Plant Products as Biopesticides: Building On Traditional Knowledge Of Vrkshayurveda: Traditional Indian Plant Science

Balasubramanian, A.V.[1], Arumugasamy, S.[1], Vijayalakshmi, K. [1] & Subhashini Sridhar[1]

Key words: Biopesticides, traditional knowledge, sustainable agriculture, vrkshayurveda

Abstract

Today there is a global 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. Our Centre has been involved in exploring the traditional knowledge regarding the use of natural products for pest control and crop protection. As part of this effort, we have looked at the traditional folk practices prevalent among farmers as well as information from classical literature on the subject drawn from Vrkshayurveda (traditional Indian plant science). Following this, we have carried out experiments for standardizing and field testing promising natural products by determining the precise range and kind of pests controlled by them, determining the optimum concentration where they can be effective against pests without being harmful to useful organisms and predators as well as studying their mode of action. Subsequently, we have also developed storage forms of various of these products by using methods based on Ayurveda. Studies on the stability and shelf life of these products are also being carried out through an insect rearing laboratory. Finally, we have also set up village based biopesticides units where a range of these products are being prepared thus providing valuable inputs to sustainable agriculture and a means of livelihood to rural women and farmers.

Introduction

Vrkshayurveda literally means – "The Science of Life of Plants". There is a vast body of literature on Vrkshayurveda both in Sanskrit and our regional languages. It encompasses areas such as collection, selection and storage of seeds; germination, sowing, various techniques of plant propagation, grafting, nursing and irrigation; testing and classification of soil and selection of soils suitable for various plants/types of plants; manuring; pest and disease management/preventive and promotive care to build up disease resistance and to cultivate healthy plants; nomenclature, taxonomy, description and classification of plants to suit varied purposes; favourable and unfavourable

[1] Centre for Indian Knowledge Systems, 30, Gandhi Mandapam Road, Kotturpuram, Chennai – 600 085. India. E-mail: info[a]ciks.org, Internet: www.ciks.org

meteorological conditions for various operations related to cultivation (such as sowing, harvesting) and use of plants as indicators of weather, water, minerals, etc. A series of publications brought out in recent years provides an overview of varied aspects of Vrkshayurveda, covering – a general introduction to this area, plant propagation techniques, nomenclature and taxonomy and pest control and disease management in Vrkshayurveda (1-2).

The Centre for Indian Knowledge has been involved in doing a lot of work relating to Vrkshayurveda for the past several years (3-6). This has included survey and collection of literature on Vrkshayurveda, shortlisting techniques and recipes for specific problems and testing out prescriptions of Vrkshayurveda in practice. Our Centre has been working with several plant products and also experimenting to test the efficacy of these plant products against different pests in farmers' fields.

Standardisation of Use

Over the last ten years our Centre has carried out a large number of experiments and tests to standardize the use of plant products for pest control. Even though a large number of anecdotal accounts and field reports are available a lot of rigorous work needs to be carried out before we can state that the efficacy of use of a plant product has been convincingly demonstrated. Based on these experiments, we have tested out practically the utility of a large number of plants and their extracts for different pests, crops and diseases. Some of the plants for which we have carried out such tests are neem, garlic, onion, persian lilac, turmeric, ginger, tobacco, papaya, leucas, pongam, tulasi, aloe, custard apple, vitex, sweetflag, poison nut, calotropis etc. Farmers are used to pesticides which are packaged and available from the shelf. Even though farmers realise the importance of using plant products as alternatives to chemical pesticides, the widespread use of these plant products will take a while to become very popular. One of the ways by which they can be popularised is to process it and make it available to the farmers in a readily usable form.

Materials and Methods

Ayurvedic approach to produce Storage Forms : Subsequently, we commenced a project for the preparation of storage forms of biopesticides based on ayurvedic principles. This work was taken up with an objective to prepare storage forms of biopesticides with increased shelf life. The Centre has a good expertise in the area of vrkshayurveda and ayurveda and hence we thought it would be best to take up processing of these plants along ayurvedic principles. The shelf life (i.e. the period for which they can be stored without loss of biological activity) of some ayurvedic preparations are as follows Swarasa or juice (3 – 4 hours), Kashayam or water extract (24 hours), the storage forms are - Churna or dry powder (6 – 12 months), Thailam or oil extract (1 – 3 years), Arkam or distillate (1 – 5 years), Asava / Arshta or fermented extracts (3 – 5 years)

Results and Discussion

Experimentation with the Storage Forms : After initial trials with 60 preparations the number of preparations taken for detailed experimentation were narrowed down to 25 preparations. The biopesticides that were prepared were tested out in experimental plots laid out in the CIKS experimental farms as well as in farmers' field. However, we have not carried out comparisons of these preparations with commercially available storage forms of biopesticides. A list of thirteen of these products that have been tried out and found to be effective are given below.

Table – I - Selected promising Biopesticides, m = month

Name of the Preparation	Croptested	Effective Against	Shelf Life
Adathoda kashayam	Paddy Vegetables	Leaf folder, bacterial leaf blight, *Helminthosporium* leaf spot	3 m
Pudhina kashayam			
Thriphala kashayam	Paddy, Ladies finger	Bacterial leaf blight and *Helmintho sporium* leaf spot,	3 m
Andrographis kashayam	Vegetables	Aphids and borers in brinjal, ladies finger	3 m
Sida kashayam			
Prosophis kashayam	Paddy	Bacterial leaf blight, *Helminthosporium* leaf spot, Blast	3 m
Barley *Sesamum* Horsegram kashayam	Vegetables	Acts as fruit yield enhancer	3 m
Cow's urine arkam & Sweet flag arkam	Paddy, Ladies finger, Chilli	Bacterial leaf blight, *Helminthosporium* leaf spot, vein clearing disease, fusarium wilt,	6 m
Garlic arkam	Paddy	Leaf folder, bacterial leaf blight, *Helminthosporium* leaf spot	6 m
Neem seed extract	All crops	Leaf folder, aphids, Jassids, fruit borer and stem borer	1 m

Conclusion

Summing up we present below some of the special features and highlights of our efforts

1. A large amount of literature has been collected and processed to identify traditional practices relating to plant protection from folk practices of farmers, reported field practices and the classical textual literature of vrkshayurveda.
2. We have tested and standardized the use of several practices looking into detail at some identified plants, which were listed earlier.
3. We have experimented with and standardized storage forms of thirteen these natural products, which can be prepared based on the ayurvedic approach.
4. Using the technologies that have been developed we have set up village based biopesticide units in nine different locations in Tamil Nadu. It serves multiple purposes of providing safe and tested plant products as biopesticides for organic farming using technologies that can be practiced and transferred to women farmers who maintain these units.
5. Simultaneously, we have set up an insect rearing laboratory where we test out the mode of action of these products as well as the shelf life of these biopesticides.

Acknowledgements

We would like to thank the Department of Science and Technology of the Government of India and the Compas project of the ETC Foundation, Netherlands for the financial support provided for this study.

References

Balasubramanian, A.V., Vijayalakshmi, K. and Sundar, K.M.S. (1997): Vrkshayurveda: Giving plants the nectar of life, Amruth, 1(7): 26 – 27p.

Manohar, P.R. (1994): Nomenclature and Taxonomy: Vrkshayurveda. Lok Swasthya Parampara Samvardhan Samithy, Madras, 100 p.

Sridhar, S., Arumugasamy, S., Saraswathy, H. and Vijayalakshmi, K. (2002): Organic Vegetable Gardening. Centre for Indian Knowledge Systems, Chennai, 53p.

Sridhar, S., Arumugasamy, S., Vijayalakshmi, K. and Balasubramanian, A.V. (2001): Vrkshayurveda : Ayurveda for plants A User's Manual – I . Centre for Indian Knowledge Systems, Chennai, 47p.

Sundar, K.M.S. and Balasubramanian, A.V. (1999): Ayurveda cosmovision and traditional agriculture. In Haverkort, B. and Hiemstra, W. (eds.): Food for Thought: Ancient Visions and new experiments of Rural People. ETC / Compas, Books for Change and Zed Books, London, 51p.

Vijayalakshmi, K. and Sundar, K.M.S. (1993): Plant propagation techniques: Vrkshayurveda. Lok Swasthya Parampara Samvardhan Samithy, Madras, 70p.