

Pesticidal plants to protect crops and grains

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Pesticidal plants are not only more beneficial for the environment, they are also more cost-effective, easily grown and less toxic. The WHO estimates that 200,000 people are killed worldwide every year from direct pesticide poisoning

Did you know that you can use plants to protect your stored grains and field crops?

Pesticides are substances or mixtures of substances used to prevent, destroy, kill, control or mitigate pests. Synthetic chemical began to be used widely in agriculture from the 1940s and continue to be the most widely used pest control option globally. For hundreds of years prior to this, pesticidal plants, which are naturally occurring pesticides derived from plants, have been used and are still used by some farmers – particularly those with limited resources and smaller scale farmers in developing countries.

Why are pesticidal plants important? They offer several important advantages over chemical pesticides. Whilst chemical pesticides are effective, they can be costly, toxic and dangerous to the health of farmers and consumers, are often adulterated by dilution, can kill beneficial

insects and have other adverse effects on the environment. Over time chemical pesticide residues accumulate, impacting the environment by killing beneficial insects (for example pollinators, natural enemies of

pest insects) and other wildlife and causing extensive groundwater contamination. Some of the health risks associated with chemical pesticides are cancer; immune systems imbalance, neurodevelopment



Tagetes help in the battle against natural pests and weeds



The fish bean (Tephrosia vogelii) works against mosquito larvae and grain borers Photo: Phil Stevenson

dysfunction and certain metabolic diseases such as diabetes, infertility and endocrine system disruption. The WHO estimates that 200,000 people are killed worldwide every year as a result of direct pesticide poisoning. Pesticidal plants are typically lower toxicity with less environmental impacts although must be handled with care as one would with synthetic products. Pesticidal plants are cost effective compared to the synthetics, particularly for poor farmers. They are natural, can be grown and easily prepared on farms and in gardens. Their effect on non-target pests are lower than synthetics, they breakdown quickly and can thus be used as an eco-friendly product for controlling pests. Some of the pesticidal tree species may be excellent additions to the tree planting programmes of Eastern Africa to diversify the species being planted away from Eucalyptus but ensuring they still have additional value to farmers.

So, what are these pesticidal plants and how can they be used? There are many examples of these plants. Some of them are known to all of us. Neem (*Azadirachta indica*) for example can be used against maize weevils and many other insects and worms. Leaves of fish bean (*Tephrosia vogelii*) can be used against caterpillars, beetles, aphids, mosquitoes and spider mites among many others. They can also be used against ticks in livestock and can also be used as green manure. Live roots of Mexican marigold (*Tagetes minuta*) shrub can repel nematodes and its plant extract can be used to fumigate against certain aphids and red spider mites in vegetables and against ticks and intestinal parasites in livestock. Its powdered dried leaves are used against grain storage pests. Extract from leaves of wormseed (*Dysphania ambrosioides*) can be used as a fumigant against mosquitoes, flies, snails and the powdered dried leaves are used against bruchids in stored grains. Shrubs of Mexican sunflower (*Tithonia diversifolia*) and their bright yellow flowers can be found along roadsides in many parts of Kenya. In Uganda farmers use the leaves in field and storage pest management. It can also be used as fodder for livestock due to its high nutritive properties. Certain species of aloe have pesticidal properties. Aloe ferox, for example, can be used as a live fence to repel certain insects, while its leaf ash has been used to



Apart from theory, participants obtained practical knowledge in the ICRAF nursery on the uses, propagation, preparation and application of cost-effective and eco-friendly pesticidal plants



Over 50 participants including 25 stakeholders supported by Prince Sadruddin Aga Khan Fund for the Environment, attended the workshop organised by World Agroforestry Centre

protect stored grains against weevils and beetles. Bitter apple (*Solanum incanum*) and monkey orange (*Strichnos spinosa*) and fever tea (*Lippia javanica*) have been shown to control cattle ticks while firesticks plants (*Euphorbia tirucalli*), having many uses, can also be used against certain aphids, mosquitoes, bacteria and molluscs. The beautiful African violet tree (*Securidaca longepedunculata*) can be used in pre and post-harvest crop protection and also has many other traditional uses in medicine, fibre and timber.

The list goes on. Many of these plants have other uses too, like fertilising the soil or having medicinal properties.

A simple, crude preparation from these

plants can be readily prepared using liquid soap and water: For example, mix 50g of dry powdered leaves with 1 litre of water containing 1% liquid soap and leave overnight or for 24 hours for the active ingredients to seep into the solution. After sieving, the solution can be diluted 5-10 times to give a concentration of 1-2%. This liquid can be spread on crops or mixed with grains. The soap acts as a surfactant and also aids in extraction of the active ingredient. It is important to wash grains well before consumption. Find out more at www.nri.org/adappt

There are however several challenges which hinder the uptake of pesticidal plants. One needs the right tree (species, varieties, mixture of species) to obtain the

correct active ingredient for use at the right place (climatic conditions, ecological suitability, market access) for the right people that fits in livelihood strategies. Accessing the planting material is another challenge. People need to know how to propagate (planting and multiplying) the material and how to use the plants. Training is critical if knowledge on these pesticidal plants is to be widely known. Most importantly, training of trainers must occur if knowledge is to be sustained in communities.

The World Agroforestry Centre recently hosted a 3-day workshop on an EC funded project (OPTIONS- Optimisation of Pesticidal-plants: Technology Innovation, Outreach & Networks) in collaboration with the University of Greenwich, Kew Royal Botanic Gardens and various partners in Africa, whereby over 50 participants including 25 stakeholders supported by Prince Sadruddin Aga Khan Fund for the Environment, attended. Participants came from Kenya, Madagascar, Tanzania and Mozambique. They were presented with some theory and obtained practical knowledge in the ICRAF nursery on the uses, propagation, preparation and application of pesticidal plants. The workshop was much appreciated by the participants who learned that, pesticidal plants can be used alone as eco-friendly products or when incorporated into integrated pest management programs, where they can help reduce the use of and reliance on synthetic pesticides or they can be used in rotation or in combination with other insecticides thus reducing the overall quantities of synthetic pesticides used. This in turn can mitigate or delay the development of pests resistant to pesticides. There is also the possibility of cultivating and selling these plants to provide sustainable income and environmentally friendly pest management control to interested parties and could be incorporated in rehabilitation programmes such as tree planting programmes currently being implemented by AKDN in Kenya.

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