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STUDIES ON PARADOXIAL NATURE OF INDIAN HERB: *AZADIRACHTA INDICA*

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ABSTRACT

Investigations have been made on paradoxical nature *of A. indica.*. The toxic effects of plant extract were studied on the life cycle, growth and mortality of beetle, *Tribolium confusum* in stored rice grains. The survival rate of beetle is significantly reduced in the grain treated with the extract of leaves of *A. indica.*. On the other hand, trace metals in plants also have medicinal, physiological use and nutritional value. The plant extract was analyzed for certain trace metals viz. copper, zinc, manganese and iron. Concentrations of these metals in plant extract were found to be as zinc (64 μg/g), iron (158 μg/g), copper (49 μg/g) and manganese (18 μg/g).

Key words : *A. indica.*, *T.confusum*. Copper, Zinc, Manganese, Iron

INTRODUCTION

US National Academy of Sciences gave report that Neem tree is solving some global problems. It is an Aristha meaning reliever of sickness. It is perhaps most useful traditional medicinal plant in India. It is used in skin diseases, fever, diabetes mellitus, cough and loss of appetite. It is most versatile medicinal plant having a wide spectrum of biological activity[1]. It is relatively safe and biodegradable. It affects a wide variety of biological processes. As 71 species of insects belonging to order of coleopteran, orthoptera have been reported to be affected by the neem extracts and pure compounds[2]. The number of insects species affected adversely by neem extracts alone was 198 as reported by Saxena[3]. Neem *(A. indica.)* products like seeds, leaves, bark from which oil cake and extracts are prepared, have been reported to posses fungicidal, nematicidal, insecticidal, insect repellant and antifeedant properties[4,5]. Being a source of antifeedant compound, *Azadirachtin* provides a safe, non-toxic, inexpensive bioinsecticide and antifertility compound[6]. As medicine, it is used in skin diseases, fever, diabetes mellitus, cough and loss of appetite[7] On the other hand, it is used as a supplementary nutrition and medicine due to its ability to accumulate some essential trace metal elements e.g. zinc, iron, copper and manganese in the edible parts of plant[8]. This could help to feed the rapidly increasing

world population and improve human health through balanced mineral nutrition. Yet the studies conducted normally deals with the medicinal and pesticidal value of neem constituent[9,10]. Very less insight has been laid on the trace metal aspect. In the present article, we have evaluated the trace metals (iron, zinc, copper and manganese) in *A. indica*..

EXPERIMENTAL

The laboratory culture of *Tribolium confusum* was maintained at the Department of Zoology J. N. V. University, Jodhpur. Leaves of test plant *A. indica* were collected dried in shade and powdered material (50 g) was used for extraction with acetone using Soxheet apparatus. The extract was kept over hot bath in a porcelain dish to evaporate acetone completely and residue was dissolve in 100 mL of benzene. This was considered as stock solution of plant extract used for spraying against beetle.

The varied volume of extract i.e. 2.5 mL, 5 mL and 7.5 mL of extract was sprayed over 50 g of rice grains. The sprayed grains were left open for 24 minutes to evaporate benzene and thereafter transferred to the incubator with *Tribolium* at 34ºC for 24 hours. The process of spraying was repeated every day. The mortality rate of beetle was observed.

The leave of *Azardirchta indica* was collected from botanical garden of Department of Botany, J. N. V. University, Jodhpur. It was ground to 1 g of plant sample, then 12 mL of digestion mixture (Cone. HNO_3 : $HClO_4$: H_2SO_4 in 2 : 1 : 9) was added and digestion was carried for one and half-hour on a hot plate to oxidize all the organic matter. The digested matter was reconstituted in 12 mL of double distilled water. For trace metal analysis, 1 mL of extract was submitted for Atomic Absorption Spectroscopic analysis (A. A. S.), (Perkin-Elmer Model, A. A. S. -100) with hollow cathode lamp for element analysis

RESULTS AND DISCUSSION

Analysis of trace metal *in A. indica* (Neem)

Our results indicate the trace copper and manganese in then plant (Table 1). High concentration of metals clearly defines the role of *A. indica*.. Neem is a tonic, astringent, better, antipatriotic and is used in treatment of many skin problems. The iron content in neem is 158 μg/g. plants. Such hyper accumulated metals have tremendous potential for application in remediation of metals in the environment. Iron levels in these plants samples were found to be comparatively higher than all other metals investigated[11].The zinc content

in *A. indica.* is 64 µg/g. An excess of Zn leads to a significant reduction of Fe concentration in plants. Zn deficiency in plant increases iron concentration[12]. The copper and manganese contents of Neem species under study is found to be 49 µg/g and 18 µg/g, respectively. These are compared with other species of Neem.

Table 1: Analysis of trace elements in *A. indica*

Species	Fe (µg/g)	Cu (µg/g)	Zn (µg/g)	Mn (µg/g)
A. indica	158	49	64	18
A. indica	(124)[13]	(169)[13]	(45)[13]	(21)[13]
A. indica	(190)[14]	-	(60)[14]	(30)[14]

A comparison between the elemental contents is these for different *A. indica* species, which may be due to influence of environmental conditions and as result, the contents are in these not similar species of Neem.

Efficacy of plant extract *of A. indica* (neem) on larvae

Effect *of A. indices* extract was studied on larva mortality of *Tribolium confusum* over a period of 6 days. Using 2.5 mL dose, 100% mortality of *Tribolium confusum* was found on 6th day and with 5 mL and 7.5 mL dose on 5th day. With increasing number of days, doses, the mortality of insects increases, and reaches cent percent on 6th day. We also found that with the increment in dose, mortality increases serial wise i.e. 2.5 mL, 5 mL and 7.5 mL.

Table 2: The effect of *A. indica* extract on *T. confusum* larvae

Days	Dose (Percent mortality)		
	2.5 mL	5.0 mL	7.5 mL
1	14.2	16.9	21.3
2	40.4	54.7	59.4
3	64.2	69.0	76.1
4	80.8	83.3	85.6
5	92.8	95.2	97.6
6	100	100	100

DISCUSSION

The trace metal in the leave extract of neem tree vary considerably depending on the tree genome, geographic area of origin and yearly variations in environment conditions[15] and even among different provenances of neem tree and between individual tree of a particular provenance. Variation of pesticidal property of Neem is shown by Schmutter[16], Isman[17] and Permachandra et al.[18]. The bioactivity of the neem extract also varied considerably as reported by Mordue et al.[19] and Immaraju[20], Gokmen et al.[21] analyses trace metals by atomic absorption spectrometry in popcorn (Zeamay) and the contents are Cu-11.89 µg/g, Zn- 63 µg/g, Mn- 46.5 µg/g and Fe- 112 µg/g.

CONCLUSION

A. indica has high rating in the pesticidal and medicinal value. However, little is known about the nutritional status of these species as minerals compositions are also important in physiological and biochemical function as nutrition. Trace metals such as Fe, Cu, Mn, Zn play important role in nitrogen uptake and also in biotransformation of nitrogenous compound with in plants. Thus, neem is a pesticidal medicinal and nutrition plant.

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REFERENCES

1. K. Biswas, I. Chattopadhyay, R. K. Banerjee and U. Bandyopadhyay, Biological Activities and Medicinal Properties of Neem, Curr. Sci., **82 (11),** 1336- 1339 (2002).
2. J. D. Warthem, A. indica and Sources of Insect Feeding Inhibitors and Growth Regulators. USDA Sci., Educ. Adam. Agric. Reviews. Manual. North Eastern series **4,** 1-21 (1979).
3. R. C. Saxena, J. Am. Chem. Soc., **5,** 110-134 (1989).
4. S. N. H. Naqui, Int. J. Neem. Protect., **6 (1),** 315-330 (1987).
5. Y. S. Xie, G. Fields, and M. B. Isman, Econ. Ent., **88,** 1024-1031 (1995).
6. K. K. Chaterjee, Nat. Prod. Res., **19(5),** 529-539 (2005).

7. C. M. Ketkar, G. G. Kale and V. B. Tapkire, Final Technical Report, Utilization of Neem (A. indica Juss) and is Products, Khadi and Village Industries Commission, Bombay **56** (India), 176 (1976).

8. W. A. House, Field Crops. Res., **60,** 115-141 (1999).

9. V. R. Castro, Bio. Trace Elements. Res., **62 (1-2),** 101- 106 (1998).

10. U. K. Bandyopadhyay, M. V. Santhakumar and B. Saratchandra, Annals. Plant Protection Sci., **13(1),** 48-53 (2005).

11. Z. Rengal, J. Nutr. Element. **86,** 53-56 (2001).

12. I. Chakmak, New Phyto., **146,** 18-205 (2000).

13. A. M. Syed, M. Qadiruddin and A. Khan, J. Chem. Soc. Pak., **9,** 387-390 (1987).

14. G. R. K. Naidu, H. O. Denschlag, E. Mauerhofer, N. Parte and T. Balaji, Determination of Micronutrient and Trace Elements in Indian Medicinal and Vegetable Leaves using NAA, Appl. Radial. Isot., **50,** 947-953 (1991).

15. D. Purve, Trace Element Contamination of the Environment, Elsevier Amsterdam, New York, J. Am. Sci., **7(1),** 282-401 (1982).

16. H. Schmutter, Int. J. Pestmanag., **51 (2),** 171 -196 (2005).

17. M. B. Isman, O. K-oul, A. Luczynski and K. J. Kamins, Insecticidal and Antifeedant Bioactivities of Neem and their Relationship to Azadirachtin Content, J. Agricul. Food Chem., **38,** 1406- 1411 (1990).

18. S. D. Premchandra, C. Borgemeister, E. Maiss and H. M. Poehling, Effect of Neem on Ceratothripoides claratris (Scumsher) (Thysanoptera, Thripidae) an Important Vegetable Pest in Thailand, under Laboratory and Green House Conditions, J. Eco. Entom., **98,** 438- 448 (2005).

19. A. J. Mordue and A. Blackwell, J. Insect Physio., **39,** 903- 924 (1993).

20. J. A. Immaraju, Pesticide Sci., **54,** 285- 289 (1998).

21. S. Gokmen, M. Tuzen, and D. Mendil, Determination of Some Metals in Popcorn (Zeamay L.) Genotypes, Asian J. Chem., **17(2),** 689- 696 (2005).

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