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Allelopathic effects of *Mikania micrantha* on agricultural crops in Mizoram, North-East India

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***Abstract*: The allelopathic effects of *Mikania micrantha* was studied on two agricultural crops *Oryza sativa and Zea mays.* Aqueous leaf extracts of *Mikania micrantha* were made to determine their effects on the seed germination as well as seedling growth on a week old *Oryza sativa and Zea mays* over a range of extract concentrations. Aqueous leaf extracts of *Mikania micrantha* shows gradual decline in seed germination and seedling growth on both the crops. The seed germination and seedling growth of *Oryza sativa* was suppressed more as compared to *Zea mays*. The study also revealed that the effects of the selected weed on the germination% as well as seedling growth of *Oryza sativa* and *Zea mays* are found to be statistically significant ($p \leq 0.05$).**

***Keywords*: *Mikania micrantha*, weeds, allelopathy, ANOVA, Mizoram.**

I. INTRODUCTION

Mikania micrantha Kunth is a fast growing, perennial, creeping climber. They belong to the family Asteraceae. They are also known as bitter vine. They are invasive weeds that grow out of place. Since both weeds and crops are plants, they have basically the same requirements for normal growth and development. They require and compete for an adequate supply of the same nutrients, moisture, light, heat, temperature, carbon dioxide and growing space. Allelopathy is an interference mechanism, in which live or dead plant materials release chemical substances, which inhibit or stimulate the associated plant growth [1]. The plant may exhibit inhibitory or rarely stimulatory effects on germination and growth of other plants in the immediate vicinity. Competition and the presence of vegetative and reproductive parts of weeds at or near to harvest have the greatest adverse affect on crop quality [2].

Since, the presence of weed is a nuisance for agricultural crops as they compete for nutrition as well as growing space, thus, understanding the weed's allelopathic effect is essential for weed management as well as for developing crop management models. Thus, it is essential to study allelopathic effects of weeds on crop production with reference to Mizoram, North-East India. Mizoram lies between 23°37'01'' N latitude and 93°18'00'' E Longitude. It is situated in the North-east region of India between the border of Myanmar and Bangladesh, covering the area of about 21087 km² with more than 90% of evergreen vegetation forest. Majority of the population still depend on agriculture for their livelihood. The purpose of this study was to determine the possible allelopathic effects of *Mikania micrantha* on seed germination and seedling growth of two agricultural crops *Oryza sativa* and *Zea mays.*

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II. MATERIAL AND METHODS

The weed sample was collected locally. The leaves were properly cleaned and air dried in room temperature. The dried plant materials were crushed into fine powder.

10 gm of air dried weed plant material was taken by Digital Electronic Weighing Machine in 100 ml of distilled water and kept for 24 hours at room temperature. It was then filtered through Whatman filter paper no.1 and the volume of the filtrate was made to 1000ml. Different dilutions such as 2%, 4%, 6%, 8% and 10% of the extract were prepared from the stock solution. The seeds *of Oryza sativa* and *Zea mays* were soaked separately in a petri-plates in distilled water overnight. The next day, the seeds were surface sterilized with 0.1% of mercuric chloride solution for two minutes and washed twice with distilled water and kept for germination. The petri-dishes were autoclaved before use in order to prevent any type of contamination or infection. Paper towels were used for germination tests and the towel was wrapped with the tissue paper. Each paper towel was moistened with approximately 10ml. of respective extracts. The soaked seeds were then placed in the petri dishes with the respective concentration and the number of seeds placed were counted. After placing the seeds they were then covered with a layer of moistened paper towel. In each set of treatment three replicates (R1, R2, R3) were kept containing the same number of seeds. Observation of germination percentage and seedling length was done after an interval of one week. The number of seeds that showed germination was counted and its % was calculated. The seedling length was measured by using a ruler. The length of the radicle was measured using a ruler and expressed in cm. The experimental data pertaining to each parameters were analyzed statistically using SPSS16 with the help of analyses of variance technique (ANOVA). Statistical significance at $p \leq 0.05$ was considered.

III. RESULTS AND DISCUSSION

Germination% of Oryza sativa when treated with aqueous leaf extract of Mikania micrantha:

Oryza sativa when treated with different leaf extracts of *Mikania micrantha* shows a decrease in the germination rate with the increase in concentration. In case of seedling growth of *Oryza sativa* when treated with *Mikania micrantha*, it was found that the control has the longest seedling length and the highest concentration (10%) of leaf extract has the least seedling growth.

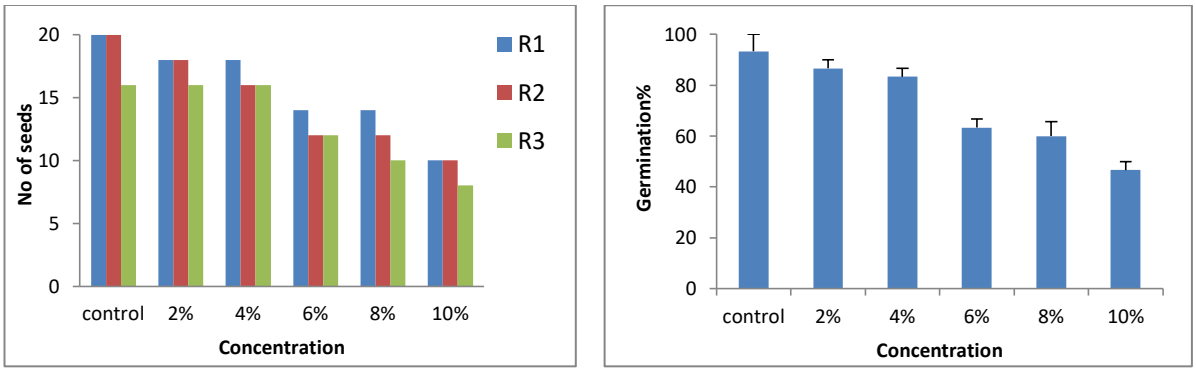

Figure 1: Effect of *Mikania micrantha* on the germination% of *Oryza sativa.*

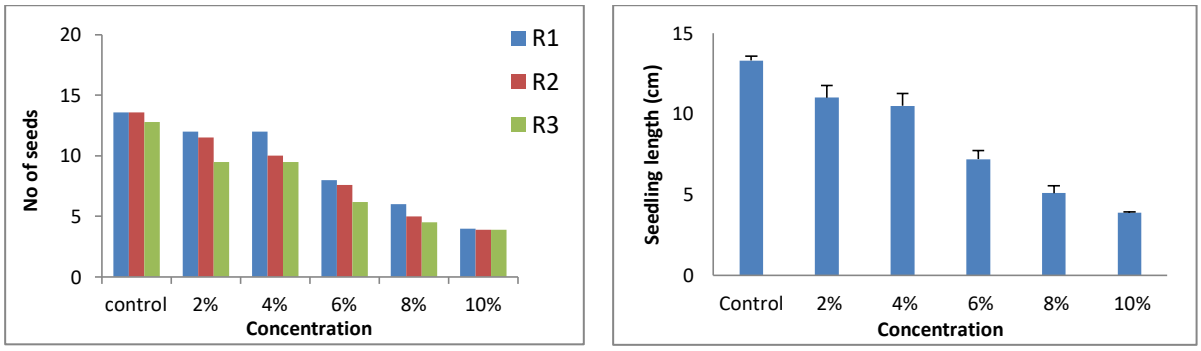

Figure 2: Effect of *Mikania micrantha* on the seedling growth of *Oryza sativa.*

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Germination% of Zea mays when treated with aqueous leaf extract of Mikania micrantha:

When *Zea mays* was treated with different concentration of aqueous leaf extract of *Mikania micrantha*, there was a gradual decrease in seed germination as well as the seedling growth. It is apparent that leaf extract of *Mikania micrantha* inhibits the growth of *Zea mays*.

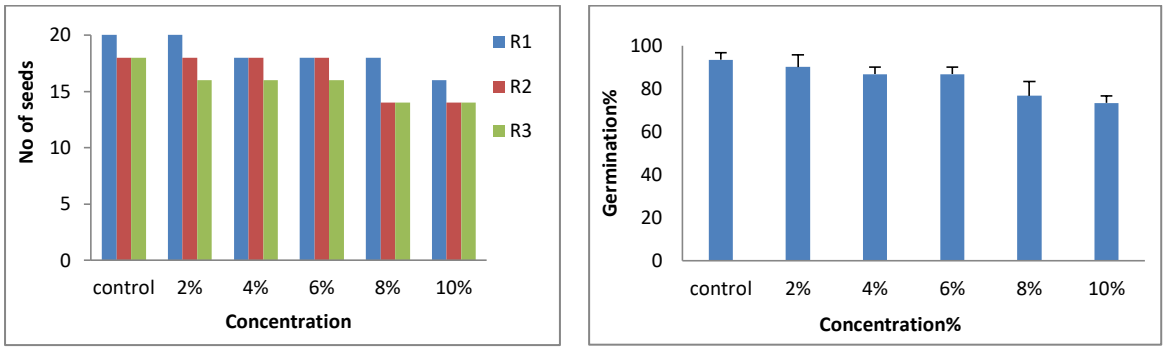

Figure 3: Effect of *Mikania micrantha* on germination% of *Zea mays.*

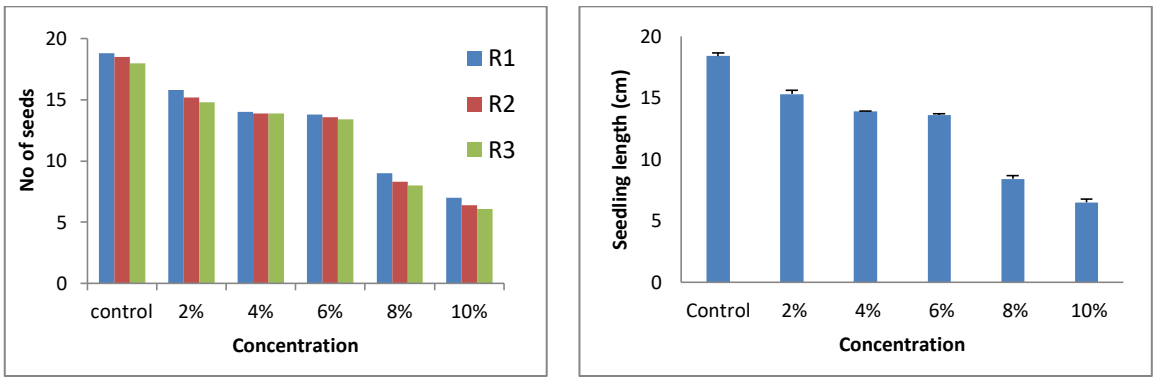

Figure 4: Effect of *Mikania micrantha* on seedling growth of *Zea mays.*

The ANOVA table for the influence of different concentrations of *Mikania micrantha* on the agricultural crops are given in Table 1. The study revealed that the effects of the selected weed on the germination% of *Oryza sativa* and *Zea mays* are found to be statistically significant ($p \leq 0.05$).

Table 1: One way analysis of variance (ANOVA) of selected agricultural crops under the influence of different concentrations of *Mikania micrantha* at CTRL, 2%,4%,6%,8%,10%. Marked effects are significant at $p \leq 0.05$.

Parameters	Source of variation CTRLX2%X4%X6%X8%X10%	F-value	p-value
M(O)	-do-	16.291	0.000*
M(Z)	-do-	2.982	0.05*

The study also revealed that the effects of the selected weeds on the seedling growth of *Oryza sativa* and *Zea mays* are found to be statistically significant ($p \leq 0.05$).

Table 2: One way analysis of variance (ANOVA) of selected agricultural crops under the influence of different concentrations of *Mikania micrantha* at CTRL, 2%,4%,6%,8%,10%. Marked effects are significant at $p \leq 0.05$.

Parameters	Source of variation CTRLX2%X4%X6%X8%X10%	F-value	p-value
M(O)	-do-	46.507	0.000*
M(Z)	-do-	379.675	0.000*

From the above data collected, it can be concluded that all target species demonstrated a significant degree of suppression and a negative response to the increasing concentration of different weed extracts. During the course of experiment the germination percentage and seedling length of *Oryza sativa* against *Mikania micrantha* remain higher and suppressed more by the weeds as compared to *Zea mays*. Suppressive effect was increased with an increase in extract concentration

indicating that the effect of plant extracts depends very much on their concentration. Similar findings also showed the effect of allelopathic leaf extract of five selected weeds on *Triticum aestivum L.* The five selected weeds *Phalaris minor L., Chenopodium murale L., Sonchus oleraceus L., Cyanodon dactylon L.* and *Convolvulus arvensis L.* shows a certain degree of suppression and a negative response to the increase in concentration of their extracts when treated on *Triticum aestivum L* [3]. Two dominant weeds (*Ageratum conyzoides* and *Chromolaena odorata)* were tested for their allelopathic influences on agricultural crops (*Oryza sativa, Brassica campestris and Glycine max*) in Mizoram [4]. Effects of leaf extracts of various weeds on germination and radical extension of field crops have also been reported [5],[6]. Similar allelopathic effects of aqueous extracts of *Imperata cylindrical, Ageratum conyzoides* and *Commelina benghalensis* on germination and vigour of soybean and maize have also been reported [6]. *Chromolaena odorata* and *Chromolaena adenophorum* showed allelopathic effects in wheat, mustard, chickpea and white clover [7],[8],[9]. Leaf extracts of *Chromolaena odorata* reduced the growth of wheat and mustard seedlings [7].

IV. CONCLUSION

The study revealed the allelopathic effects of *Mikania micrantha* on *Oryza sativa* and *Zea mays*. The germination percentage and seedling growth of *Oryza sativa* against *Mikania micrantha* remain higher and suppressed more by the weeds as compared to *Zea mays*. They were mostly found abundantly throughout the year. Because of this reason, periodical weeding is required to control their rapid growth so that the agricultural crops can grow without any inhibitory effect from them. There is a need to control commonly found weeds especially in Mizoram where most of the population depend on agriculture for their livelihood.

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