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Short Communication

ALLELOPATHIC EFFECTS OF *AZADIRACHTA INDICA* A. JUSS. AND *MIKANIA MICRANTHA* KUNTH LEAVES EXTRACTS ON SEED GERMINATION OF *AMARANTHUS SPINOSUS* L.

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ABSTRACT

Allelopathic effects of aqueous leaf extracts of two selected plant species -*Azadirachta indica A.Juss and Mikania micrantha Kunth* on the seed germination of a common weed *Amaranthus spinosus L.* were studied. The experiments were conducted under laboratory conditions. Different test concentrations [5%, 10%, 15% and 20%] of aqueous extracts of both leaves were prepared separately. The receptor seeds were collected from A*maranthus spinosus*. Seed germination tests were carried out in sterilized petri dishes. Effects of different concentrations of leaves extracts on the germination of seeds were studied and recorded for seven consecutive days. This data was compared with that of Control, *i.e.* Distilled water. Allelopathic inhibition of seed germination increased with increasing concentrations of leaves extracts for both donor plants. From the recorded results Germination potential and Germination rates were calculated. Germination potential was found to be the least in 15% and 20% concentration of both the leaves extracts. Germination rate was the lowest in 20% concentration of *Mikania micrantha* leaf extract. From the study, it was found out that both the plants show significant allelopathic effect against a common weed *Amaranthus spinosus* and this potential could be used to manage weeds. This work tries to point towards the possibility of developing bioherbicides from plants with such allelopathic activity, which could be used to control many weeds, an important problem faced in the agriculture fields.

Keywords: Allelopathy, Amaranthus, Azadirachta, Germination potential, Germination rate, Mikania

1. INTRODUCTION

Allelopathy refers to a biological interaction, that may be positive or negative which results from the action of certain secondary metabolites known as allelochemicals [1]. Allelopathic interactions between plants either stimulate or inhibit growth. Many algae, lichen, crops and weeds are known to produce Allelochemicals [2,3]. These substance are present in different parts of plants like leaves, flowers, fruits, roots and stems [4]. Allelochemicals can influence many processes in ecosystems and agroecosystems [5-7]. Allelopathic effects can be inhibitory or negative [8]. Depending on the allelochemicals, their concentration and the target plants,often allelopathic interaction can be positive also [9]. Many plants, crops and weeds are known to produce Allelochemicals. Chon et al 2006 reported that allelopathy can influence management of weeds [10]. Plants producing allelochemicals can be used in the synthesis of herbicides. Production of allelochemicals requires high energy investment, which may affect their production [11].

The Neem (*Azadirachta indica)* the evergreen tree native in India is a member of family Meliaceae. It is found in tropical and temperate regions [12, 13]. Due to the presence of various allelopathic compounds neem plants are found to be allelopathically active. [14]. Neem leaf extract have an inhibitory action on germination of roots and shoot elongation of various test plant [15]. The Neem leaf extract contains phenols, flavonoids, tannins, β-sitoserol, luped, rutin, ellagic acid and quercetin[16]. According to Salam and Noguchi [17] higher concentration of Neem extract have a direct relation in the inhibitory activity.

Mikania micrantha belongs to the family Asteraceae. It is a perennial vine. Cordate leaves with slightly protruding veins and arranged in opposite pairs [18]. In *Mikania micrantha* allelochemicals are released by volatilization or decomposition of plants debris. Allelopathic effect of aqueous extract of stem and leaves of *Mikania micrantha* cause significantly inhibited the growth of plants while roots had lesser effect [19].

In the agricultural lands infestation of weeds is a major problem faced by the developing countries [20]. Putnam et al [21] and Hogue et al [22] were of the opinion that certain weeds release allelochemicals into soil that reduce the growth of crops.

Amaranthus spinosus L. is commonly known as 'Spiny Amaranth' or 'pigweed'. It is a native to Tropical America. This plant is found throughout India as a weed [23]. This study tries to evaluate the allelopathic effects of *Azadirachta indica* A. Juss *and Mikania micrantha* Kunth on the seed germination of a common weed *Amaranthus spinosus* L. and thereby point towards the chances of developing bioherbicides using such plants to manage weeds.

2. MATERIAL AND METHODS

2.1. Preparation of aqueous leaf extracts

For preparation of aqueous leaf extracts, mature leaves from *Mikania* and *Azadirachta* were collected and dried under shade for 4 weeks. After proper drying the leaves were powdered and 15g of each leaf powders were weighed out and dissolved separately in 100 ml distilled water to obtain 15% stock solutions of both the leaf extracts. These were kept under room temperature for 48 hours. The resulting extracts were filtered through Whatman filter paper No.1 and subjected to centrifugation at 3500 rpm for 15 minutes in an ultracentrifuge. Supernatants were collected and stored separately in sterilized conical flasks. These are known as undiluted extracts [24]. The undiluted extracts were then diluted with distilled water to get different test concentrations such as 5%, 10%, 15% and 20%. Distilled water was used as Control.

2.2. Collection of receptor seeds

For germination tests, seeds of *Amaranthus spinosus L.* were used. The receptor seeds were collected and washed with distilled water. The seeds are then surface sterilized using 15% sodium hypochlorite for 20 minutes and rinsed with distilled water. Tests were carried out in sterilized petri dishes of diameter 9 cm. 50 seeds were placed in each petri dish lined with two layers of Whatman filter paper No.3. Each petri dish was moistened using the respective treatment concentrations and the seeds used as controls were treated with distilled water. The seeds under test were incubated for 24 hours at room temperature. Number of seeds germinated was recorded for seven consecutive days. From the observations, germination potential and germination rate were calculated using the following equations: [24]

Germination rate (%) = (Number of seeds germinated in the seventh day/Total number of seeds) X 100

Germination potential(%)=(Number of seeds germinated in the third day/Total number of seeds) X 100

3. RESULTS AND DISCUSSION

The effects of aqueous extracts of *Azadirachta indica* and *Mikania micrantha* on the seed germination of *Amaranthus spinosus L* were shown in Table 1 and Table 2.

Table 1: Effect of *Mikania micrantha* leaf extracts on seed germination of *Amaranthus spinosus*

Treatments	Germination potential	Germination rate
T0(Control)	18%	97%
T1(5%)	12%	52%
T2(10%)	10%	42%
T3(15%)	0%	4%
T4(20%)	0%	0%

Table 2: Effect of *Azadirachta indica* leaf extracts on seed germination of *Amaranthus spinosus*

Treatments	Germination potential	Germination rate
T0(Control)	14%	95%
T1(5%)	8%	32%
T2(10%)	6%	32%
T3(15%)	0%	12%
T4(20%)	0%	2%

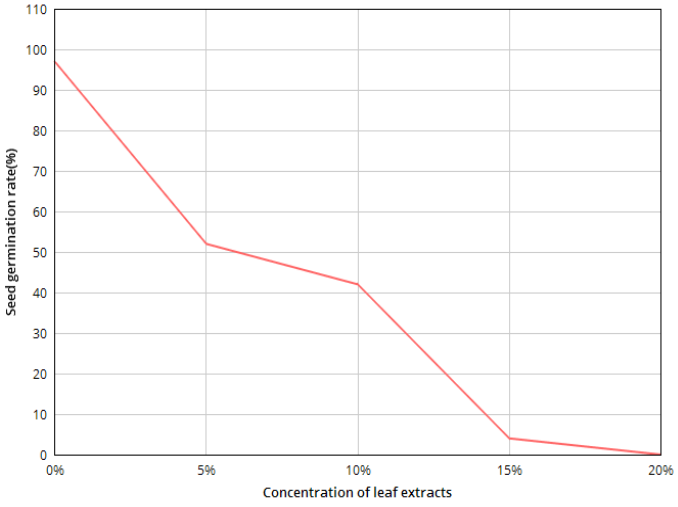
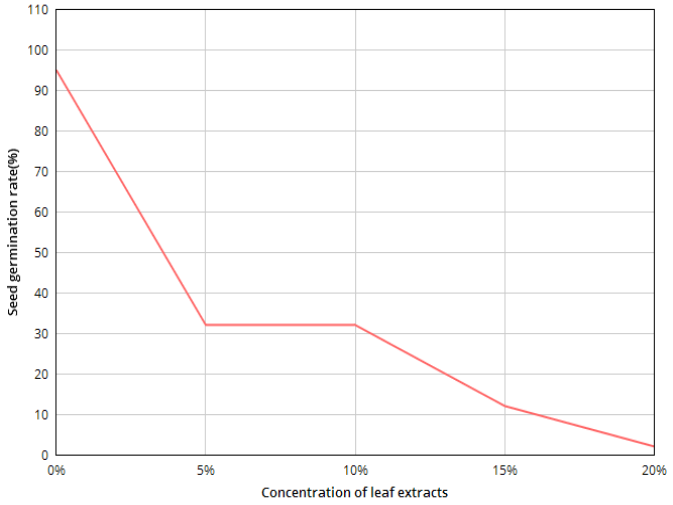


Fig. 1: Allelopathic effect of *Mikania micrantha* leaf extracts on seed germination rate (%)

Germination potential of the seeds was least in 15% and 20% of *Azadirachta indica* leaf extracts which was 0% in both the concentrations (table 2). The germination rate was found to be the lowest in 20% concentration of *Azadirachta indica* leaf extract (figure 2). In 20% concentration the germination rate was 2% (table 2). In the leaf extracts of *Mikania micrantha* seed treated with 15% and 20% showed the lowest germination potential which was 0 % (table 1), and the germination rate was lowest in 20% which was 0% (figure 1). Comparing the effects of both the plant extracts on the seed germination of *Amaranthus spinosus* L., we have observed *Mikania micrantha* leaf extracts have more inhibitory effect than that of *Azadirachta indica*.

Aqueous extracts of *Mikania micrantha* and *Azadirachta indica* leaves have significant inhibitory effect on the seed germination of *Amaranthus spinosus L*. For both the plants, the inhibitory action on seed germination of *Amaranthus spinosus* was directly proportional to the concentration of the leaf extracts (figure 1, figure 2). The results obtained are in accordance with the results obtained by Shao H *et al.* who concluded that aqueous extracts of *Mikania* leaf extracts significantly inhibited the growth of many plants [19]. According to Salam and Noguchi [17], the inhibitory activity of aqueous leaf extracts of Neem increases with increasing concentration



4. CONCLUSION

By analyzing the results of present study, we can conclude that, leaf extracts of *Azadirachta indica* and *Mikania micrantha* suppress the seed germination of the weed *Amaranthus spinosus L*. These results suggest that *Azadirachta indica* and *Mikania micrantha* could be used as two important natural resources for developing bioherbicides for weed management.

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