



Received on 05 February 2020; received in revised form, 06 April 2020; accepted, 28 August 2020; published 01 February 2021

EFFECT OF GARLIC AND GINGER AQUEOUS EXTRACT ON MITOTIC INDEX OF ONION ROOT TIPS GROWN IN PESTICIDE CONTAINING WATER

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Keywords:

Aqueous extract, Ginger, Garlic, Residual pesticide, Foldscope, Mitotic index

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ABSTRACT: Since ancient times, herbal knowledge has been used in the field of health care by different cultures. Ginger and garlic are important herbs that have covered a wide role in various health ailments like kidney and heart diseases. Also, they are considered to be potential against suppressing toxicity. The present study was conducted to evaluate the toxicity suppressing capability of these two herbs against residual pesticides. Residual pesticides were extracted from apples by solvent extraction procedure. Onion tips were allowed to grow in water containing residual pesticides. Aqueous extracts of ginger and garlic were prepared for the study. The study was classified into groups: group1: control/normal (root tips grown in distilled water); group 2: root tips treated with residual pesticide; group 3: root tips treated with a combination of residual pesticide and garlic extract and group 4: root tips treated with a combination of residual pesticide and ginger extract. Mitotic index was documented using a paper microscope (Foldscope). The result was recorded for 24 h and 72 h. In 24 h, group 1 showed $63.66 \pm 1.52\%$; group 2 ($50.8 \pm 1.28\%$); group 3 ($60.16 \pm 2.28\%$) and group 4 ($49.66 \pm 2.08\%$) whereas in 72 h changes were recorded for group 1 ($60.29 \pm 1.12\%$); group 2 ($17 \pm 1.73\%$); group 3 ($40.97 \pm 1.66\%$) and group 4 ($37 \pm 1.60\%$). From the results, it can be concluded that both garlic and ginger extracts have toxicity suppressing power. Moreover, garlic extract showed better suppressing activity, which supports its use as an anti-cancer agent.

INTRODUCTION: About 80% of the world's population still uses traditional remedies, including plants, for primary health care. Most of the new drugs developed nowadays are mostly derived from natural products, especially plants. Among the most studied herbs are ginger and garlic, which are attributed to disease curing properties.

Ginger and garlic are best known for their activity against heart and kidney diseases. These plants have potent anti-bacterial, anti-fungal, and anti-viral properties. Many studies have stated their activity against cellular toxicity.

Pesticides sprayed on fruits and vegetables, on the other hand, is a global concern today for their toxic effects. Residual pesticides that retain fruits and vegetables are consumed by humans and further lead to serious health problems. These contaminants also pollute water bodies and hence are hazardous for other life forms as well ¹. The present study was conducted to observe the suppressing effect of aqueous extract of ginger and garlic

<p>QUICK RESPONSE CODE</p> 	<p>DOI: 10.13040/IJPSR.0975-8232.12(2).988-90</p>
<p>The article can be accessed online on www.ijpsr.com</p>	
<p>DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.12(2).988-90</p>	

against residual pesticides extracted from apples using *Allium cepa* as a test model ². *Allium cepa* has been known to be used as a potential biomarker of genotoxic studies as they help to study toxic compounds that decrease their mitotic index ³. Foldscope (a paper microscope) has been used for the study. It is an economical and portable microscope ⁴.

Extraction of Residual Pesticides: Apples were collected from local markets of Guwahati. 50 g of apple was weighed and washed thoroughly for extraction of residual pesticides. Extraction was done by a mixture of toluene, ethyl acetate, and hexane in a ratio of (3:1:1) ⁵. Chopped pieces of weighed apple with intact peel were infused in the mixture for half an hour. After half an hour, the mixture was filtered with Whatman filter paper. The filtrate thus obtained was allowed to evaporate in room temperature to remove the solvent, and dried residual pesticide extract was obtained.

In-vitro Genotoxicity Suppressant study in *Allium cepa* Model: Onion (*Allium cepa*) bulbs

were used as a test model for evaluating the *in-vitro* genotoxicity of residual pesticides. The onion bulbs were cleaned and dipped in water containing residual pesticides. After the growth of root tips to about 2 cm length, the tips were cut and observed for different stages of mitosis ⁶. Tips were cut and fixed in ethanol and acetic acid solution (3:1 ratio) for 20 min. The tips were further hydrolyzed in 0.1N HCl for 30 min. They were washed with distilled water and stained with aceto orcein for visualization of mitotic cells. Aqueous extract of ginger and garlic were prepared. The study was grouped into: group 1: control/normal (root tips treated with distilled water); group 2: root tips treated with residual pesticide (100 µg/ml conc.); group 3: root tips treated with a combination of residual pesticide and garlic extract (100 µg/ml conc. of each) and group 4: root tips treated with a combination of residual pesticide and ginger extract (100 µg/ml conc. of each). Mitotic Index of the dividing cells of onion tips was calculated.

Mitotic Index (MI) = No. of dividing cells / Total no. of cells

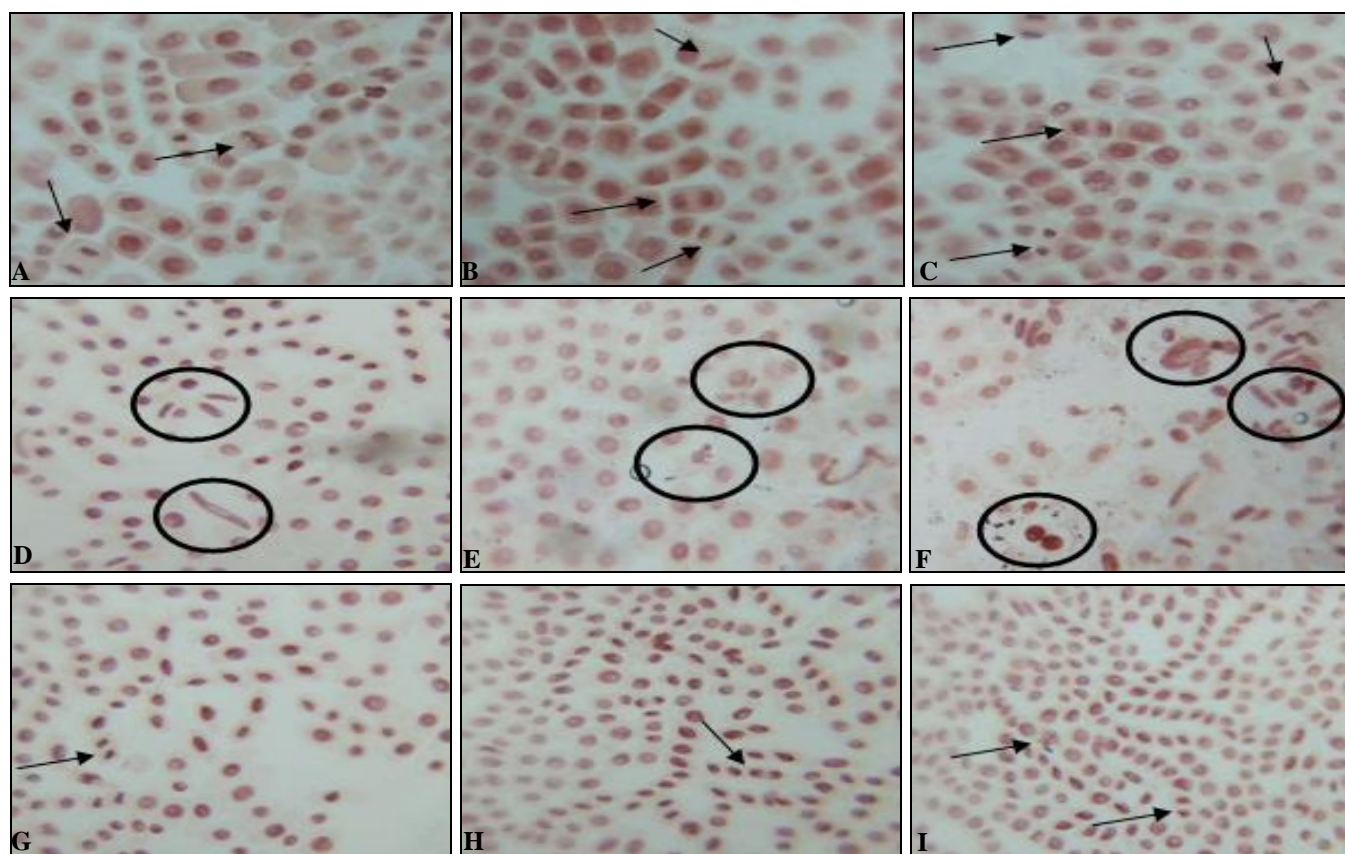


FIG. 1: GROUP 1: NORMAL STAGES OF MITOTIC DIVISION (A,B,C); GROUP 2: DAMAGED CELLS OBSERVED ON TREATMENT WITH RESIDUAL PESTICIDE (D,E,F); GROUP 3: NORMAL DIVIDING TIPS ON TREATMENT WITH COMBINATION OF RESIDUAL PESTICIDE AND GARLIC EXTRACT (G,H) AND GROUP 4: RESIDUAL PESTICIDE AND GINGER EXTRACT TREATED TIPS (I)

TABLE 1: TABLE SHOWING MITOTIC INDEX OF ROOT TIPS UNDER DIFFERENT TREATMENTS

Day	Normal water treated (Group 1)	Residual pesticide-treated (Group 2)	Residual pesticide & garlic extract-treated (Group 3)	Residual pesticide & ginger extract treated (Group 4)
1	63.66 ± 1.52%	50.8 ± 1.28%	60.16 ± 2.28%	49.66 ± 2.08%
2	64.58 ± 1.02%	45.73 ± 2.40%	59.93 ± 1.677%	46.66 ± 1.52%
3	60.29 ± 1.12%	17 ± 1.73%	40.97 ± 1.66%	37 ± 1.60%

*Values of mitotic index are Mean ± SD

Normal water treated onion tips showed the active division of cells. Different cell division stages such as metaphase, prophase, anaphase, and telophase were observed in **Fig. 1**. Group 2 tips showed severe cell damages and irregular mitotic division with a decrease in mitotic index from $50.8 \pm 1.28\%$ to $17 \pm 1.73\%$ on day 3 shown in **Table 1**. Group 3 tips showed a considerable increase in mitotic index from $17 \pm 1.73\%$ (residual pesticide-treated tips) to $40.97 \pm 1.66\%$ on day 3. Group 4 tips also showed an increased mitotic index from $17 \pm 1.73\%$ (residual pesticide-treated) to $37 \pm 1.60\%$ on day 3.

To monitor ginger and garlic extract toxicity, tips were also treated with aqueous garlic and ginger extract, which showed the normal division of cells, and different stages such as metaphase, anaphase, late anaphase, and telophase were observed.

CONCLUSION: The present study concludes that both garlic and ginger extracts have the property of suppressing genotoxicity of residual pesticides. But garlic extract has stronger potential of suppressing the toxicity as compared to ginger extract which supports the use of garlic as anticancer agents in herbal medicine.

How to cite this article:

Das K, Gogoi J and Dutta P Effect of garlic and ginger aqueous extract on mitotic index of onion root tips grown in pesticide containing water. Int J Pharm Sci & Res 2021; 12(2): 988-90. doi: 10.13040/IJPSR.0975-8232.12(2).988-90.

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ACKNOWLEDGEMENT: The authors would like to thank the Department of Biotechnology, Government of India for financial support and Assam Down Town University for providing the infrastructure facilities.

CONFLICTS OF INTEREST: None

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