IJCRT Publish Paper record is available at DOI: http://doi.one/10.1727/IJCRT.17190

Azadirachta indica Mix Fly-ash: Challenging Modern Pesticides

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***Abstract*— The introduction of chemical fertilizers and pesticides in 1960s brought green revolution in India where the country experienced revolutionary proliferation in the crop production. But sluggishly, the side effects of the chemicals over the agronomic properties of soil was experienced. 'Survival of the fittest' let the pest to resist the applied pesticides with time thereby attacking the crops. Hence, it was required to develop a nutrient for the plants having the properties of both fertilizers and pesticide that should be eco-friendly, economical and efficient enough to enhance the agronomic properties of the soil.**

In the present research, a paste was prepared using the concoction of *Azadirachta indica* (neemboli) and fly-ash. For the experimentation, the fly-ash was obtained from oil mill factory and *Azadirachta indica* was obtained from neem trees. The paste was applied over the tomato crops in varying conditions. The product when tested over the tomato crop was able to represent the collective properties of fertilizers and pesticide. The methodology adopted was found to encourage the waste management of thermal power plant and allowed the biological enhancement in the nutrients characteristics of crop.

Keywords*— Neemboli, Pesticides, Fertilizer, Fly-Ash, *Azadirachta indica, Agriculture, Khut.

I. INTRODUCTION

In India, pesticide and fertiliser were available on a much-subsidised rate thereby endorsing farmers to grab it for their farms. But in genuine sense, it was disturbing agrarian properties of agricultural farms. If the credit of pesticides included enhanced economic potential in terms of increased production of food and fibre then their debits in the form of amelioration of vector borne diseases, had resulted in serious health implications to the man and environment. The term pesticide covered wide range of compounds including insecticides, fungicides, herbicides, etc. Utilisation of these chemical in India and its comparison with the world is shown in Fig. 1. As per the research, fertiliser was a chemical product which contain one or more recognised crop nutrients which was used to promote its growth.

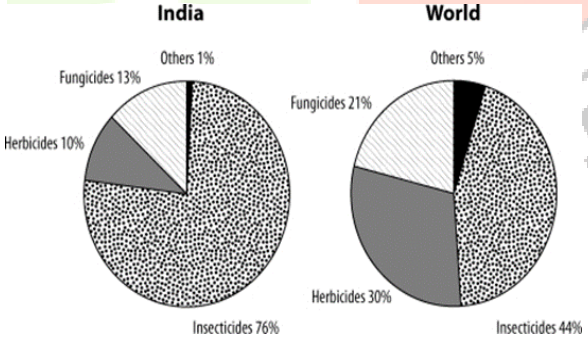

Fig 1: Use of the different chemicals in India and the world [1]

The population explosion and the scarcity of the fertile land was becoming a challenge in front of subjected Engineers and Agriculturist to work for determining an alternative methodology.

In the present research, a paste was prepared using the concoction of *Azadirachta indica* (neemboli) and fly-ash. For the experimentation, the fly-ash was obtained from oil mill factory and *Azadirachta indica* was obtained from neem trees. The paste was applied over the tomato crops in varying conditions. The product when tested over the tomato crop was able to represent the collective properties of fertilizers and pesticide. The methodology adopted was found to encourage the waste management of thermal power plant and allowed the biological enhancement in the nutrients characteristics of crop.

II. CHEMICAL IMPACT

The chemical nature of pesticides could contaminate soil, water and vegetation. According to U.S. geological survey, at least 143 different pesticides and 21 transformation products (TPs) had been found in ground water including pesticides from every

major chemical class thereby became a worldwide problem and sufficient enough to cause health crisis [3]. In the most generalised sense, the impact of the pesticides could be summarised as:

1) Pesticides exterminate insects or weeds and were toxic to the host of other organisms including birds, fish, beneficial insects, and non-targeted plants.
2) Insecticides were generally the most acutely toxic class of pesticides, but herbicides could also pose risks to non-targeted organisms.
3) It caused ground water and surface water contamination as pesticides could reach surface water through runoff from treated plants and soil.
4) The larger the organic matter content the greater was the adsorption of pesticides and TPs in soil thus greater would be the chance of chemical hazards.

III. PROBLEM STATEMENT

Fertilizers had become the fundamentals of the current crop nutrients in India [4]. At the same time the fertilizers and the pesticides had negative impact over the crops as well as the soil properties of the irrigation field. The chemicals within this supplement have some lacuna which has made them unfeasible in the field conditions. Hence, there was the requirement for the solution from the natural origin effective enough to replace the harmful chemical content from the fertilizers and the pesticides.

IV. EXPERIMENTAL INVESTIGATION

The experiment for present research was carried out on the black soil farmland in Khamgaon, India. The *Azadirachta indica* (from neem tree) and fly-ash both were obtained from oil mill factory, Shri Krishna Industries, Khamgaon, India. The azadirachta indica was commercial product of industry while fly ash was by product obtained from waste of boiler unit of industry. Following were the steps taken in the experimental investigation.

A. *Objective:*

The objective was to prove that the crop production using standard fertilizers/Pesticides were lesser than the paste if it was used in the production. To propos paste of azadirachta indica and fly-ash had raised the production and increased safety especially against biological attack.

B. *Arrangement:*

1) The *Azadirachta indica* origin from Neem trees were mixed with the fly-ash obtained from the Oil Mill Industry (the composition of the paste for this purpose was future scope study). The paste was showered over the crop field.
2) The 15 tomato plants were planted in 3 chambers each containing 5 crops of tomato in black cotton soil.

C. *Processing:*

1) In the 1st chamber, the growth and development of tomato crop without any chemical/paste was done i.e. plant was provided only with water.
2) In the 2nd chamber, the tomato plants were grown with the addition of local fertilizers and pesticides.
3) In the 3rd chamber, the tomato plants were grown with paste of *Azadirachta indica* and flyash. In addition, the crop was showered with diluted *Azadirachta indica* with water as an alternative to pesticide.
4) When the crop attained, its full growth, the number of tomatoes were counted that were grown over each plant (listed in the observation Table I).
5) Later the plants were plucked. Over the same soil, another set was planted and the same procedure was followed. The number are shown in Table II.

D. *Observations:*

1) Since the tomato crop was grown with different additives, hence, it was certain to obtain varied results in number of tomatoes that were obtained on single plant as shown in the table:

TABLE I
NUMBER OF TOMATOES GROWN IN EACH PLANT OVER THE FRESH BLACK COTTON SOIL

Chamber Number	**Tomato Crop Number**					**Mean**
	I	*II*	*III*	*IV*	*V*	
1st	*07*	*06*	*06*	*04*	*08*	*6.2*
2nd	*27*	*22*	*24*	*18*	*31*	*24.4*
3rd	*49*	*46*	*48*	*37*	*53*	*46.6*

2) The repeated arrangement and the same procedure was used again to grow the crops over the black cotton soil for growing tomato crop in order to confirm previous result:

TABLE II
NUMBER OF TOMATOES GROWN IN EACH PLANT IN SECOND ATTEMPT OVER BLACK COTTON SOIL

Chamber Number	**Tomato Crop Number**					**Mean**
	I	*II*	*III*	*IV*	*V*	
1ST	*02*	*01*	*07*	*03*	*02*	*3.0*
2ND	*24*	*18*	*32*	*21*	*14*	*21.8*
3RD	*61*	*47*	*68*	*52*	*43*	*54.2*

V. RESULT ANALYSIS

The results from Table I & II about the growth pattern of tomatoes over a single plant led to the following analysis:

A) Chamber 1: with water, only

1) The mean of tomato on each plant in 2 cases were found 6.2 & 3.

2) Rate of tomato production was too less. The crops were required to be get treated with nutrients.

B) Chamber 2: with fertilizer/pesticides

1) The mean of tomato on each plant in 2 cases were found 24.4 & 21.8.

2) With respect to this experiment, the rate was moderate. The production was required to be increased.

C) Chamber 3: with (Azadirachta indica) + fly-ash paste

1) The mean of tomato on each plant in 2 cases were found 46.6 & 54.2.

2) Within this experiment, we could rate this as the best. Tomato production was found impressive.

VI. ADVANTAGES

On the basis of experimentation and result analysis it can be inferred about the comparative advantages over the use of pesticides or fertilizers as listed below:

1) Use of paste of azadirachta indica+ flyash increased the total production of tomato crop thereby proved better than the chemicals used in the experiment.

2) No side effects were found. It was economical, easy to handle with better output.

3) Provided natural resistance to pest/microbial attack.

4) The paste can be synthesised manually at site as well as off the site with limited resources.

5) The method regulated the waste management of oil mill industry.

VII. DISADVANTAGES

With the advancement in agricultural techniques we could overcome the disadvantages listed below:

1) The experiment of tomato crop was successfully conducted over black cotton soil but it may deviate from the results if either the crop or soil was changed.

2) The paste of *Azadirachta indica* and fly-ash had no definite composition. It was dependent over many factors.

3) The availability of Neem trees everywhere may not be possible.

VIII. CONCLUSIONS

In the present paper, a trial experiment was conducted about the application of the paste developed by mixing *Azadirachta indica* and fly-ash. The chemical composition about the paste had not been studied. Therefore, the result about the experimental investigation of this research was based on the field determination of crops by physical appearance and the number of the tomatoes grown on each of the plant. The number of the tomatoes on each plant was increased in the case of *Azadirachta indica* and fly-ash paste. Whether it was enhancing the quality of the tomatoes or how it was affecting the crops on the field is the future study and scope.

Hence, it can be concluded that the use of such eco-friendly products on farm land would definitely be economical, ecofriendly and beneficial to farmers.

ACKNOWLEDGEMENT

At the outset, we wish to express our deep sense of gratitude to Prof. Dr. M. Husain, (Head, Civil Engineering Department, SSBT-COET, Bambhori, Jalgaon, Maharashtra, India) for guiding us to make this concept presentable as per the requirement of the research in Environmental Engineering. Salute to Prof. Dr. Ratnamala S. Bendre (Head, School of Chemical Sciences, NMU, Jalgaon, Maharashtra, India) guiding us regarding the awareness of the chemistry of Neem trees with further elaborations and research that can be extended related to this paper. Deep sense of gratitude to Shri Krishna Oil Industry, Khamgaon, India for Supporting and providing required material free of cost and providing farmland for chambers for successful completion of the experimental investigation.

IJCRT Publish Paper record is available at DOI: http://doi.one/10.1727/IJCRT.17190

REFERENCES

[1] https://india.gov.in/topics/agriculture/fertilizers-pesticides , Visited 20 February, 2017.
[2] Neem Pesticides in India by Parmar Balraj S, Walia Suresh, Anupama and Kumar Jitendra, SPS Publication no. 15, society of Pesticide Science, Division of Agricultural Chemicals, IARI, New Delhi, January 2008.
[3] Kumari Anitha, Raja Kumar K. N., and Narasimha Rao CH., (2014), Adverse Effects of Chemical Fertilizers and Pesticides on Human Health and Environment, Journal of Chemical and Pharmaceutical Sciences, 2115 JCHPS Special Issue 3: pp. 150.
[4] Govindan P., "The Green Revolution in India: A Case Study of Technological Change," Technology and Culture, v.33, no.4 (1992), pp. 738-739.
[5] Spencer Herbert in Principles of Biology of 1864, vol. 1, p. 444, wrote about the 'survival of the fittest (Univ. Press of the Pac. 2002.)