

Allelopathic effect of *Digera muricata* (L.) Mart. of Amaranthaceae on seed germination and seedling growth of Paddy crop variety “BPT 5204”

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Abstract

As there were no earlier allelopathic studies on Paddy. We selected this study to conduct in fields of Paddy crop variety “BPT 5204”, a very popular crop among farmers and consumers in Kurnool district. The study revealed *Digera muricata* (L.) Mart. of Amaranthaceae as a dominant weed in selected crop fields. The results were analyzed by standard deviation method and graphical representation given to the germination rate, growth of root and stem on 3rd, 5th and 7th day of the experiment. Allelopathic effect studies of aqueous extracts of root, stem and leaf of *Digera muricata* found no effect on seed germination. But they shown progressive decrease in root length and shoot length when crops were exposed to increasing concentrations.

Key words : Allelopathy, Dominant weed. Allelochemicals, Aqueous extracts, Seed germination, Root & Shoot growth.

The term ‘Allelopathy’ was explained by Rice⁹ as “any direct or indirect harmful or beneficial effect by one plant on another through production of chemical compounds that escape into the environment. Allelochemicals are produced by plants as end products, byproducts and metabolites and are contained in the stem, leaves, roots, flowers, inflorescence, fruits and seeds of the plants. Alam & Islam² said that they inhibits the growth of the newly emerges,

propagules and young plants. Generally plants get in touch with the allelochemicals in soil^{5,8}. Allelopathic effects may be species specific and their influence can be positive (stimulatory) or negative (inhibitory)⁷. They often affect germination dynamics and growth of crop⁶. There were no earlier allelopathic studies on Paddy. So, we were selected Paddy crop variety “BPT 5204” for study. Dry seeded paddy variety ‘BPT 5204’ is very popular among

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farmers and consumers because of its high yield, medium slender, fine grain type, and fabulous cooking and eating quality.

Selection of a weed : To provide baseline information about weeds of the study area, 1m. X 1 m. size quadrates are laid down at random in cultivated area Their number is depended on the cultivated area. The weeds encountered in the field sites of the crop fields are carefully collected and identified with the help of authentic regional floras, monographs and other relevant literature and consequently the correct names were provided to each plant. To select the weed species for allelopathic studies, sum of total number of individuals for all species was taken into consideration.

Study on Allelopathic effect : Aqueous leaf, stem and root extracts (0.0, 0.5, 1.0 and 5.0%) of the selected dominant weed was prepared to determine allelopathic effect on germination of selected crop seeds i.e. on Paddy variety “BPT 5204”. Petri plates were taken and sown with 10 seeds of test crop

and then irrigated with aqueous leaf extracts. The control plates were irrigated with distilled water. The experiment was designed as completely randomized design (C.R.D.) with three replications. The results were analyzed by standard deviation method and graphical representation was given to the germination rate, growth of root and stem on 3rd, 5th and 7th day of the experiment.

Digera muricata (L.) Mart. of Amaranthaceae was identified as the dominant weed in selected crop fields of dry seeded paddy variety ‘BPT 5204’.

Leaf Extracts Effect on germination, root growth and shoot growth :

Figure-1 indicates the allelopathic effect of leaf extracts on germination of paddy seeds. It was shown, no effect at 0.5%, 1%, and 5% concentrations on 3rd and 5th days and a slight decrease on 7th day at all concentrations.

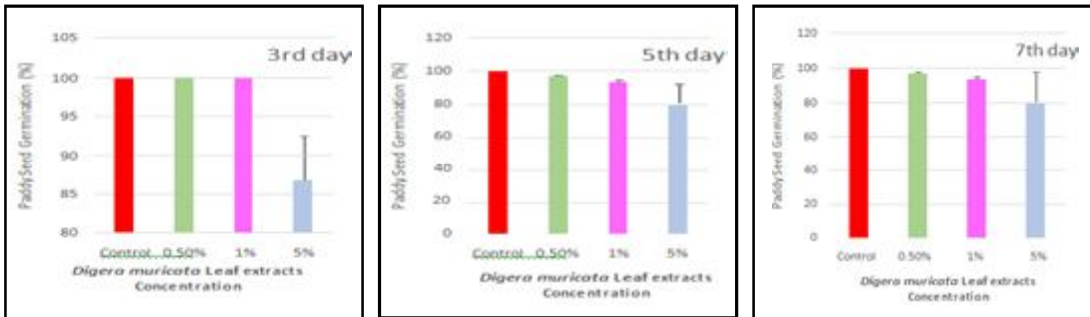


Figure – 1: Effect of leaf extracts on seed germination of paddy :

Figure -2 indicates the allelopathic effect of leaf extracts on root growth of dry seeded paddy. There was a gradual decrease

of root growth on 3rd day, 5th day and 7th day at all concentrations that were taken.

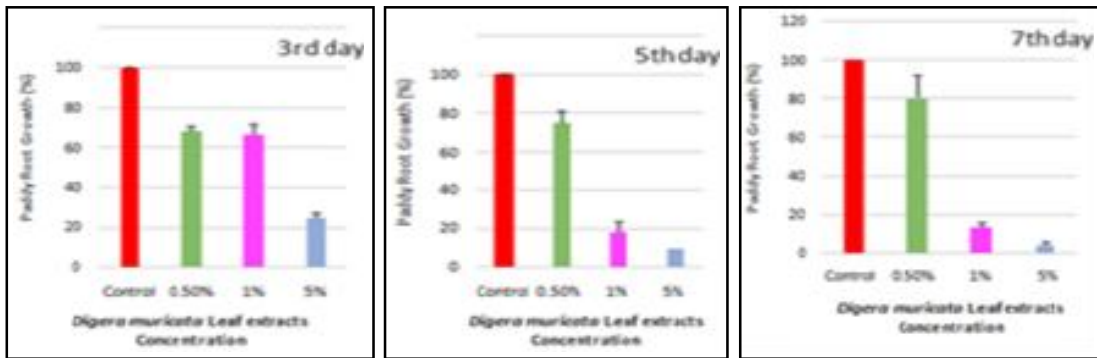


Figure-2: Effect of leaf extracts on root growth of paddy:

Figure- 3 indicates the allelopathic effect of leaf extracts on shoot growth of dry seeded paddy. There was no shoot growth on 3rd day. On 5th day and 7th day, there was a decrease in growth at all the three concentrations, 0.5%, 1% and 5%.

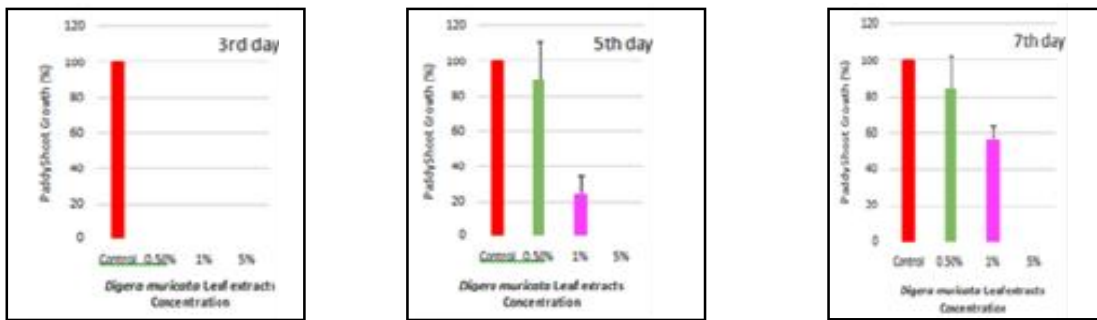


Figure-3: Effect of leaf extracts on shoot growth of paddy:

Stem Extracts Effect on germination, root growth and shoot growth :

Figure-4 indicates the allelopathic effect of stem extracts on germination of dry seeded paddy. It was shown no effect on

germination at concentrations of 0.5% and 1% concentrations on 3rd, 5th and 7th day. At 5% concentration it was shown only 80% of seed germination on all the three observed days.

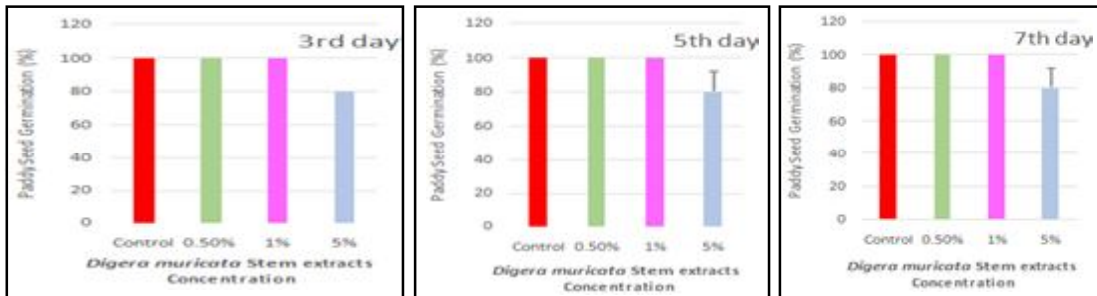


Figure – 4: Effect of stem extracts on seed germination of paddy:

Figure-5 indicates the allelopathic effect of stem extracts on root growth of dry seeded paddy. It was shown a gradual decrease in root growth from 3rd day to 7th day at all three tested concentrations of stem extracts.

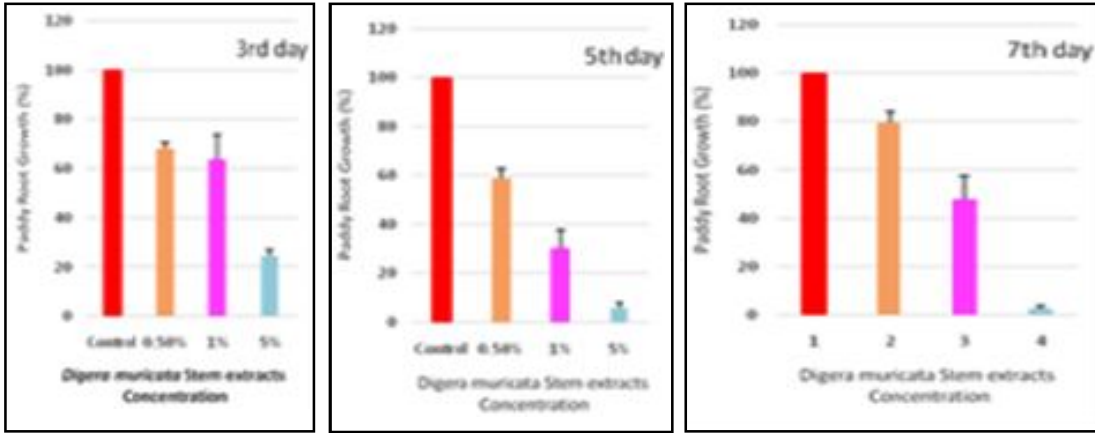


Figure – 5: Effect of stem extracts on root growth of paddy:

Figure-6 indicates the allelopathic effect of stem extracts on shoot growth of dry seeded paddy. It was shown no shoot growth on 3rd day even in control, and there was an increase of growth at 0.5% and a decrease of growth at 1% concentration from 5th day to 7th day. No growth at 5% concentration on all three days.

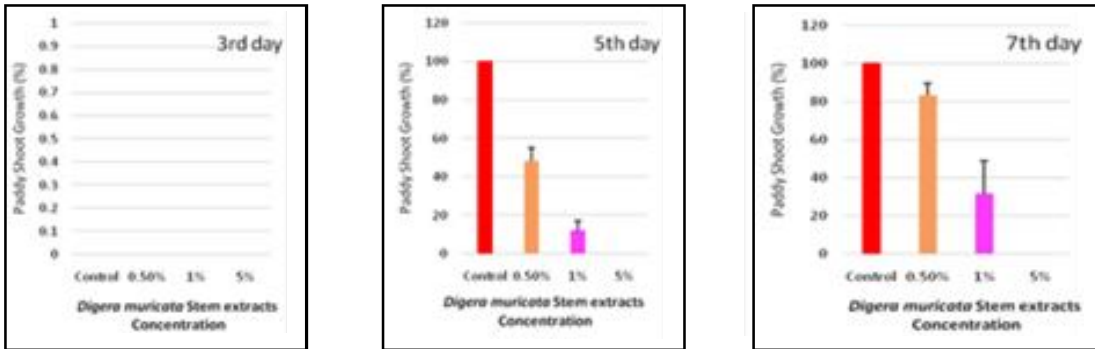


Figure – 6: Effect of stem extracts on shoot growth of paddy:

Root Extracts Effect on germination, root growth and shoot growth :

Figure-7 indicates the allelopathic effect of root extracts on germination of dry

seeded paddy. It was observed 100% germination in control, at 0.5% and 1% concentrations on all the three observation days. There was no germination at 5% concentration on all the three days.

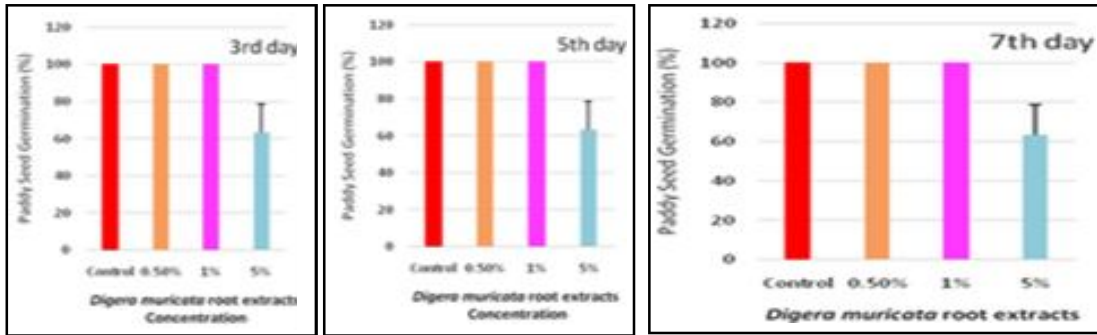


Figure – 7: Effect of root extracts on seed germination of paddy :

Figure-8 indicates the allelopathic effect of root extracts on root growth of dry seeded paddy. It was observed a gradual decrease in root growth at all three tested concentrations from 3rd day to 7th day

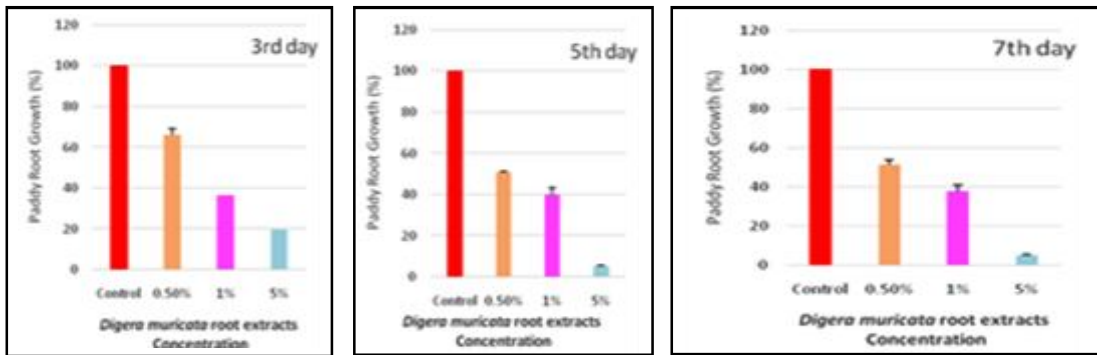


Figure-8: Effect of root extracts on root growth of paddy:

Figure – 9 indicates the allelopathic effect of root extracts on shoot growth of dry seeded paddy. It was observed a slight decrease in shoot growth at 0.5% and 1% concentrations on all the three observed days. There was no growth on all the three days at all three tested concentrations.

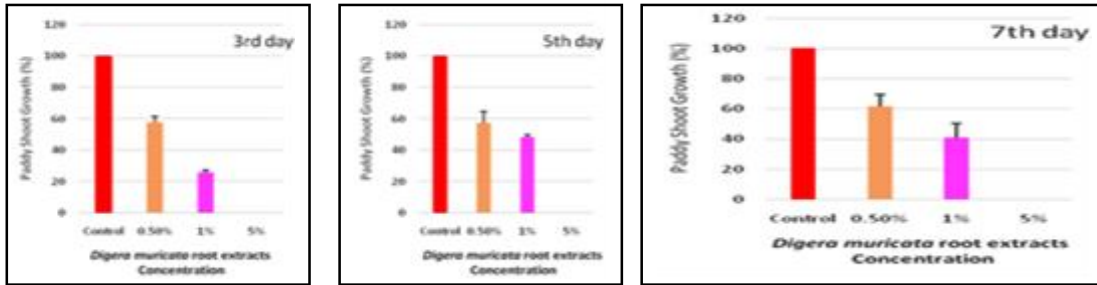


Figure-9: Effect of root extracts on shoot growth of paddy:

Sidhimol *et al.*¹¹ studied on allelopathic effect of the weed *Grangia maderaspatena* Forsk. on seed germination and seedling growth of three varieties of rice and found increased inhibitory effect with increase in concentration of the extract. Aasifa Gulzar and Siddiqui¹ studied on allelopathic effect of aqueous extracts of different parts of *Eclipta alba* (L.) Hassk, and found no effect on seed germination by aqueous extracts of root, stem and leaf. But they shown progressive decrease in root length and shoot length when crops were exposed to increasing concentrations. The similar kind of effect was observed by Sen *et al.*¹⁰ with leaf, stem and root extracts of *D.muricata* on pearl millet.

Bimal Debnath *et al.*,³ were studied on allelopathic effect of *Solanum sisymbriifolium* and found 100% inhibition potentiality in 8% aqueous extract of flowers. Chopra *et al.*,⁴ studied on the allelopathic effect of *Echinochloa colonum* and found a gradual decrease in seed germination percentage and seedling growth with increase in extract concentration. The present study revealed no effect of leaf stem and root extracts at low (0.5% & 1%) concentrations and inhibitory effect at high (5%) concentration on germination of rice seeds. Root and shoot growth was also inhibited by leaf, stem and root extracts at all tested concentrations. This observation was supported the findings of Sen *et al.*,¹⁰.

In agriculture, the inhibitory effect of weed species on germination and growth of crops has been attributed to phytotoxic chemicals released from the leaf litter and roots. These allelochemicals offer great

potential to be used as pesticides because they are free from problems associated with the present pesticides. Therefore, allelochemicals are considered as an important area of current research domain for the development of new herbicides. These could be used for weed control directly or their chemistry could be used to develop new herbicides.

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