

# Allelopathic Evaluation and Dried Leaf Aqueous Extract Effect of *Tecoma stans L* on Seed Germination and Biochemical Changes in *Vigna radiata L*.

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## Manuscript Details

Available online on <https://www.irjse.in>  
ISSN: 2322-0015

### Cite this article as:

Benson Abraham, Vaishali Y Charjan and Nisha K Churad Allelopathic Evaluation and Dried Leaf Aqueous Extract Effect of *Tecoma stans L* on Seed Germination and Biochemical Changes in *Vigna radiata L*, *Int. Res. Journal of Science & Engineering*, 2023, Special Issue A13:69-73.

<https://doi.org/10.5281/zenodo.XXXXXX>

Article published in Special issue of National Conference on "New Frontier of Biological Sciences (NCNFB-2023) jointly organized by Internal Quality Assurance Cell (IQAC) and Biological Society, Shri. Shivaii Education Society Amravati's Science College, Pawni, Dist. Bhandara, Maharashtra, India, date, April 26, 2023.



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## ABSTRACT

Allelopathy influence the growth, survival, development, and reproduction of other organisms. Generally, these interactions are deleterious to the receiver plants but may also provide a selective advantage to the donor. The current study is to find effect of *Tecoma stans* extract on the growth of *Vigna radiata* to understand its Allelopathic potential. It had a positive effect at lower concentration Upto 10% Howe revere at higher concentration of 20% had inhibitory effect.

**Keywords:** Allelopathy, *Vigna*, *Tecoma*, Seed germination, Protein profile SDS PAGE.

## Introduction

Allelopathy plays an important part in agroecosystems, and affects the growth, quality and quantity of the products by the interactions among crops, weeds and trees. Generally, these interactions are deleterious to the receiver plants but may also provide a selective advantage to the donor [1]. Allelochemicals released from plant parts are largely classified as secondary plant metabolites (such as alkaloids, isoprenoids, phenolics, flavonoids, terpanoids and gluconolates etc.). These chemicals are present virtually in all plant tissues, including leaves, flowers, fruits, stems, roots, rhizomes, seeds and pollen. Among the plant parts, leaves seem to be the most consistent producers of these allelochemicals. Several chemicals can be released together and may exert toxicities in an additive or synergistic manner [2].

Many investigators reported that large number of metabolites occur in different parts of plant and may have stimulatory or inhibitory effects on seed germination and seedling growth of other plants [3].

*Tecoma stans* L is an ornamental plant is an erect, branched, sparingly hairy or nearly smooth shrub, about 2 to 4 meters in height. Its leaves are opposite, odd-pinnate, and up to 20 cm in length, with 4 to 5 leaflets. Leaflets are lanceolate to oblonglanceolate, 6 to 13 cm long, pointed at both ends, and toothed at the margins. Flowers are yellow, faintly scented, borne in short, dense, terminal clusters.

Its chemical constituents are phytosterols, alkaloids, quinines, amino acids, monoterpenes, triterpene, glycosides, phenols, flavonoids, saponins, and tannins.

Mungbean [*Vigna radiata* L] is such a minor crop that dryland smallholder farmers can use to break the downward spiral, and increase the profitability and sustainability of their farms. It is a nutritious warm season legume crop. The grains are rich in protein, minerals, and vitamins. Mungbean is widely grown in Asia, but also in parts of Africa and Australia.

## Methodology

### Materials

#### Collection of *Tecoma stans* L plant materials:

Mature leaves were collected from garden land area of mahalgi nagar Nagpur. The *Tecoma* leaves were dried for ten days at room temperature. The plant materials were crushed into fine powder [4].

#### Collection of *Vigna radiata* (green gram) seeds:

Well mature *Vigna radiata* seeds were collected from the Tirupati Agro Service, Kalamna, Nagpur. The seeds were kept under sunlight for 3 hours. Then the seeds were soaked in Sodium hypochlorite solution for 5 minutes for sterilization [5].

### Methodology

**Aqueous extract of the leaf powder preparation:** 100 gram fresh leaves of study plant is shade dried (kept

in room temperature for 10 days). It is powdered and larger particles are remove. 10 g of leaf powder dissolved in 100ml of distilled water then boiled at 60° C for 30 minutes and cooled and filtered in fine cloth. It is Centrifuged at 5000prm for 15 minutes. Supernatant /Filtrate is kept as 100% concentration. Different concentrations for experimental work are prepared with distilled water (1%, 5%, 10%, and 20% and control is distilled water)

#### Seed selection and pretreatment:

Required number of healthy seeds (of the plant to be tested) was purchased from authorized dealer. Kept in 2-5% pot hypochlorite for seed surface sterilization for 10 minutes. Sterilized seeds are washed well in distilled water Well washed seeds are ready for experimental study.

#### Experimental set up

Triplicate discs for each concentration is set. Each disc is single lined with whatman1 filter paper to provide wetness to seeds continuously 10 ml of extract (different concentration) added to each disc 50 seeds per petri disc. Maintained at room temperature (in diffused light and dust free) for 3 days.

#### Measurement of Plumule and radical length

Plumule and Radical length was measured using the graph sheet and one foot scale.

#### Estimation total protein

Total protein is estimated by Bradfords method

#### Protein profile is studied by SDS-PAGE

SDS-PAGE was performing using Himedia's kit. KIT NO. HT1009. After the run was completed, the gel was removed from the glass plates and was immersed in staining solution for at 3 hrs on the next day the stained gel was put in destaining solution and it was kept until the gel becomes colorless leaving only the protein bands colored.

## Result & Discussion

The study examined the allelopathic effects of *Tecoma stans* aqueous extract of dried leaves on germination and radical growth of *Vigna radiata*. The result of the

germination, radical length, total protein activity of the *Vigna radiata* seed treated with aqueous leaf extract of *Tecoma stans* were studied. The length of the radical of the seed soaked in control, 1%, 5%, 10% and 20% was found to be increased in each day of the experiment and in each case radical length was found more in treatment than in control. The overall result of my study shows that the aqueous extract of dried leaves of invasive plant *Tecoma stans* having high stimulatory & Inhibitory effect on the radical growth of *Vigna radiata*. so, it implies that with increase in concentration to a certain extend i.e. 5% & 10% the radical length was found to be increased after which inhibitory action was seen. Overall, there were significant differences in radical length.

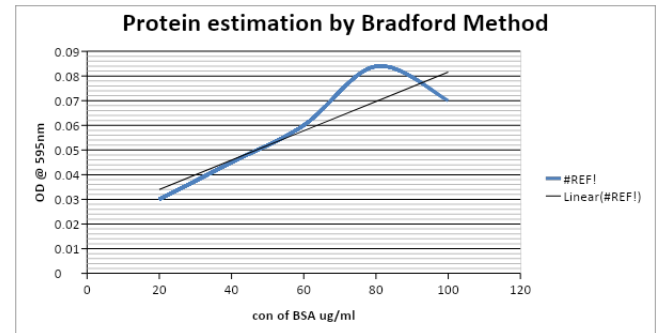
Treatment of *Vigna radiata* with the aqueous leaf extract of dried leaves of *Tecoma stans* resulted in increase of total protein activity. In SDS - PAGE experiment, control, 1%, 5%, 10% and 20% concentration were taken. The 5% and 10% concentration showed 3 bands having mole wt. Showed thicker bands compared to others.

**Bradford Assay**

The readings for the Bradford assay were taken in 595 nm wavelength. Standard curve for the protein was prepared with the help of following observation.

**Table 1.**

Sample	OD @ 595 nm of Sample	Protein Conc/ml
Control	0.0325	17 ug/100ml
1%	0.043	25 ug/100ml
5%	0.037	35 ug/100ml
10%	0.041	32 ug/100ml
20%	0.029	12 ug/100ml

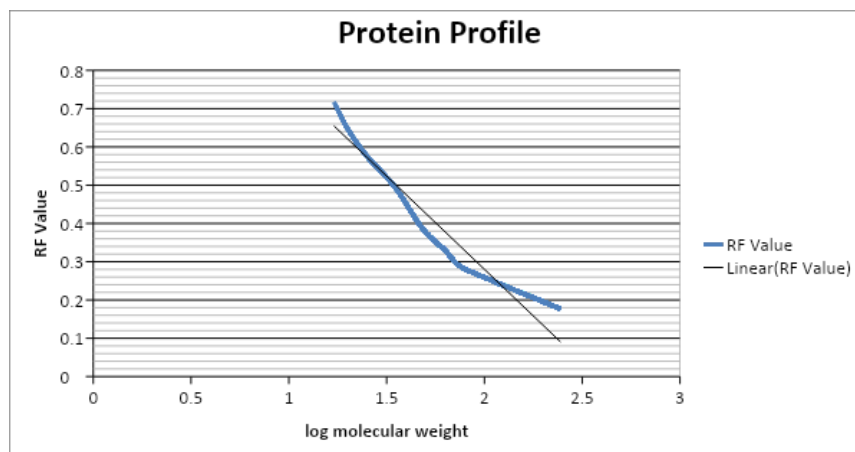


From the above table 1 it is shown that the estimation of protein in *Vigna* plant treated with *Tecoma* leaf extract at concentrations of 5% & 10% showed higher protein concentration as compared to control and higher concentration.

**Protein profile by SDS PAGE:**

**Observation for leaf of *Vigna radiata*:** Three bands were obtained in the gel showed thicker bands at 5% and 10% treatments, the molecular weight can be calculated with the help of standard curve

Sr. No	Distance Travelled by band in cm	Rf Value	Log Molecular weight	molecular weight (k Da)
1	3.3	0.38823529	1.777386	59.9
2	4.7	0.55294118	1.43925	27.49
3	7	0.82352911	0.883742	7.651



Allelopathy is the direct influence of a chemical released from one living plant on the development and growth of another [6]. The results of this study indicated that the allelopathic effects of aqueous leaf extract of *Tecoma stans* L *Vigna radiata* L are stimulatory as well as inhibitory. The aqueous leaf extract of *Tecoma stans* L also caused a remarkable increase in seedling growth of *Vigna radiata* L. The stimulatory effect of radicle length was found to be concentration-dependent. This Stimulation may be due to the stimulators which are present in dry leaves resulting in changing of macromolecules such as proteins, lipids as well as nucleic acids [7]. It has been found that the influences of allelochemicals on seed germination, and the growth of root may be due to improper cell division [8,9] which resulted from damage of cell membrane caused by allelochemicals in the present study.

It has been also reported that seedling root (radical) growth is sensitive to allelochemicals which stimulate cell division and elongation in the root apical meristems [10]. Previous studies have shown that extracts from various plants tend to stimulate germination and seedling growth of a number of crop species [11].

Many phytotoxic allelochemicals have been isolated, identified and found to influence a number of physiological reactions, for example, water utilization, photosystem II (PSII) efficiency, nutrient uptake, ATP synthesis, cell division, and gene expression [12].

## Conclusion

Experimental studies showed that the seed germination, radical growth, total protein activity and enzyme activity were significantly first increased and then decreased concentrations of the leaves extracts of *Tecoma stans* L in the *Vigna Radiata* seedlings.

Further investigation is required to analyse the phytochemistry of *Tecoma* leaves and their allelopathic action on crop plants in field level. It is evident from the present investigation that *Tecoma stans* L has allelopathic potentiality on *Vigna radiata*. The present research suggested that, although the

experiment was done in the laboratory condition but further investigation in the field is essential.

SDS-PAGE can be efficiently employed to study protein profile of plants. In Protein profile studies the control, 1%, 5%, 10% and 20% concentration concludes that 5% and 10% concentration showed increased expression of certain proteins.

**Conflicts of interest:** The authors stated that no conflicts of interest.

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