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Manufacturing and Characterization of Bio-pesticide from Custard Apple Seeds

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ABSTRACT

One crucial component of the agro-business complex, which is so important to the future development of nations like India, is pesticides. Pesticides can be produced in a variety of ways, either naturally occurring or artificially. Here, the seeds of the "Custard Apple (Annona Squamosa)" serve as a natural insecticide. These seeds' oil is extracted using solvents like hexane or methanol, and on the basis of earlier data gathered at the time, it is examined for pesticide component content. Maldison, dimethoate, and methylated spirits are currently the most widely used synthetic insecticides. During harvest, they leave a residue on the crop surface that does their job. The efficiency of the eco-friendly bio-pesticide that is derived from custard apple seeds in the current work is assessed. This natural pesticide can also be produced from other parts of custard apple plant.

Key Words: Bio pesticide, Custard apple, oil extraction.

1. INTRODUCTION

1.1. Bio pesticide

Pesticides are mixtures of chemicals used to prevent, eradicate, or mitigate pests or to control plant growth, all of which can have detrimental effects on human health. Therefore, using biopesticide is the best and safest alternative. Biopesticides are an affordable and risk-free alternative for people, animals, and plants. Different plant-derived substances from various plant families have been used as pesticides. The plant family Annonaceae includes the custard apple (Annona squamosal). Its oil can be used as a pesticide to control a variety of common pests, including termites, aphids, and white mealy bugs. Acetogenin, a group of potent respiratory- inhibiting toxic components found in custard apple seed oil, is responsible for acting as a biopesticide.

Custard apple

A sizable family belonging to the Mangnoliophyta division, the Annonaceae contains about 130 genera and 2300 species. Custard anona, also known as anona squamosal apple or sugar apple trees and shrubs are found in tropical and subtropical regions. They have zigzag twigs and irregular branches, and they are between 10 and 20 feet tall. The fragrant flowers can be found alone or in clusters of two to four. When the fruit is ripe, it separates from its nearly round, oval, or conical shape. Fruit flesh that is fully ripe is creamy white, sweet, and delicious. The blackish brown, hard, shiny seeds that are dispersed throughout the flesh are poisonous when chewed. The Annona rainforest is home to the tropical branched custard apple (Annona Squamosa). It can grow from three to eight meters long. The flowers are greenish-yellow, and the leaves are thin and oblong. The conical fruit, which has a purple skin with bumps, is very sweet and can be consumed straight from the fruit or added to milkshakes, ice cream, and even sherbet. The fruit resembles a huge raspberry and is juicy and creamy white. The plant is indigenous to both India and America. In India, people commonly refer to it as "Sitafal."

The custard apple tree doesn't need much attention, and it will thrive if it receives regular irrigation and enough light to grow. In contrast to other plants in its family, it thrives in hot, dry climates and adapts to any type of soil. If you have planted the seeds, the plant will produce fruit in two to three years. The fruits usually have a conical or rounded shape and ripen in 3 to 4 months.

2. MATERIAL AND METHODOLOGY

2.1 Materials

Methanol CH3OH Chemical Formula CH3OH Appearance: Colorless liquid. Physical State: Liquid.

Molecular Weight: 32.04 gm/Mole.

Odor: distinctive odor that is somewhat milder and sweeter than ethanol. Specific Gravity (Water = 1.0): 0.790 gm/liter at 20 Degree Celsius.

Solubility in Water (Weight %): Completely soluble. Boiling Point: 64.6°C.

Vapor Pressure: 12.8 Kepa at 20 degree Celsius. Vapor Density (Air = 1.0): 1.1 gm/l.

1. Methanol is soluble in water.
2. Highly flammable.
3. It is Flammable liquid.
4. It is volatile and light liquid.
5. Methanol is toxic in nature.
6. Methanol is primarily used as an industrial solvent for inks, resins, adhesives, and dyes.
7. Methanol is also used as an antifreeze for automotive radiators.

Two necked round bottom flasks, Condenser, heating mantel, thermometer, Beaker 500 ml, measuring cylinder, Weighing Balance, Seed Crusher,

Oil Seed Sample,

2.2 PROCESS

Custard apple seeds can be processed into biopesticide using straightforward extraction and grinding techniques.

When the desired compound has a limited solubility in a solvent and the impurity is insoluble in that solvent, soxhlet extraction is used. Custard apple seeds are removed from the ripened custard apples, washed to remove any dirt, and then dried in the sun to remove any moisture. To separate the kernel from the hulls, custard apple seeds are crushed and ground to a powder with the aid of a grinder. Using a mixer, the kernels are ground into a powder. In order to extract oil from seed kernels, this powder is next combined with a solvent such as hexane or methanol.

15ml of solvent per g of powdered seed kernels is used during extraction.

Throughout the extraction, a constant stirring temperature of 65 to 700C was maintained for about 3 to 4 hours. Following extraction, the sample is filtered to remove any solid residue, and the filtrate contains the oil that was solvent-extracted. This filtered sample is then subjected to a straightforward distillation. Solvents are removed from the mixture after distillation, leaving the extracted oil in the distillation chamber.

3. APPLICATION

Using accepted techniques, the obtained oil is examined for its ability to kill pests. The oil is applied to white mealy bugs on the surface of the hibiscus plant after it has undergone tests on its various properties. Preparing the blank solution is done before applying the oil to mealy bugs on the surface of hibiscus plants. By combining 6 parts of labolene soap with 94 parts of water, the blank solution is created. Spraying the custard apple seeds' extracted oil onto the pest- attacked hibiscus plant's surface requires adding 30ml to 100ml of a blank solution. From Day 1 to Day 5, the biopesticide's impact is examined, and a decline in white mealy bugs is noted.

3. LIMITATION

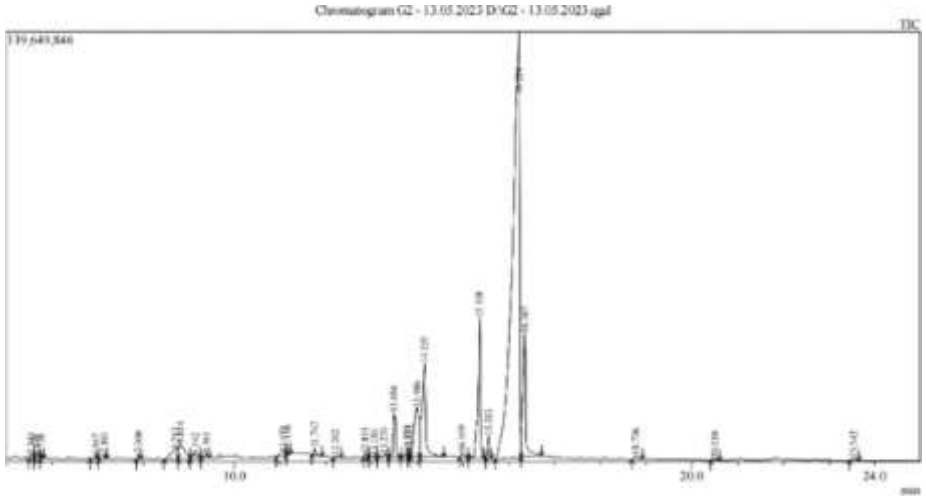
The following are some of the limitations of the bio-pesticide. The solvent cannot be entirely recovered. The extraction requires a specific temperature, which if not maintained, may prevent the production of the desired result.

4. FUTURE SCOPE

In fact, bio-pesticide has a greater impact and is more advantageous than synthetic pesticide, it creates the hub of ideas to make bio-pesticide from various natural materials that contain insecticidal properties, one may account for its production at higher level, making it a very interesting topic for an agriculturist to study.

5. GC-MS

Gas chromatography-mass spectrometry (GC-MS) is the most universal analytical technique for the identification and quantitation of organic substances within a test sample(Sparkman et al., 2011). The product composition was analyzed by using a gas chromatography (Agilent, 7890B) coupled with a mass spectrometry (Agilent, 5977A MSD).



Peak Report TIC

Peak#	R.Time	Area	Area%	Height	Height%	A/H	Name
1	5.543	6257831	0.27	1329008	0.44	4.71	4-Hexen-3-one, 4,5-dimethyl-
2	5.656	5973628	0.26	989159	0.32	6.04	Nonanoic acid
3	5.776	2816542	0.12	951413	0.31	2.96	2,6-OCTADIENAL, 3,7-DIMETHYL-
4	6.967	3562527	0.15	934940	0.31	3.81	DODECANAL DIMETHYLACETAL
5	7.160	3568481	0.15	1576647	0.52	2.26	1-PENTADECENE
6	7.900	3944436	0.17	1832764	0.60	2.15	BICYCLO[7.2.0]UNDEC-4-ENE, 4,11,11-TR
28	18.776	6285841	0.27	1367973	0.45	4.60	Eicosanoic acid
29	20.510	3197953	0.14	605848	0.20	5.28	2-(DIMETHYLAMINO)ETHYL 2-METHYL
30	23.542	5149382	0.22	927748	0.30	5.55	HEXATRIACONTANE
		2341364455	100.00	305495205	100.00		
11	11.075	8513217	0.36	912443	0.30	9.33	3-Deoxy-d-mannoic lactone
12	11.156	4072653	0.17	904119	0.30	4.50	2,6,9,11-DODECATETRAENAL, 2,6,10-TRI
13	11.747	6247618	0.27	2101575	0.69	2.97	Tetradecanoic acid
14	12.202	2724540	0.12	689653	0.23	3.95	Cyclohexasiloxane, dodecamethyl-
15	12.855	3498841	0.15	1091751	0.36	3.20	Pentadecanoic acid
16	13.050	3166854	0.14	632912	0.21	5.00	1,2-Benzenedicarboxylic acid, diundecyl ester
17	13.270	6562713	0.28	965702	0.32	6.80	2-Heptadecanone
18	13.484	55978383	2.39	14434848	4.73	3.88	Hexadecanoic acid, methyl ester
19	13.775	8845048	0.38	1562721	0.51	5.66	9-Octadecenal, (Z)-
20	13.815	5613506	0.24	1839227	0.60	3.05	3-Isopropoxy-1,1,1,7,7,7-hexamethyl-3,5,5-tri
21	13.986	122160546	5.22	16103226	5.27	7.59	n-Hexadecanoic acid
22	14.155	168064188	7.18	30519176	9.99	5.51	2,6-OCTADIEN-1-OL, 3,7-DIMETHYL-, (Z)
23	14.969	8218092	0.35	1685839	0.55	4.87	Heptadecanoic acid
24	15.358	146260291	6.25	45627726	14.94	3.21	11-Octadecenoic acid, methyl ester
25	15.553	20121267	0.86	7460233	2.44	2.70	OCTADECANOIC ACID, METHYL ESTER
26	16.224	1461062677	62.40	117804299	38.56	12.40	Oleic Acid
27	16.347	176834712	7.55	40152889	13.14	4.40	Octadecanoic acid

5. CONCLUSION

The results show that the project's goal has been accomplished. The amount of methanol solvent needed to extract the custard apple seed powder at various temperatures was decided by the amount of natural insecticide produced from custard apple seed. The pH value for a 12-hour extraction increases with the amount of methanol solvent used. For 8 hours and 4 hours of extraction, the pH values were low in the meantime. All of the samples reduced pest populations, regardless of the quantity of methanol solvent employed for extraction. The herbicide was liquid, which allows it to facilitate photosynthesis**.** If the created insecticide had taken the form of oil, it would have acted as wax on the leaf's cuticle layer and prevented the leaf from absorbing sunlight to produce nourishment. We may draw the conclusion that the natural insecticide made from custard apple seeds is effective, useful, affordable, and safe to use. Due to the low cost of this raw material, the cost of processing and solvent recovery are reduced overall.

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