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Inhibition and stimulation response of selected crop on the application of leaf leachate of Drek

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Abstract
The allelopathic research is undertaken to observe the influences of leaf leachates of *Melia composita* on the seed germination and early growth of mustard in laboratory conditions. The various concentrations (10%, 20%, 30%, 40%, 50% and 100%) of leachates were tried to investigate their effects on seed germination and growth of radicle and plumule. The results showed that the leachates of Melia leaves have inhibitory effects on seed germination and radicle growth at various concentrations with some stimulation at 10% leachates concentration.

Keywords: Inhibition, stimulation, leachate, concentrations etc.

Introduction
The study of allelochemicals has become a major thrust in tree biology in the recent years. The term "allelopathy" is from greek which means "to suffer from each other."Allelopathy has traditionally been considered only the negative chemical warfare of one organism upon other. Modern researchers suggests that allelopathic effects can be both positive and negative, depending upon the dose and organism affected. Allelopathy is the active or passive effects of chemicals released into the environment which influences other organisms. For a tree to be biologically efficient and ecologically effective, it must interfere with another surrounding species. This interference has two primary components: competition and allelopathy. Competition is the control or removal from the common environment of essential resources needed for life. Allelopathy is the addition of materials to the common environment which changes life functions. Allelopathy is the biochemical modification of the environment to enhance tree survival and reproduction. Interference is the proper name for individual ecological interactions. Allelopathy is a defensive component of tree interference. Allelopathy is the interference of one plant with another through substances produced by the plant and released into the environment. A rapidly growing body of data suggests that allelopathy is often important in the survival and growth of trees both in plantations and natural stands. An awareness of this phenomenon, and its potential effects on regeneration and site productivity, is essential in the practice of intensive silviculture (Fischer, 1980) [1]. Allelopathic interactions may occur throughout the life of a stand, but most commonly observed during reforestation or regeneration. The plants exhibit the allelopathic effects on seed germination, growth and development of other plants by releasing allelochemicals into the soil, either as exudates from living organisms or by decomposition of plant residues (Narwal, 1999) [2]. The failure of forest tree regeneration is a major problem in natural conifer forests. Allelopathy, competition, soil nutrient imbalance and poor ectomycorrhization have been implicated in conifer regeneration failure in the presence of dense ericaceous under-story resulting from forest harvesting and fire in boreal forests and sub-alpine spruce forests (Mallik, 2003) [3]. Pellisser and Souto (1999) [4] have reviewed the role of allelopathy in northern temperate and semi natural boreal forests. Allelopathic compounds may be produced in any part of the plant, but the highest concentrations appear to be in foliage, fruits and in roots and may be released to the environment by volatilization or by leaching and exudation and affect various physiological processes of receptor plants.

Material Method
Preparation of leaf Leachates: The leaves of *Melia composita* were collected during the month of April. The sampled leaves of the plants were dried and soaked in distilled water in

the ratio of 1:5 (w:v) and kept in refrigerator at 8 °C for 48 hours. The leachates were filtered with muslin cloth and Whatman No. 1 filter paper. They were raised to original volume by adding distilled water and were treated as leachates of 100% concentration. Leachates of graded concentration of 10, 20, 30, 40, 50, and 100% were prepared by diluting the mother leachates. These leachates were transferred in capped bottles and kept in refrigerator at 7- 8 °C (Richardson and Williamson, 1988) [5] and applied finally for tests.

Laboratory Bioassay: The fifty seeds of wheat and mustard were evenly placed on two layers of whatman #1 filter paper in sterile Petri dishes (100×25 mm). Five ml of leachate solutions was added to each Petri dish as per treatment and distilled water was used as control. Each treatment was replicated four times and the Petri plates were placed in the germinator having temperature of 300C. Germination count was recorded daily and germination test was run for 28 days. Seeds were considered germinate when the radicle emerged about 1cm long. The data of seed germination were recorded and quantified according to ISTA (1993) rules. Radicle and plumule length of germinated seeds was measured using centimeter scale at the end of experiment. The following are the treatments:

T0 = Seeds treated with distill water only (control)
T1 = Seeds treated with leachate extracts of 10% concentration.
T2 = Seeds treated with leachate extracts of 20%concentration.
T3 = Seeds treated with leachate extracts of 30%concentration.
T4 =Seeds treated with leachate extracts of 40%concentration.
T5 =Seeds treated with leachate extracts of 50%concentration.
T6 = Seeds treated with leachate extracts of 100%concentration.

The magnitude of inhibition versus stimulation by various leachate applications in the experiments was compared with the Response Index (RI). RI is calculated using the formula of Richardson and Williamson (1998) [5], which is as:

Response Index (RI)= (T/C) – 1 ×100

Where T= Treatment, C= Control

Result and Discussion

Germination Percent

All the concentrations of foliage leachates of *Melia composita* inhibited the seed germination of Wheat except 10% of concentration which stimulated the germination percentage. The maximum and minimum germination percent observed was 76.10% and 57.25%, respectively. The germination differed significantly at various leachates concentration and decreased with the increase in leachate concentrations. The response index of germination with different leachates concentrations also showed -3.81%, -11.11%, -11.80%, -17.70%, -20.48% inhibition in germination at 20%, 30%, 40%, 50%, 100% concentrations, respectively with stimulation of +6.25% in germination at 10% concentration. Thus the foliage leachates of *Melia composita* inhibited the seed germination of wheat in all applied concentrations except at 10% concentration in laboratory conditions. This inhibition in seed germination should also be tested in field conditions as some of the allelochemicals degraded in field due to various chemical and biological reactions.

Radicle Length

The radicle length of wheat was also get inhibited by foliage leachates of *Melia composita*, however, treatments did not differ significantly except 10% concentration of leachates during the year 2017, which differ significantly from control at 1% level. The results of response index showed inhibition of -6.12%, -2.61%, -2.10%, -6.72%, -18.77% in 20%, 30%, 40%, 50%, 100% concentrations with stimulation of +12.44% in 10% concentration (Table 1). The rate of inhibition increases with the increase in concentrations showing some toxic effect of leachates on radicle growth of wheat.

Plumule Length

The plumule length of wheat was stimulated by foliage leachates of *Melia composita*, however, treatments did not differ significantly. The response index showed stimulation of +60.63%, +55.45%, +46.40%, +49.56%, +63.50%, +40.37% in 10%, 20%, 30%, 40%, 50%, 100% concentrations during the years (Table 1). The rate of stimulation decreases with the increase in concentrations except at 50% concentration.

Table 1: Effect of leaf leachates of *Melia composita* on growth parameter of Wheat Crop

Concentration level (%)	Germination Percent (%) Response Index	Plumule Length (cm) Response Index	Radicle Length (cm) Response Index
10%	+6.25	+60.63	+12.44
20%	-3.81	+55.45	-6.12
30%	-11.11	+46.40	-2.61
40%	-11.80	+49.56	-2.10
50%	-17.70	+63.50	-6.72
100%	-20.48	+40.37	-18.77
Control Treatment	72.00	6.96	9.96
SD	6.10	1.49	0.93
CD (0.05)	9.03	1.35	1.30

Conclusion

The allelopathic research is undertaken to observe the influences of leaf leachates of *Melia composita* on the seed germination and early growth of mustard in laboratory conditions. The various concentrations (10%, 20%, 30%, 40%, 50% and 100%) of leachates were tried to investigate their effects on seed germination and growth of radicle and plumule. The results showed that the leachates of Melia leaves have inhibitory effects on seed germination and radicle growth at various concentrations with some stimulation at 10% leachates concentration. The leachate concentrations significantly inhibited the seed germination and radicle growth of the receptive species at lower rates. However the plumule growth was stimulated at all the foliage leachates concentrations The rate of inhibition increases with the increase in concentrations of the leachates.

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