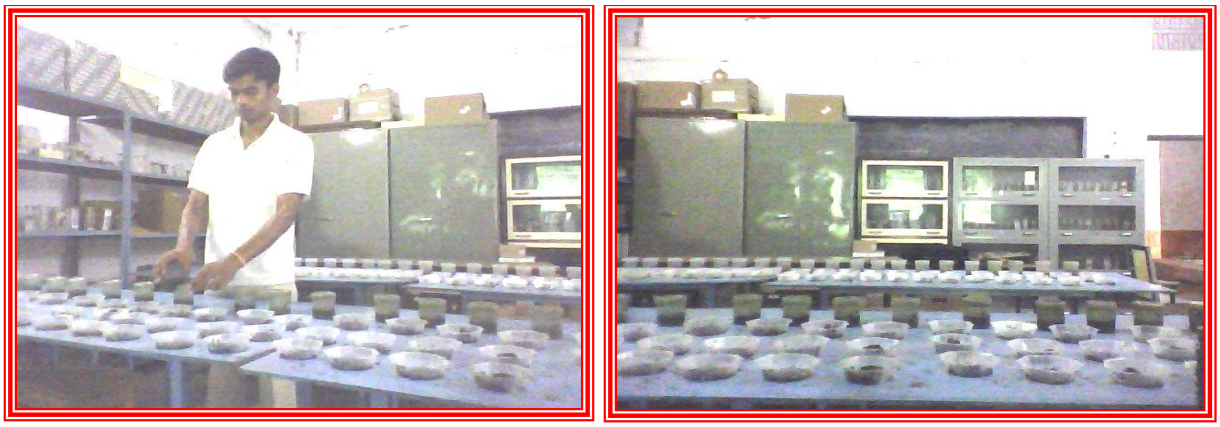

Fig-10: Experimental setting during research work.

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