



Annona Squamosa: A Source of Natural Pesticide

Ajay. V. Gawali¹, Sapna K. Deotale², Tousf Yunus Shaikh³

Department of Chemical Engineering, A. E. C., Chikhli, India^{1,2,3}

Abstract: Pesticides make up one essential segment of the agro-business complex which is so vital to the future development of countries such as India. There are various sources to manufacture of pesticides, which may be natural or synthetic in nature. Here the "Custard apple (Annona Squamosa)" seeds acts one of the natural source of pesticide. The oil is extracted from these seeds by using solvents like hexane or methanol and is analyzed for contain of pesticide ingredient on the basis of past data collected then, during the test of GC we found some other components in our extracted oil sample With some insecticidal properties. Also some possible physical and chemical properties tested and determined at laboratory level. Along with this, other studies objected for formulation, improvement of properties of oil extracted as pesticide. Also the other studies include for provision of this extracted oil as natural pesticide or biochemical pesticide. This natural pesticide can also be produced from other parts of clustered apple plant.

Keywords: custard apple seeds, extraction, formulation, properties, modifications and improvements.

I. INTRODUCTION

Pesticides are any substance or mixture of substances, intended for preventing, destroying, or mitigating any pest, or intended for use as a plant growth regulator. Pesticides destroy, prevent, or repel pests, such as insects, weeds, and rodents, but may cause a range of harmful health effects in humans, including cancer, short- and long-term injury to the nervous system, lung damage, reproductive dysfunction, and possible dysfunction of the endocrine (hormone) and immune systems. Thus only the safe and best alternative is to use natural pesticides. Pesticides are used in developing countries must continue to expand in order to maintain agricultural productivity and to permit farmers to reap the benefits of related agricultural investments. Natural pesticides are a cheap and safer alternative for the products as well as human being who always exposed to pesticides during use.

Here we are producing the pesticide by the extraction of seeds followed by vacuum distillation, using various solvents like hexane, methanol, etc. Further studies focused for the formulation, modification and determinations of some possible properties of oil. Then the testing results for our sample discussed.

II. CUSTARD APPLE PLANT

Custard apple (Annona Squamosa) is a tropical branched tree or shrub, indigenous to the Amazon rainforest. It grows around 3 meters to 8 meters in length. The leaves are thin and oblong, while the flowers are greenish - yellow. The conical fruit, with a purple knobby skin, is very sweet and eaten fresh or can be used for milkshakes, ice- creams and even sherbets. The fruit is juicy and creamy-white and looks like a giant raspberry. The plant is native to both America and India. It is popularly known as 'Sharifa' in India. Custard apple tree does not require much care and will do well if watered regularly, along with enough light for it to grow. It grows well in hot dry

climates and adjusts in any kind of soil, a job that is a little difficult for other plants in its family. If you have sowed the plant's seeds, it will bear fruits in 2 to 3 years. The fruits are generally conical or round in shape and will take around 3 to 4 months to ripen.

III. PESTICIDE

Pesticides include all materials that are used to prevent, destroy, repel, attract or reduce pest organisms. Thus we can say that Pesticides are chemicals that we use to kill undesirable organisms. When we say undesirable organisms, we are referring to organisms (plants, animals, insects, etc.) that are harmful to us. Some of these organisms, or "pests," eat our crops, while others spread diseases. And it doesn't always have to be this serious. Weeds can be considered a pest for just growing in the wrong places (our yards). The point is, if we are using some type of chemical to control these pests, that chemical would be considered a pesticide. These pesticides classified into various classes on the various bases as organic, inorganic, natural, and synthetic, etc.

IV. INSTRUMENTATION AND METHODOLOGY

There are various methods to produce natural pesticides from custard apple seeds like simple grinding and extraction. Here the natural pesticide from custard apple seeds is produced by the method of batch extraction.

A. Equipments:-Cell:

Two necked flat bottom flask, Seed kernel solvent mixer, Thermometer pocket, Thermometer, Vertical condenser, Magnetic stirrer cum heater.

B. Extraction Solvents:

n-hexane, Acetone Methanol, Benzene, Ethyl acetate As per our convenience we used two solvents n-Hexane and Methanol. And the sample extracted by using n-hexane is analyzed by making GC test for constituents.



C. Raw material:
Custard apple seed kernels..

D. Experimental set-up:

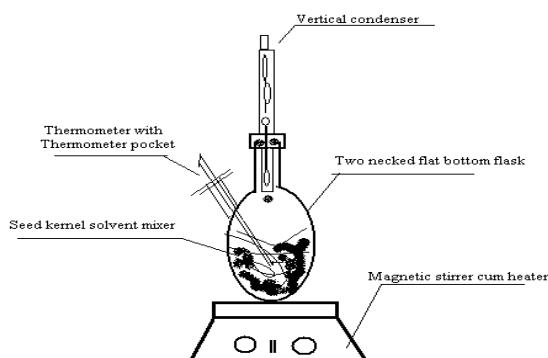


Figure 1: Experimental set-up for extraction of custard apple seeds.

E. Process:

In this extraction method seed kernels crushed and grounded to powder. Then this powder is mixed with hexane or methanol solvent to extract oil from seed kernels. During extraction solvent is used in the ratio of 15ml/g of seed kernels powder and extraction time was 3hr, 4hr, 4hr for two hexane, and one methanol solvent respectively. Temperature was maintained near about 65-70 degree Celsius by regulating the magnetic cum heater and stirrer.. After extraction, sample is filtered out to remove solid material as residue and filtrate is contained with oil extracted. This filtered sample is lead to the vacuum distillation for first sample and simple distillation for other two samples. Then after distillation solvents distilled out while the oil extracted was remain in distillation chamber. Then lastly the oil separated is analyzed for density, percent of oil and acid value.

V. RESULT AND DISCUSSION

After the extraction and separation of oil by vacuum distillation we analyzed oil samples for determination of percentage oil, density, acid value and colour appearance. The calculations and result interpreted in Table 1 below.

Table 1: TEST RESULTS AT CHEMICAL LAB.

| Solvent used | %oil | Density (g/ml) | Colour | Acid value (mg KOH/g sample) |
|--------------|------|----------------|-----------------------|------------------------------|
| Hexane | 19 | 0.876 | Yellowish-light brawn | 1.683 |
| Methanol | 10.5 | 0.954 | Dark-woody brawn | Not determined |

After the determinations at laboratory level we was sent the sample extracted using hexane solvent to "Anacon laboratories" , Nagpur for gas chromatography (GC) and we found some components as cited below.

Table 2: TEST RESULTS OF ANACON LAB NAGPUR

| Test Result | | |
|-------------|-------------------------------------|--------------|
| Sr. No. | Qualitative | Quantitative |
| a. | 2,4-Decadienal | -- |
| b. | Caryophyllene | -- |
| c. | Hexadecane 2,6,11,15-tetra methyl | -- |
| d. | Phenyl 2,4-Bis (1,1-dimethyl Ethyl) | -- |
| e. | Tetradecane 2,6,10-Trimethyl | -- |
| f. | Eicosane 2- Methyl | -- |
| g. | Plamitic Acid | 0.03% |
| h. | Methyl 11,14-Eicosadienoate | -- |
| i. | Butyl 9, 12-Octadecadienote | -- |
| j. | Ethyl iso-allocholate | -- |

As concern of pesticide formulation for this product, we can prefer the liquid formulation because here the active ingredient is from oil has a liquid form. Further from liquid formulation we can go for Emulsifiable concentrate (EC) for the formulation of custard apple seed oil.

VI. CONCLUSION

We can conclude that, the natural pesticide produced from custard apple seed oil proves itself efficient, advantageous, cheap and safety to handle .It's recovery by using Hexane solvent is 19% than the methanol solvent is 10.5%.This pesticide material can make easy available for every former thought the India without taking much more efforts. This raw material will be very cheap which minimizes the total cost of processing along with solvent recovery.

ACKNOWLEDGEMENTS

This study was supported by **Dr. V.S. Sapkal and Dr. R.S. Sapkal**, University Department of Chemical Technology, Amravati, which the authors are thankful.

REFERENCES

- [1]. Dryden's "Outlines of chemical technology", edition 2nd page no. (541).
- [2]. Biochemical Methods, 3rd edition by S.Sadasivam and A. Manickam, page no. (20-30).
- [3]. Physico-Chemical Properties of Oil Extracted from Custard Apple (*AnnonaSquamosha*) Seeds, Document by Mr. Bharadwaj.
- [4]. Fats and Oils: Formulating and Processing for Applications, Third Edition, By Richard D. O'Brien, page no. 220,221.
- [5]. Pesticide Formulations, by Frederick M. Fishel, page no. (2-5), University of Florida.
- [6]. Study on the insecticidal activity compounds of the essential oil from *Syzygium aromaticum* against stored grain insect pests, by Zeng, L., Lao, C.Z., Cen, Y.J., Liang, G.W. Guangdong Institute for Cereal Science Research, and P. R. China. , Laboratory of Insect Ecology, South China Agricultural University, Wusan Road, Guangzhou, Guangdong, 510640, P. R. China.