

# ALLELOPATHIC EFFECT OF DIFFERENT PARTS OF *EUCALYPTUS CAMALDULENSIS* ON WHEAT VARIETY "INQALAB-91"

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## ABSTRACT

Allelopathic effects of different parts of *Eucalyptus camaldulensis* on wheat variety "Inqalab-91" were studied in this experiment. Plants were irrigated with aqueous extract of thoroughly chopped fresh leaves, dry leaves, fresh bark, dry bark, fruits and floral buds of *Eucalyptus camaldulensis* whereas ordinary water was used for control. Fertilizer was also applied to the wheat crop. Effects of different parts of *Eucalyptus camaldulensis* on germination percentage, number of tillers per plant, height of crop and yield of wheat crop were studied which were statistically insignificant.

## INTRODUCTION

Allelopathy is a controversial subject, and the term refers to the effects one plant can have on others due to chemicals that it releases into the environment. Such effects may be direct or indirect, as for example through the mediation of micro-organisms. Effects may be deleterious or stimulatory.

Farmers of this region are practising agroforestry since long to fulfil their needs for food, fire and shelter. Common species raised on farm lands are Shisham, Kikar, Toot, Poplar, Semal and Eucalyptus. *Eucalyptus camaldulensis* is being planted through out the country. There exists a controversy among farmers about its allelopathic effects (Negative) on agricultural crops.

A study was conducted during 1990-91 to explore the allelopathic effect on wheat crop. Another study was conducted on same lines with little changes to confirm the earlier results. In the present study actual field conditions were kept in mind to see the allelopathic effect of different parts of *Eucalyptus camaldulensis* on wheat crop affecting its germination, tillering capacity, height and over-all production.

Hamful effects of forest trees on agricultural crops through production of allelochemicals have assumed a great importance in the recent past with the recognition of agroforestry as an independent discipline.



Ahmad *et al.* (1982) reported the allelopathic potential of *Eucalyptus tereticornis* Sm. against *Sorghum vulgare* Var. Dale, *Sorghum vulgare* Var. Wing, *Phareolus mungo*, *Brassica chinensis*, *Brassica compestris*, *Sisymbrium irio*, *Nigella sativa*, *Raphanus sativus* and *Setaria italica* using aqueous extracts from leaves, flowers buds and bark.

Singh and Bawa (1982) studied the allelopathic effects of *Eucalyptus globulus* on horned poppy (*Glaucium flavum*). In their study they concluded that germination was significantly inhibited by the leachates, and at higher temperatures the degree of inhibition correlated strongly with the duration of leaf immersion.

Rao and Reddy (1984) carried out investigation that leaf extracts of *Eucalyptus tereticornis* inhibited germination of crop seeds to a certain extent, although to a lesser extent in soil.

Reid and Wilson (1985) found that some species of *Eucalyptus*, such as *Eucalyptus globulus* appear to inhibit grass growth around the tree growth.

Sharma *et al.* (1987) used dry leaves of *Eucalyptus tereticornis* to prepare foliar leachates, which were relatively dilute. This extract was found to inhibit germination and seedling growth of raya (*Brassica juncea*). The same extract inhibited seedling growth, but not germination of wheat, lentil (*Lens culinaris*) and pea (*Pisum sativum*).

Suresh and Rai (1987) tested the allelopathic effects of *Eucalyptus tereticornis* on the crops sorghum, cowpea, and sunflower by growing of crops on top soil or rhizosphere soil from a 3 year old plantation or on field soil mulched with dry leaves or irrigated with aqueous leaf leachates. *E.tereticornis* significantly reduced

both germination and seedling growth, and of the media tested, top soil proved most inhibitory overall. Sorghum proved most sensitive to *E.tereticornis*.

Sindu and Hans (1988) prepared artificial litter by cutting shoots from 7 year's old trees of *Eucalyptus tereticornis*. The litter was then incorporated into nursery soil at rates of U, 3, and 5%, and placed in pots; half of the pots were treated with NPK fertilizer. The pots were sown with 100 seeds of wheat, and after 20 days, were thinned to five seedlings. All pots treated with *Eucalyptus* litter subsequently showed significantly reduced growth, and fertilization was found to have little effect.

Jayakumar *et al.* (1990) investigated the effect of aqueous extracts of freshly fallen leaves of *Eucalyptus globulus*. It was observed that the growth of weeds and grasses beneath these trees seemed inhibited, and thus the authors sought to study the effect of *Eucalyptus* leaf extracts on the growth of peanut (*Arachis hypogaea*) and corn (*Zea maize*) seedlings. Aqueous extracts equivalent to 5g, 10g and 20g leaf material per 100 ml water were prepared using a blender. The leaf area, plant height, and leaf chlorophyll content of both test species were significantly inhibited by the 10-20% extracts, and chromatography of the extracts revealed the presence of the phenolic acids, chlorogenic acid, P. coumaric acid, Caffeic acid and Gallic acid, as well as several unknowns, which led the authors to conclude that inhibition may be due to the action of the phenolic substances.

## MATERIALS AND METHODS

An experiment was laid out in Punjab Forestry Research Institute, Faisalabad in Rabi 1992-93 in randomized complete block design in four replications. Seed of wheat variety Inqalab-91



was sown in polythene bags after proper treatment. These were 50 seeds per experimental unit making a total of 200 seeds in four replications for one treatment and 1200 seeds in the experiment for six treatments. Treatments applied for the experiment was as under:

- A- Irrigation with fresh leaves aqueous extract
- B- Irrigation with dry leaves aqueous extract
- C- Irrigation with fresh bark aqueous extract
- D- Irrigation with dry bark aqueous extract.
- E- Irrigation with fruits and floral buds aqueous extract.
- F- Irrigation with control (irrigation of wheat plants with ordinary water)

Fresh leaves, fresh bark, dry leaves, dry bark, fruits and flowers of *Eucalyptus camaldulensis* were collected and chopped thoroughly before use. Five grams of crushed material was soaked in 100 ml water separately for each treatment. After 24 hours it was filtered and seed of wheat was soaked in that filtered solution for 24 hours, except one treatment (control) where ordinary water was used, and then sown in polythene bags (4.5"×9.0") filled with ordinary field soil. 0.1 gram of Diamonium phosphate fertilizer was mixed in each polythene bag. All the irrigations till maturity of crop were done with solution prepared as above except for control (F) where ordinary water was used for irrigation. 0.1 gram of urea per plant was applied at the time of first irrigation. Germination percentage was recorded after three weeks of sowing of crop. Number of tillers per plant were counted in last week of March, Height of crop and production of wheat grains and straw was determined after harvesting of crop.

## RESULTS AND DISCUSSION

Main objective of this experiment was to determine the allelopathic effect of different parts of *Eucalyptus camaldulensis* on wheat crop. For

this purpose aqueous extract of different parts of *E.camaldulensis* was used for irrigating the wheat crop and its effects on germination, tillering capacity, heights of crop, straw and grains weight was determined.

Average germination recorded was 93.68%. Maximum germination was observed with fresh bark aqueous extract and minimum with fresh leaves aqueous extract which were 95.00 percent and 92.00 percent respectively (Table-I). Variation observed in different treatments was non-significant. Germination in some treatments was even more than control where ordinary water was used for irrigation purpose.

More tillers per plant is the quality of good wheat variety as it is directly related to production. So the second parameter studied was tillering capacity of wheat with different treatments. Data collected revealed that different treatments did not effect the number of tillers per plant. Average number of tillers per plant came out 2.47 where as control produced 2.57 tillers per plant. Maximum tillers per plant were obtained with fresh leaves aqueous extract treatment which were 2.67 (Table-I).

Adverse factors also affect the normal height of plants. Effect of different treatments was also observed in the height of the crop. There was slight difference among the heights of plants with different treatments but the results were statistically non-significant. Average height of matured crop calculated was 55.51 cm (Table-I).

Last parameter studied was production of wheat crop. Wheat crop was harvested and threshed manually to separate grains and wheat straw. Average weight of grains per plant came out 3.61 grams. Whereas average straw weight was 2.93 grams per plant (Table 1).



Table 1. Termination percentage, number of tillers, height, straw and grain weight of wheat with different treatments

Treatments	Germination %age	Tillers/plant No.	Av.Ht. of crop (cm)	Straw wt./plant (gm)	Grains wt./plant (gm)
A. Dry leaves	93.00	2.56	59.03	3.16	3.57
B. Fresh leaves	92.00	2.67	55.90	2.81	3.51
C. Dry bark	93.05	2.29	54.93	3.10	3.14
D. Fresh bark	95.00	2.51	53.65	3.09	3.91
E. Fruits/Flowers	94.50	2.27	51.28	2.70	3.84
F. Control	94.50	2.57	58.28	2.72	3.68
Average:	93.68	2.47	55.51	2.93	3.61

Variation in the yield due to different treatments did not differ significant. Thus observation recorded for all the parameters did not show any significant difference among different treatments.

## CONCLUSION

On the basis of above results of the study it could be concluded that aqueous extract (5:100 ratio) of different parts of *Eucalyptus camaldulensis* do not have adverse effect on wheat (*Triticum aestivum*) due to production of allelochemicals from its leaves, bark floral buds, etc. Decrease in production of wheat in combination with *Eucalyptus camaldulensis* at farms, therefore, may be due to other factors, like competition for space, light moisture, nutrients, etc. Fertilizers were applied to the crop. It increased the yield in all treatments. The fear that fertilizers may have adverse effect on crop in combination with allelochemicals was nullified.

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