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Standardization and Quality Evaluation of Herbal Pestiside

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Abstract: Botanical pesticides are good alternatives to chemical pesticides. It is eco-friendly, economic, target-specific and biodegradable. Present day research necessitate to explore and harnessing the traditional knowledge regarding the use of natural products for crop protection in reference to traditional folk practices prevalent among farmers as well as information from classical literature. This review provides a brief explanation of various green pesticide research methodologies that are helpful in and quick identification, upgradation, standardization of botanicals.

Key words:

INTRODUCTION

Insecticides have a pivotal role in our lives, not only for crop protection in agriculture, but also to avoid the spreading of harmful pests causing human diseases such as malaria. Another way organically grown food products with high nutritive value and absence of chemicals (with potential carcinogenic and mutagenic properties) are being increasingly preferred over conventional agro products because the global consumer becoming health cautious with diet. Soil and environmental health are also important reason for adoption of green pesticide for insect and pest control. Due to economic and medical reasons, the design of effective agents that control these pests is quite an important task in agrochemical science and in the industrial sector.

Nevertheless, the non restricted use of highly toxic insecticides for several decades has provoked negative effects in the environment and the poisoning of non-targeted species. For these reasons, the development of selective and harmless insecticides is needed. Another aspect across the world is the area under organic farming is increasing at a substantial pace, owing to environmental concerns as well as the explosive growth in the organic food segment. The size of the global organic food market is estimated at around USD 40 bn, increasing annually at 13%. According to the Indian Competence Centre for Organic Agriculture, the global market for organically produced foods is $26 billion and is estimated to increase to $102 billion by 2020. As part of 10th Five Year Plan (2002-07), the government earmarked Rs 100 crore (Rs 1 billion) for the promotion of sustainable agriculture in the country.

In the present day there is a worldwide search for alternatives to chemical pesticides and as part of this process there are various efforts to test the use and efficacy of natural products for pest control and crop protection. It need to explore the traditional knowledge regarding the use of natural products for pest control and crop protection in reference to traditional folk practices prevalent among farmers as well as information from classical literature. Our laboratory intensively involved in the experiments for standardizing and field testing of promising natural products. We resolve the precise range of botanicals and kind of pests and diseases controlled by them, optimum concentration, their mode of action, development of storage forms, stability and shelf life of these products.

Green Pesticide Their Efficiency: Worldwide development bio-pesticides researches have brought a wide scope for organic agriculture. Wide botanical diversity coverage, quality control and technical specifications of such botanicals are essential for end users to understand and adoptability of such bio-pesticide. Different types of plant preparation such as powder, solvent extract, essential oil and whole plant are being investigated for their insecticidal activity including their action as fumigants, repellents, anti-oviposition and insect growth regulators (Table 1) [1-6].

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Table 1: Botanical preparation and their effectiveness

Name of the Preparation	Crop tested	Effective Against	Shelf Life
Adathoda water extract	Paddy Vegetables	Leaf folder, bacterial leaf blight,	3 month
Pudhina water extract		*Helminthosporium* leaf Spot	
Andrographis water extract	Vegetables	Aphids and borers in brinjal, ladies finger	3 month
Barley (*Sesamum* Horsegram) *water extract*	Vegetables	Acts as fruit yield enhancer	3 month
Garlic distilled	Paddy	Leaf folder, bacterial leaf blight, *Helminthosporium* leaf Spot	6 month
Neem seed extract	All crops	Leaf folder, aphids,Jassids, fruit borer and stem borer	1 month

Botanicals are a rich source of novel substances that can be used to develop environmental safe method for insect control [7]. Considerable efforts have been focused on plant derived materials, potentially useful as commercial insecticides. Toxic effects of plant products on some pest have been studied by many researchers [8-11]. Roy *et al.* [12] established leaf extracts of Shiyamutra (*Blumea lacera*) as botanical insecticide against lesser grain bore and rice weevil. Christos *et al*. [13] showed that there is significant different between application of vary commodities and insecticidal effects of plants.

Standardization and Evaluation of Principal Content: Standardization is an essential measurement for ensuring the quality control of the botanicals [14]. "Standardization" expression is used to describe all measures, which are taken during the manufacturing process and quality control leading to a reproducible quality. It also encompasses the entire field of study from birth of a plant to its application. It also means adjusting the crude preparation to a defined content of a constituent or a group of substances with known activity [15]. "Evaluation" of a extract means confirmation of its identity and determination of its quality and purity [16] Standardization of botanicals is not an easy task as numerous factors influence the bio efficacy and reproducible pesticidal effect.

The Standardization of crude botanicals materials includes the following steps

Authentication Parameter: Each and every step has to be authenticated.

- Stage of collection.
- Parts of the plant collected.
- Regional status.
- Botanical identity like phytomorphology, microscopical and histological analysis like Trichomes, Stomata, Quantitative microscopy, Taxonomical identity, Foreign matter, Organoleptic evaluation, Ash values and extractive values, Moisture content determination, Chrometographic and spectrometer analysis, Heavy metal determination, Pesticide residue, Microbial contamination, Radioactive contamination [17].

Stability Parameters: Stability parameters for the herbal formulations which include physical, chemical and microbiological parameters are as follow:

Physical Parameters: Include color, odor, appearance, clarity, viscosity, moisture content, pH, disintegration time, friability, hardness, flow ability, flocculation, sedimentation, settling rate and ash values.

Chemical Parameters: Include limit tests, chemical tests, chemical assays etc.

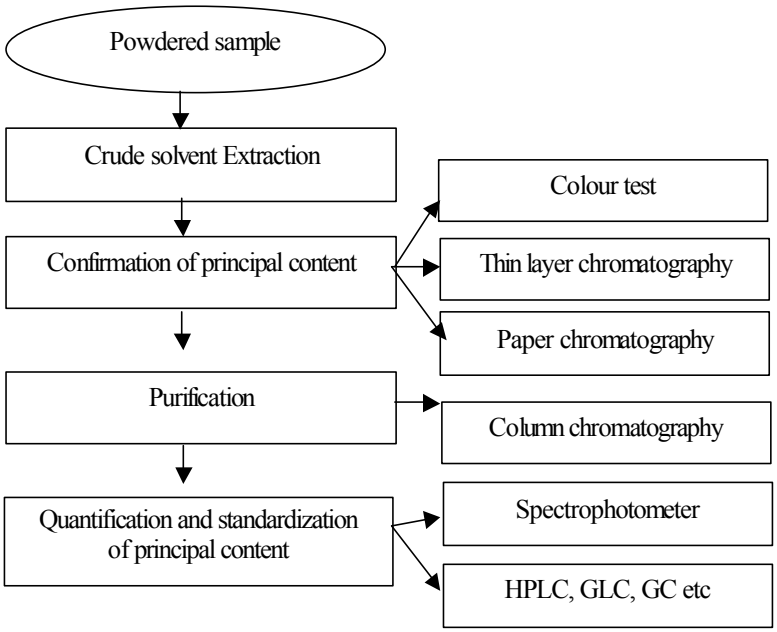
Chromatographic analysis of herbals can be done using TLC, HPLC, HPTLC, GC, UV, GC1MS, fluorimetry etc.

Microbiological Parameters: Include total viable content, total mold count, total enterobacterial and their count. Limiters can be utilized as a quantitative or semi quantitative tool to ascertain and control the amount of impurities like the reagents used during abstraction of various herbs, impurities coming directly from the manufacturing vessels and from the solvents etc. In order to obtain quality oriented products, care should be taken right from the proper identification of plants, season and area of collection and their extraction and purification process [14]. The various local available botanicals have to check out the presence and amount of active principal content for making standards of effective concentration. Some botanicals and their principal content have been listed below (Table 2).

Table 2: Examples of some botanicals, their active principle contents and mode of action

S. No.	Species	Common name	Plant part/ Product	Active principle	Activity
1.	*Andrographis paniculata*	Kalmegh	Leaf Extract	Andrographolide, Neo-andrographolide	Insecticidal
2.	Turmeric	Turmeric	Plant extract	Curcumin	Insecticidal
3.	*Albizia lebbeck*	Wild sirissa	Seed, leaf, pod, bark and root	Caffeic acid, alkaloids and quercetin	Insecticidal
4.	*Anacardium occidentale*	Cashew nut	Shell oil	Phenolic compounds	Insecticidal
5.	*Annona squamosa*	Custard apple	Stem, leaf and semi-ripe fruit	Annonine	Insecticidal
6.	*Azadirachta indica*	Neem	Seed and seed oil	Azadirachtin, nimbidin, salanin, meliantrol and other bitter principles (terpenoids)	Antifeedant, oviposition deterrent, IGR and insecticidal
7.	*Butea monosperma*	Flame of the forest	Flower extract	Chalcones and aurones	Termiticidal
8.	*Madhuca indica*	Mahua	Seed and seed oil	Saponins	Repellent and insecticidal
9.	*Lantana camara*	Lantana	Leaf extract	Lantadenes	Insecticidal, anti-feedant, repellent

Simple Flow Diagram for Identification and Quantification of Active Ingredient



Determining of Effective Concentration of Biopesticides: The efficacy of different concentrations of pesticides determine by the significant inhibition of ovi-position, pupation and adult emergence. Latent effects of bio-pesticides in the next generation progenies are also essential to assess reduction in the growth of larvae and impact on length of larval period.

Procedure for Determining Efficacy

The Test Insects and Source of the Test Compound: The target insect *(e.g. Helicoverpa armigera, Spodoptera litura)* will collect on standard food medium in plastic containers. The experimental compound bio-pesticides like Azadirachtin (defined concentration in a. i.) extract of neem are to be prepared in variable concentrations (viz. 0.5, 1, 2, 4, 8 and 16 ml/ kg) by mixing the requisite amounts of the food medium.

Experimental Procedures: One hundred eggs will release on treated foods at the age of 24 hours old. An equal number of eggs of the same age will be released on untreated food as controls. The eggs will expose to treated food for 24 hrs and will be transferred to clean Petri-dishes separately for each concentration to record their hatching percentage. The newly-hatched larvae will transfer to untreated food separately for each concentration. The food medium is changed with a fresh one after every 7 days. The larvae will be left in the food medium up to pupation. The following data are to be recorded:

- Larval survival rate on day 13 after hatching
- Pupal and adult recovery rate

To assess the effects on the next generation, adults emerging from the treated eggs will kept in separate Petri-dishes provided with fresh food. Adults 18 days after hatching will be allowed to oviposit for 3 days. Eggs are incubated and neonates transferred to fresh food up to pupation (food medium to be changed regularly). The following data will recorded: (i) Weight of larvae on day 12 and day 16 (ii) Length of development period; (iii) Pupal and adult recovery rate (iv) Weight of male and female pupae and (v) Weight of male and female adults. All the experiments will be repeated three times and conducted at mean room temperatures without any humidity and light control. All collected data will analyzed by a suitable statistical package and suitable interpretation of results are specified.

CONCLUSION

The subject of green pesticide research is massively wide and deep. Now days newer and advanced methods are available for the standardization of botanicals like fluorescence quenching, combination of chromatographic and spectrophotometric methods, biological assays, use of biomarkers in fingerprinting etc. Bioassay can play an important role in the standardization of herbal drugs and can also become an important quality control method as well as for proper stability testing of the product [15]. India needs to explore the botanicals product against insect and pest.

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