



PHYTOTOXIC EFFECT OF DIFFERENT PLANT LEAF WATER EXTRACTS ON THE GERMINATION AND SEEDLING GROWTH OF VARIOUS WEEDS OF THE RICE-WHEAT CROPPING SYSTEM

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Abstract

In this present article, the use of plant water extracts to control the weeds of the rice-wheat cropping system has been discussed. The use of an alternative method to control weed infestation in field conditions is much needed in recent times to minimize the use of herbicides or weedicides. In the past decade or two weeds are getting vigorous in the field condition which is having a great impact in the total loss of the farmer. It can vary from 10-50 % loss in the standing crop. As a result, more use of herbicides and weedicides are being in the run. Weeds are getting resistant to chemicals which can create a great problem in the field of agriculture in the future times. So, an alternative method is necessary. By using the plant water extracts with the combination of herbicides, we can easily control the weeds in the field condition and can also reduce the use of herbicides. So in lab conditions, different combinations of plant extracts have been checked for the best combination to control in the Rice-wheat combination. Out of so many concentrations in the lab condition, the best results were 5% of Eucalyptus plant extract, 10 % of Neem plant extract, and 25 % of Guava plant extract.

Keywords- Plant extract, Weeds

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Introduction-

The use of Plant extracts to control the weeds in fields has been popularized over the years. The use of allelopathic compounds in the field condition is much needed in recent times to minimize the use of herbicides or weedicides. In the past decade or two weeds are getting vigorous in the field condition which is having a great impact on the total loss of the farmer. It can vary from 10-50 % loss in the standing crop. As a result, more use of herbicides and weedicides is being in the run. Weeds are getting resistant to chemicals which can create a great problem in the field of agriculture in the future times. So, an alternative method is necessary. By using plant extracts or allelochemicals we can easily control the weeds in the field condition and can also reduce the use of herbicides. Allelochemicals can be used as an aqueous extract form of plants, or with herbicides too. The impact is great in the field condition. Sorghum, Wheat, Rice, Sunflower, Guava, Eucalyptus, etc can be used in the field condition as the allelochemicals.

The essential methodology utilized in allelopathic research for agricultural crops has been screening crop yield plants and typical vegetation for their ability to suppress weeds. To exhibit allelopathy, plant source, production, and distinguishing proof of allelochemicals must be established and persistent in nature over time in concentrations sufficient to affect a plant species. On the other hand, utilization of allelopathic compounds previously, alongside, or after synthetic herbicides could improve the general impact of the two materials, in this manner lessening the application paces of synthetic herbicides. A few researches have been reported on the use of aqueous extracts of allelopathic plants on crops for weed suppression.

The utilization of allelopathic cover crops in decreased culturing tillage cropping system gives a biologically stable and ecologically safe administration technique for weed control (Barnes and Putnam, 1983). Alsaadawi et al. (1985) isolated four nonvolatile inhibitors that showed that they are phenolic in nature. Then again, five volatile inhibitors were identified by gas chromatography, four of which were terpenes. All inhibitors decreased seed germination as well as seedling development of *Amaranthus retroflexus*. Muhammad Jamil et al. (2009) described Alternative control of wild oat and canary grass in

wheat fields by allelopathic plant water extracts where they found the use of sorghum extract in Wild oats and also with eucalyptus, sunflower, sesame, and tobacco water extract inhibited the growth of Wild oat and canary grass in a great extent.

In another research work Abdul Razzaq et al. (2012) described Reduced herbicide doses used together with allelopathic sorghum and sunflower water extracts for weed control in wheat showed a great result in suppressing the weeds. The allelopathic water extract of Sorghum and Sunflower 18l/ha with leveled or 70 percent reduced herbicide doses shows a great reduction in total dry matter by 90%.

Methodology

To achieve the ideal result for the targeted objective we have followed the method of normal plant leaves water extract method. Where we just made the plant leaves water extracts to check the germination percentage of the crop and weeds. We also checked the phytotoxicity of the targeted plant leaves water extracts.

Sample collection-

Samples of the weed seeds had been collected from the field of Lovely Professional University, Phgwara, Jalandhar (2020-2021) to ensure lab screening and testing. From the field of rice-wheat crops, seeds were collected.

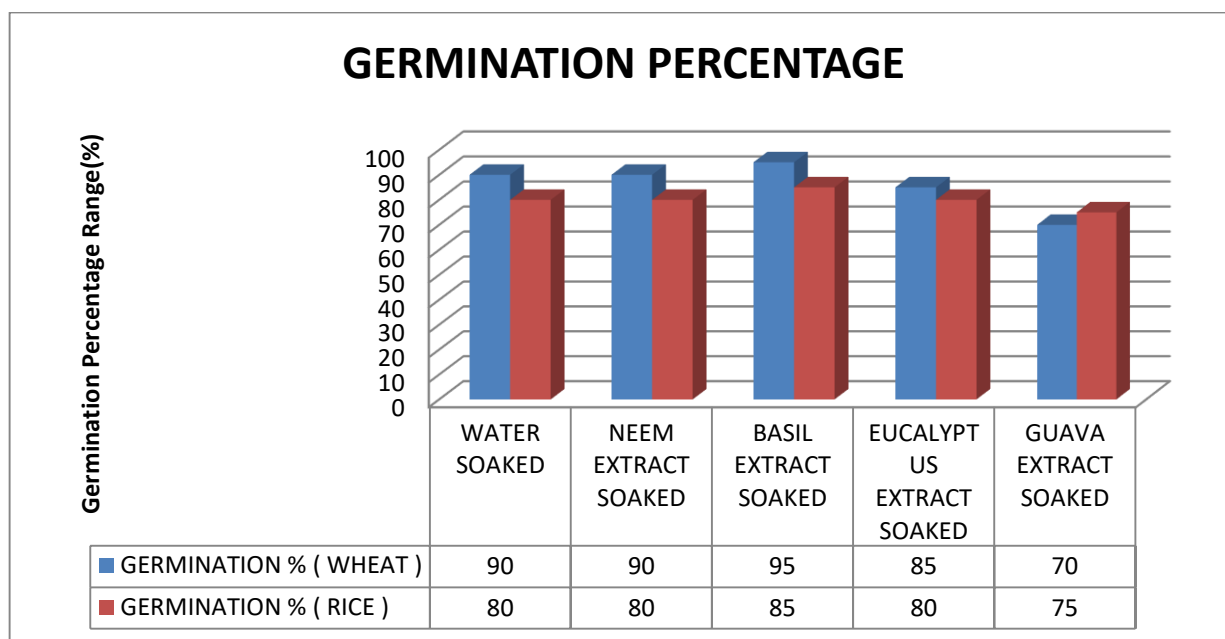
Plant leaves extract preparation-

Plant aqueous extracts from different selected plant leaves need to be prepared in a fresh manner with different concentrations to apply to the targeted crops and weeds. At the time of plant extract preparation characterization of the active plant extract needs to be done. Fresh leaves are to be grind and then the extract should be mixed properly with water and sprayed in weeds. Combinations of plant leaves water extract and herbicide can be made accordingly.

Result and discussion

Germination percentage of crops

As the plant leaves extracts had been use to control weeds, so it was needed to be check with the crop so that the assurance of no negative affect on crop can be determined. So as a result the germination percentage was checked in rice and wheat crop seedlings.



Firstly, the lab screening for the finalized treatments has been initiated on 26/04/2022. In the first phase of screening the plant extract formulations have been directly applied to the lab-grown Wheat-Rice seeds followed by data analysis. The effect of the plant extract on seeds and grown seeds has been observed in case of any antagonistic response in the case of crops also. Eucalyptus, Neem, Basil and Guava plant extracts have been directly applied to the grown crop seed of Wheat-Rice in lab conditions. The temperature of the germinator was maintained at 21-25 degrees C and the humidity was maintained around 70-80%.

2nd Phase screening-

In this phase of screening, the plant extract formulations have been checked in different concentrations to find the best-suited one. And to find the effective ones from different concentrations of Eucalyptus, Neem, Guava, and Basil leaves extracts. 0.5 %, 2%, 5%, 7%, 10%, 12.5%, 15%, and 25 % plant extract has been applied in the grown weed seeds and crop seeds of wheat and rice.

Weed seeds of *Phalaris minor*, *Chenopodium album*, *Spergula arvensis*, *Cyprus diformis*, *Echinochloa colona*, *Echinochloa crusgalli*, *Chloris barbata*, Hoorah grass, Crowfoot grass, Amaranthus have been taken for screening as these were collected from the field in different seasons.

Then the best results were selected for the next phase of screening. Various concentration from Eucalyptus plant leaves extract, (0.5%, 5%, 7%,

10%) from Basil leaves extract, (5%, 7%, 15%, 25%) from Neem plant leave extracts (2%, 5%, 10%, 15%) and from Guava plant leaves extracts (5%, 7%, 10%, 15%, 25%) showed promising results to control the weed growths.

3rd Phase screening-

In this phase of screening, the best results from 2nd phase of screening have been taken for further study. The different concentrations of plant extracts which stood out in the 2nd phase have been screened again for the best-suited concentration of plant extracts for field trials to control weeds.

The plant leaves extract of Eucalyptus (0.5%, 5%, 7%, 10%), Basil leaves extract (5%, 7%, 15%, 25%), Neem plant leave extracts (2%, 5%, 10%, 15%) and Guava plant leaves extracts (5%, 7%, 10%, 15%, 25%) has been applied in the grown weed seeds of *Phalaris minor*, *Chenopodium album*, *Spergula arvensis*, *Cyprus diformis*, *Echinochloa colona*, *Echinochloa crusgalli*, *Chloris barbata*, Hoorah grass, Crowfoot grass, Amaranthus.

Out of these concentrations, the best results were 5% of Eucalyptus plant extract, 10 % of Neem plant extract, and 25 % of Guava plant extract.

Phytotoxicity percentage-

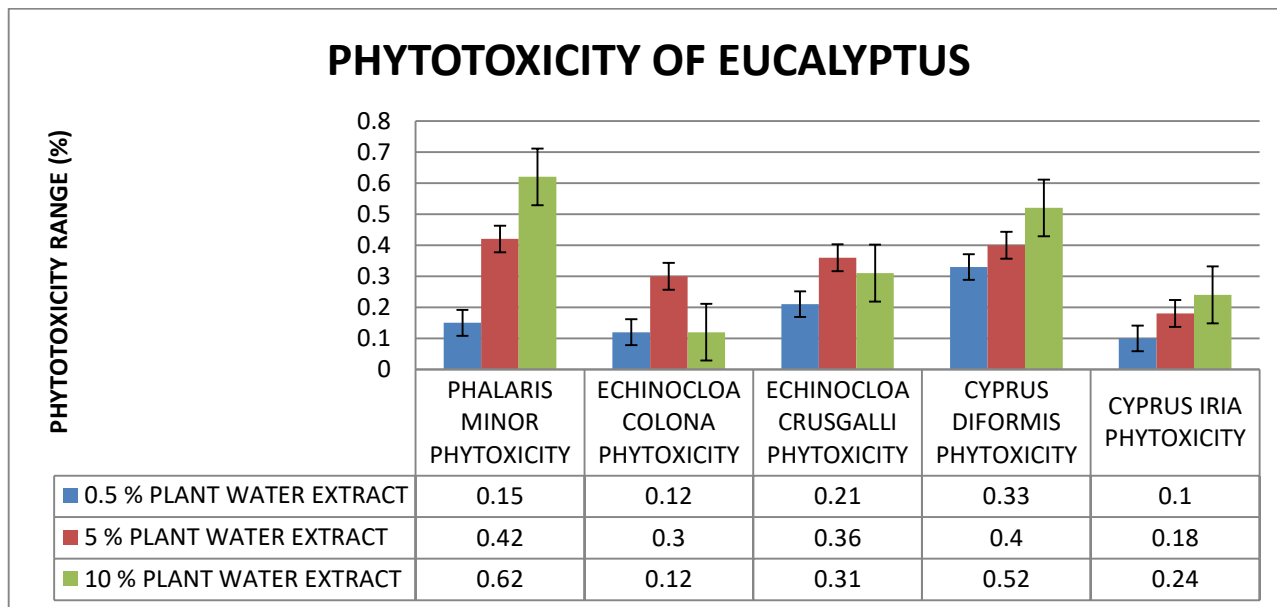
Phytotoxic symptoms include shortness of roots; change in root tip color; root raised from the base and less number of root hairs growth. These symptoms are most noticeable in the early root growth phase.

Phytotoxicity percentage can be calculated as per the formula evolved by **Surendra and Pota (1978)**.

Phytotoxicity % =
Seedling length of control - Seedling length of treatment /control of length Seedling

Phytotoxicity (Eucalyptus plant leaf extracts)

Phytotoxicity level by different plant leaf water extracts had been check in different weed flora. In Eucalyptus plant leaf water extract concentration by which the weed flora has been checked are 0.5%, 5% and 10%.



In 0.5 % Eucalyptus plant leaf water extracts the result shows 0.15% phytotoxicity in *Phalaris minor*, 0.12% phytotoxicity in *Echinocloa colona*, 0.21% phytotoxicity in *Echinocloa crusgalli*, 0.33 phytotoxicity in *Cyprus diformis* and 0.1 phytotoxicity in *Cyprus iria*.

In 05 % Eucalyptus plant leaf water extracts the result shows 0.42% phytotoxicity in *Phalaris minor*, 0.3% phytotoxicity in *Echinocloa colona*, 0.36% phytotoxicity in *Echinocloa crusgalli*, 0.4 phytotoxicity in *Cyprus diformis* and 0.18 phytotoxicity in *Cyprus iria*.

In 10 % Eucalyptus plant leaf water extracts the result shows 0.62% phytotoxicity in *Phalaris minor*, 0.12% phytotoxicity in *Echinocloa colona*, 0.31% phytotoxicity in *Echinocloa crusgalli*, 0.52 phytotoxicity in *Cyprus diformis* and 0.24 phytotoxicity in *Cyprus iria*.

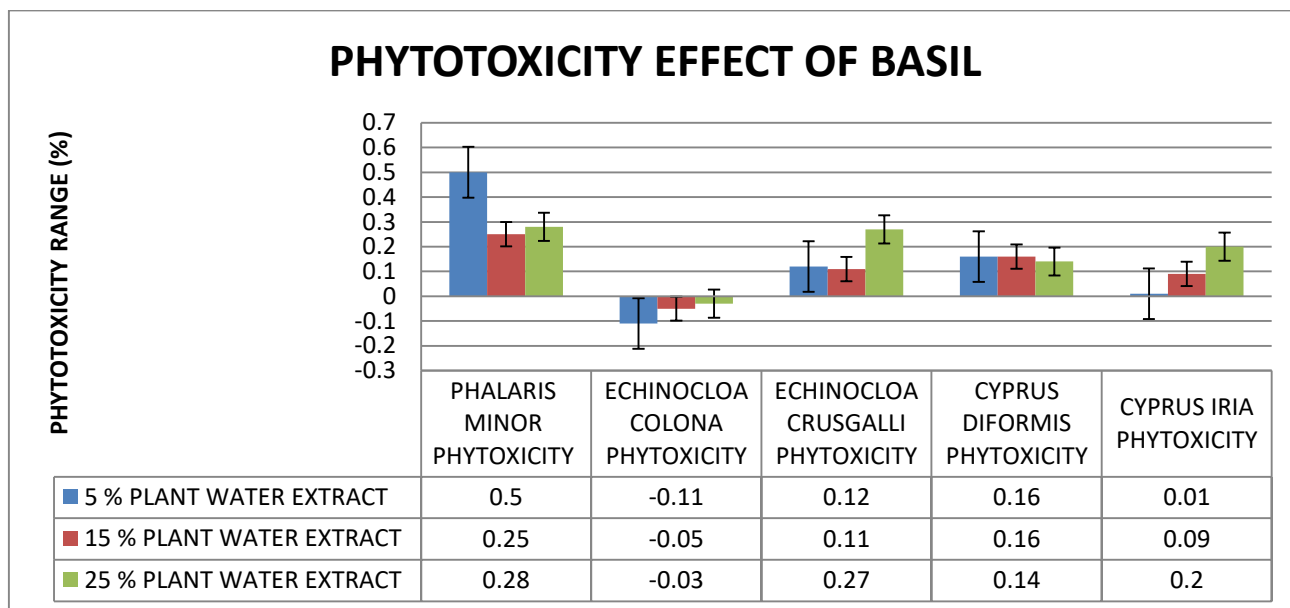
Phytotoxicity (Basil plant leaf extracts)

In Basil plant leaf water extract concentration by which the weed flora has been checked are 05%, 15% and 25%.

In 05 % Basil plant leaf water extracts the result shows 0.5% phytotoxicity in *Phalaris minor*, - 0.11% phytotoxicity in *Echinocloa colona*, 0.12% phytotoxicity in *Echinocloa crusgalli*, 0.16 phytotoxicity in *Cyprus diformis* and 0.01 phytotoxicity in *Cyprus iria*.

In 15 % Basil plant leaf water extracts the result shows 0.25% phytotoxicity in *Phalaris minor*, - 0.05% phytotoxicity in *Echinocloa colona*, 0.11% phytotoxicity in *Echinocloa crusgalli*, 0.16 phytotoxicity in *Cyprus diformis* and 0.09 phytotoxicity in *Cyprus iria*.

In 25 % Basil plant leaf water extracts the result shows 0.28% phytotoxicity in *Phalaris minor*, - 0.23% phytotoxicity in *Echinocloa colona*, 0.27% phytotoxicity in *Echinocloa crusgalli*, 0.14 phytotoxicity in *Cyprus diformis* and 0.2 phytotoxicity in *Cyprus iria*.



Phytotoxicity (Neem plant leaf extracts)

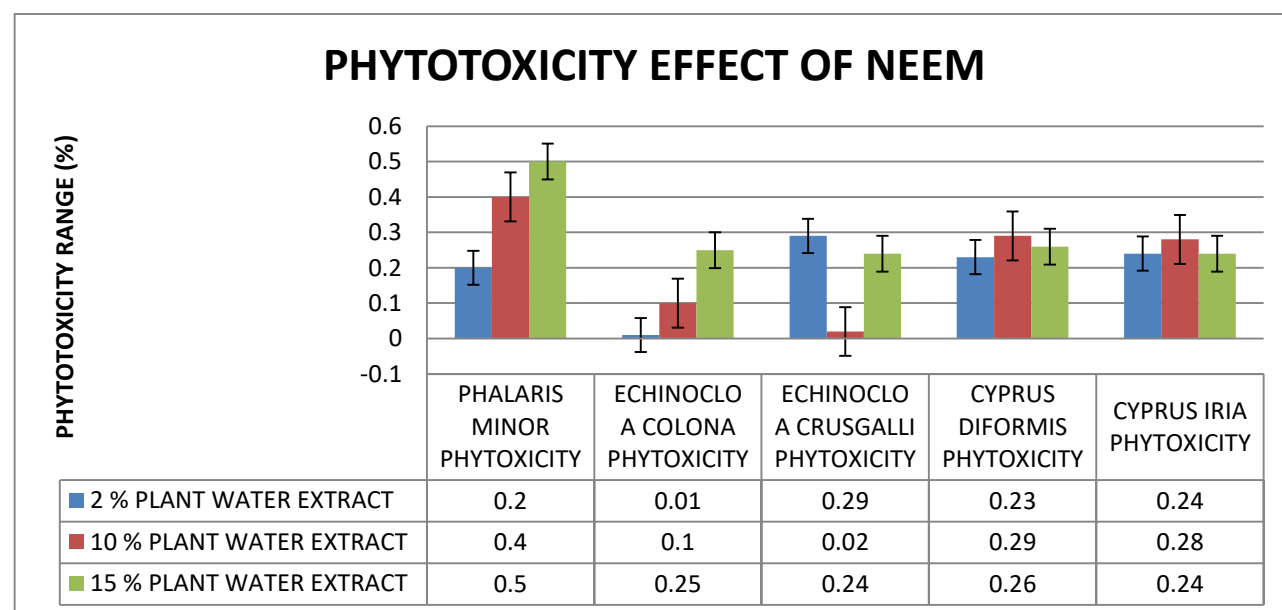
In Neem plant leaf water extract concentration by which the weed flora has been checked are 02%, 10% and 15%.

In 02 % Neem plant leaf water extracts the result shows 0.2% phytotoxicity in *Phalaris minor*, 0.01% phytotoxicity in *Echinochloa colona*, 0.29% phytotoxicity in *Echinochloa crusgalli*, 0.23 phytotoxicity in *Cyprus diformis* and 0.24 phytotoxicity in *Cyprus iria*.

In 10 % Neem plant leaf water extracts the result shows 0.4% phytotoxicity in *Phalaris minor*, 0.1%

phytotoxicity in *Echinochloa colona*, 0.02% phytotoxicity in *Echinochloa crusgalli*, 0.29 phytotoxicity in *Cyprus diformis* and 0.28 phytotoxicity in *Cyprus iria*.

In 15 % Neem plant leaf water extracts the result shows 0.5% phytotoxicity in *Phalaris minor*, 0.25% phytotoxicity in *Echinochloa colona*, 0.24% phytotoxicity in *Echinochloa crusgalli*, 0.26 phytotoxicity in *Cyprus diformis* and 0.24 phytotoxicity in *Cyprus iria*.



Phytotoxicity (Guava plant leaf extracts)

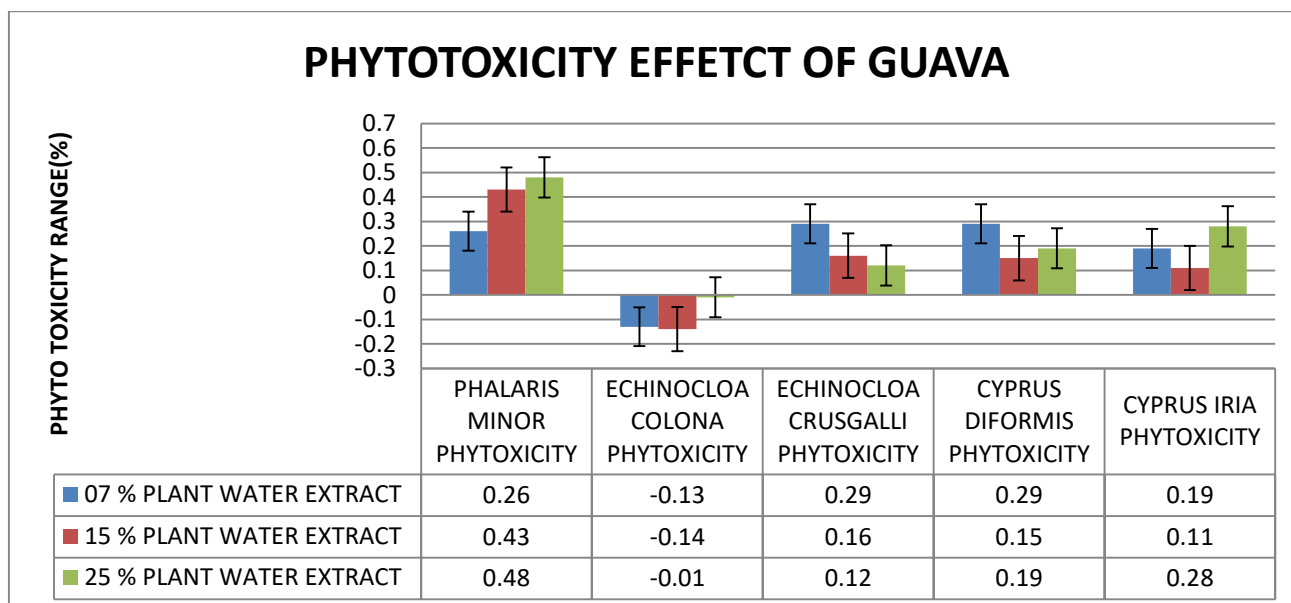
In Guava plant leaf water extract concentration by which the weed flora has been checked are 07%, 15% and 25%.

In 07 % Guava plant leaf water extracts the result shows 0.26% phytotoxicity in *Phalaris minor*, -0.13% phytotoxicity in *Echinochloa colona* 0.29% phytotoxicity in *Echinochloa crusgalli*, 0.16

phytotoxicity in *Cyprus diformis* and 0.12 phytotoxicity in *Cyprus iria*.

In 15 % Guava plant leaf water extracts the result shows 0.43% phytotoxicity in *Phalaris minor*, - 0.14% phytotoxicity in *Echinocloa colona*, 0.16% phytotoxicity in *Echinocloa crusgalli*, 0.15 phytotoxicity in *Cyprus diformis* and 0.11 phytotoxicity in *Cyprus iria*.

In 25 % Guava plant leaf water extracts the result shows 0.48% phytotoxicity in *Phalaris minor*, - 0.01% phytotoxicity in *Echinocloa colona*, 0.12% phytotoxicity in *Echinocloa crusgalli*, 0.19 phytotoxicity in *Cyprus diformis* and 0.28 phytotoxicity in *Cyprus iria*.



Conclusion-

By doing all the screening, the results shows clearly that a higher dose of plant water leaf extracts also shows higher phytotoxicity. So the plant water leaf extracts had a great impact on the growth of weeds. But there was very less negative effect in crops. Out of all the concentrations of plant leaf water extracts, the best results were 5% of Eucalyptus plant extract, 10 % of Neem plant extract, and 25 % of Guava plant extract

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