

A STUDY ON THE BIOCHEMICAL COMPONENTS OF BLACK GRAM (VIGNA MUNGO (L.) HEPPER) WITH EFFECT TO THE ALLELOPATHIC POTENTIAL OF TAMRINDUS INDICA L.



BIO

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Theme of the Article: Allelopathy

Research Objectives: The study is on Allelopathic Potential of *Tamindus indica* L. on morphological parameters and Biochemical Components of Black gram (*Vigna mungo* (L.) HEPPER).

mal has presented numerous research papers internationally, earning multiple awards and honours.

The current investigation is on Allelopathy which is ecologically important because it influences dominance. Productivity, succession. Species diversity, composition of plant communities and vegetation dynamics, the acquired knowledge of allelopathy helps in Explaining vegetation patterns in plant communities. The study is on Allelopathic Potential of *Tamindus indica* L. on morphological parameters and Biochemical Components of Black gram (*Vigna mungo* (L.) HEPPER). Various concentrations of leaf leachates and leaf extracts were prepared respectively from fully senesced fallen leaves and fully matured leaves of *Tamirindus* tree for the experiment.

In the germination study, healthy and uniform seeds of *vigna mungo* selected and experiments were conducted by the application various concentrations of leaf leachates and leaf extracts to the seeds length and germination study and were dramatically decreased with increasing the concentrations of leaf extract. The leaf extract had more inhibitory effect than the leaf leachates on germination and morphological parameters and Biochemical components of black gram. From this investigation it clearly showed *Tamarinbus indica* had strong allelopathic effects on germination, growth and Biochemical components of black gram *vigna mungo*.

Keywords:

Allelopathic Potential, Germination study, leaf leachates, leaf extracts, morphological

parameters, Biochemical components, black gram, Tamarindus tree.

Introduction

Hans Molish (1937), Emeritus professor of plant physiology at the university of Vienna, coined the word 'Allelopathy' from Greek words 'allelon', meaning 'mutual' and pathos, meaning harm to describe the effects that one plant could have on another due to released chemicals. Allelopathy has received increased attention Over the last 40 years with studies on effect of weed interference on crop yields, allelopathic effects of crop plants on other crop plants, crop plants on weeds and allelopathic effects of woody seed plants on crop plant in forestry and Horticultural fields. The present study was carried out to 'investigate the allelopathic effect of Tamarindus indica L. leaf leachates and leaf extracts on seed germination and seedling growth of black gram (*Vigna mungo* Hepper).

Objectives of the Study

- Vegetation pattern in Plant Communities
- To understand the mechanism of action of Allelochemicals inhibiting the uptake of nutrients

- To study the morphological and biochemical parameters with effect of leaf leachates and leaf extracts.
- Seed germination and Seedling Growth of *Vigna mungo*.

Materials and Methods

Seeds of *Vigna mungo* L. were procured from Regional Pulse Research Station vamban, Pudukottai District, Tamil Nadu. The fully matured senesced fallen leaves of *Tamarindus indica* L. were collected from Annamalai University campus, Annammalai nagar.

Preparation of leaf leachates,

The Preparation of leaf leachates and dried fresh leaf extracts and germination studies were followed as per the methods of Padhy *et al.*, (2000)

20 grms of fallen leaves were collected from *Tamarindus indica* L., tree. They were washed in tap water thoroughly followed by tap water and were later soaked in 100 ml of distilled water for 48 hours, later the leaves were filtered, and the filtered water is known as leaf leachates and were considered as 20% concentration.

Preparation of Dried leaf

extracts

The collected Tamrinduss indica were air dried, ground to a fine powdered and extracted in water, where in 25 grms of Tamrinduss indica leaf powder was soaked in 1 litre of distilled water kept for 48 hours at Room temperature with occasional shaking.

Germination Study,

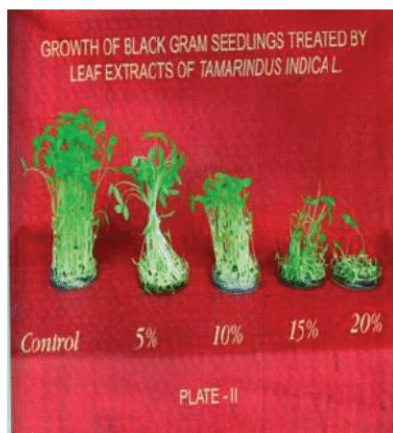
The selected seeds of vigna mungo were surface sterilized with 0.03% formalin solution for 20 minutes and then washed thoroughly with distilled water.

In the germination study, 25 seeds were placed sterilised petiolate lined with two layered filter paper, 10 ml of leaf leachates and leaf extracts was added per treatment to the seeds on the petri plates. Distilled water served as a control. The process was continued for 15 days. Later the seeds were allowed to germinate in a growth chamber and kept in light intensity of 2+- 0.4 K Lux and at 30+-20°C till 15 days. Each treatment was repeated in triplets. The number of seeds germinated were counted regularly each day and germinating percentage was calculated. The morphological parameters were studied on the root and shoot length from 8th and 15th day after sowing. The infusion was decanted and filtered through 3 layers of Whatman No 1 filter paper.

The concentrations of leaf leachates and leaf extracts were prepared with dilutions such as 5%, 10%, 15% and 20% was the standard solution, with distilled water were prepared respectively from fully senesced fallen leaves of Tamarindus tree for the experiment.

The Germination Percentage refers to the appearance of the radical by visual observation. It was calculated using the formula, the formula was given by Carley and Watson (1968)

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



Biochemical Analysis

The fresh material as used for the estimation of Chlorophyll, Sugar, Free Amino Acids and Proteins.

Observations and Results

The study showed a dramatically decreased with increasing the concentrations of leaf extract

The leaf extract had more

inhibitory effect than the leaf leachates on germination and morphological parameters of black gram.

Form this investigation it clearly showed Tamarinbus indica had strong allelopathic effects on germination and growth of black gram vigna mungo.

Allelopathy depends on chemical compounds mainly added to the environment from living plants or dead and decaying plant parts (Tukey, 1969) Allelochemicals

also refers to the secondary metabolites produced by plants and are the byproducts of primary metabolic process and they have no physical function essential for the maintenance of life (Levin,1976).

Bio-chemical Analysis for Chlorophyll, (mg/gfr.wt) the changes in Chlorophyll-a and Chlorophyll -b total

Chlorophyll content under leaf leachates treatment is given in table -3.

The Chlorophyll content changes of Black gram seedlings under the treatment of leaf extracts is shown in the Table -3.

Bio-chemical Analysis for Amino acids, (mg/gfr.wt) the changes in Amino acids content under leaf leachates treatment are given in table -5.

The Amino acids content changes of Black gram seedlings under the treatment of leaf extracts is shown in the Table -5. It showed the inhibitory effect than the leaf leachate on Amino acids content of leaf and root of Black gram seedlings.

The Bio-chemical Analysis for **Proteins (mg/g.Fr.wt.)** The higher number of proteins (9.12 and 7.12 respectively for leaf and root) were observed in the control seedlings. In the leaf leachate treatments showed negative effect on protein contents in the seedlings. Because when increasing the leaf leachate concentrations (5%, 10% and 15%) there was a decreasing trend of protein contents both in leaf and root of green, black seedlings Table -4

The leaf extract concentrations were showed more retarding effect on protein content of black gram than that of leaf leachates treated and control seedling. The protein content

35% decreased in the leaf and nearly 50% decreased in the roots of black gram seedlings at 20% of leaf extract treatment. (Table – 5

Total sugars (mg/g.fr.wt)

The total sugar content of leaf and root of black gram seedlings treated with various concentration of leaf leachates and leaf extract are presented in Table -5 The 5% concentration of leaf leachate had less inhibitory effect on Total sugar both in leaf and root, the decrease was 2.87% and 5.2% respectively observed in black gram seedlings

There was a steady increase in the decreasing content of total sugar with increasing the leachate concentrations. the total sugar content was nearly 70% in leaf and 67% only present in the root of black gram compared with the value of control seedlings at the 20%

The leaf extract showed more retarding effect on total sugar content both in leaf and root of black gram seedlings when compared with treated by leaf leachate and control seedlings. (Table -5). The maximum total sugar

content was found to be control (18.12, 6.12 respectively for leaf and root) and the minimum sugar content (11.75 and 3.8 respectively for leaf and root) was observed at 20% concentrations of leaf extract treated seedlings. In the lower Concentrations of leaf extract (5% 10% and 15%) had lesser inhibitory effect on total sugar than its 20% concentration.

The leaf extract had more retarding effect on morphological and biochemical constituents of black gram seedlings than the leaf leachates

Table :1 Allelopathic effect of Leaf Leachates and Leaf Extracts of *Tamrindus indica* L. on germination percentage of *Vigna mungo* (L.) Hepper.

Concentrations	Leaf Leachates	Leaf Extracts
Control	97	97
5%	91	86
10%	84	78
15%	76	63
20%	67	56

Table :2 Allelopathic effect of Leaf Leachates and Leaf Extracts of *Tamrindus indica* L. on the shoot length and root length (cm/plant) of *Vigna mungo* (L.) Hepper.

Concentrations	8 th day old seedlings		15 th day old seedlings	
	Shoot length	Root length	Shoot length	Root length
Control	9.2	6.1	15.12	8.4
5%	8.7	5.6	14.1	7.2
10%	7.2	5.2	12.5	6.1
15%	0.6	4.8	10.3	5.4
20%	5.9	4.2	9.2	4.1

Table- 3. Allelopathic effect of Leaf Leachates and Leaf Extracts of Tamarindus indica L. on chlorophyll content (mg/g. fr.vt) of Vigna mungo (L.) Hepper (15" day old seedlings)

Concentration	Leaf Leachates			Leaf Extracts		
	Chl.a	Chl.b	Total Chl	Chl.a	Chl.b	Total Chl
Control	0.580	0.440	1.20	0.580	0.440	1.20
5%	0.580 (-2.58)	0.410 (-6.82)	0.975 (-18.75)	0.540 (-6.89)	0.400 (-9.09)	0.940 (-32.5)
10%	0.485 (-16.38)	0.365 (-17.04)	0.850 (-29.17)	0.465 (-19.82)	0.345 (-21.59)	0.810 (-38.33)
15%	0.450 (-22.41)	0.315 (-28.41)	0.765 (-36.25)	0.430 (-25.00)	0.310 (-29.55)	0.740 (-41.25)
20%%	0.420 (-27.59)	+0.300 (-31.82)	0.720 (-40.05)	0.410 (-29.31)	0.295 (-32.96)	0.705 (-41.25)

Data in parenthesis indicates % increase (). Decrease (-) over control

Table - 4. Allelopathic effect of Leaf Leachates of Tamarindus indicus L. on Amino acid, Protein and Total sugar content (mg/g.f.wt.) of Vigna mungo (L) Hepper (15" Day old seedlings)

Extract Concentrations Control	Leaf			Root		
	Amino acids	Proteins	Total Sugars	Amino acids	Proteins	Total Sugars
Control	2.68	9.12	18.12	1.82	7.20	6.12
5%	2.45 (-8.58)	8.68 (-4.82)	17.60 (-2.87)	1.65 (-9.34)	6.30 (-12.5)	5.8 (-5.2)
10%	2.12 (-20.89)	7.85 (-13.9)	15.45 (-14.73)	1.35 (-25.82)	5.40 (-25.00)	5.2 (-15.03)
15%	1.85 (-30.97)	7.25 (-20.50)	13.50 (-25.50)	1.15 (-36.81)	4.6 (-36.11)	4.6 (-24.84)
20%	1.72 (-35.82)	6.80 (-25.44)	12.80 (-29.35)	0.95 (-47.80)	+2.0 (-41.67)	4.1 (-33.00)

Data in parenthesis indicates % increase (+), decrease (-) over control

Table -5 Allelopathic effect of Leaf Extracts of *Tamarindus indica* L on Amino acid, Proteins and Total sugars (mg/g.fr.wt.) of *Vigna mungo* (L) Hepper (15" Day old seedlings)

Extract Concentrations Control	Leaf			Root		
	Amino acids	Proteins	Total Sugars	Amino acids	Proteins	Total Sugars
Control	2.68	9.12	18.12	1.82	7.25	6.12
5%	2.35 (-12.31)	8.45 (-21.05)	16.80 (-7.28)	1.40 (-23.08)	6.10 (-15.86)	54 (-1.76)
10%	1.95 (-27.23)	7.20 (-21.05)	14.80 (-18.32)	1.25 (-31.32)	5.20 (-28.27)	490 (-19,93)
15%	1.65 (-38.48)	6.40 (-29.82)	12.20 (-32.67)	0,95 (-47.80)	3.95 (-45,5)	42 (-31.37)
20%	1.25 (-53.35)	5.90 (-35.3 1)	11.75 (-35.15)	0.85 (-53,30)	3.75 (-48,27)	3.8 (-37,90)

Data in parenthesis indicates % increase (+), decrease (-) over control

The acquired knowledge of allelopathy helps in

- Explaining vegetation patterns in plant communities.
- Understanding reduction in crop yields to adaptation of minimum tillage and use of stubble mulch of crop residues.
- Breeding crop plants will inhibit the weeds through allelopathic action, thus reducing the need for chemical weed killers.
- Afforestation.
- Understanding several ecological phenomena such as succession patterning of vegetation

etc.,

Allelopathy is an area where research studies have shown that allelopathy could be utilised, for the following,

- To increase the production of food grains, vegetables, fruits and forestry
- To decrease harmful effects of modern agricultural practices on soil health and productivity and
- To maintain soil productivity and pollution free environment for our future generations.

Allelopathy is ecologically important because it

influences dominance, productivity, succession, species diversity, composition of plant communities and vegetation dynamics,

Conclusion

The study clearly showed the Allelopathic potential of leaf leachates on the germination and growth parameters black gram (*Vigna mungo*.(L.) Hepper. From the investigation the Leaf Extracts of *Tamrindus indica* L. had more adverse effect on the germination, growth of Black gram seedlings than the Leaf Leachates

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