



## Cotton: non-chemical pest control by Alexandra Baier

### Cotton is attractive..., not only to people

Cotton is a plant which is desirable to many so-called pests. For this reason, many chemical, synthetic pesticides are used, of which many are insecticides. However, a high price is paid, not only from an economic point of view, but also from health and ecological standpoints. This is due to the fact that many chemical pesticide users suffer acute poisoning or even death. Although there is still much research to be done regarding the chronic damage caused, there are already hints that, especially in the poor countries of the South, that the chronic damage and developmental disturbances caused by pesticides hinder the potential of whole generations. The environment also suffers from pesticide use; contaminated water sources, the loss of biological diversity and the contamination of the ground are some of the effects.

There is, however, a sustainable alternative to chemical, synthetic products. Organic cotton cultivation, which has been practiced in various projects and countries for the last 20 years, has proved this.

### Organic cultivation based on precaution

The most important aspect of organic cultivation is the precautionary principle. Measures are taken to avoid the occurrence of any economic burden caused by a particular pest or other sources of damage such as fungi, bacteria or herbage.

An especially important aspect is the crop rotation. Crop rotation ensures that on one and the same field different crops are grown for a period of two to three consecutive years. Monoculture, which makes it easy for so-called pests to find their favourite source of food regularly in the same place, is avoided by these measures. In addition, monoculture also reduces the quality of the earth which means that some sources of plant nourishment are reduced or not available at all. This weakens the immune system of the plants and makes them susceptible to disease and pest attacks.

### Variety and protection

Dependent on climatic conditions, the market situation and the availability of land, there are various possibilities of crop rotation. Maize, millet, different

varieties of beans and peanuts are grown. Other alternative rotations alternate cotton with pulses and oil plants or grains, or some cultivation projects rotate spice or vegetable plants such as chili or onions with cotton.

A concrete example is shown in the illustration: in the Meatu Project in Tanzania various rotations are practiced. Cotton is followed by oil plants and grains, concrete millet, sesame and safflower are followed by pulses such as pigeon peas or mung beans. Other pulses which are grown in rotation at the Meatu Project are chick peas, black-eyed beans and peanuts. The pulses are not only a source of protein for farmers and their families, but they also provide nitrogen for the soil and prepare the fields for the following year's cotton crop.

**Table: Selected cotton pests and their incidence**

Pest	Occurrence
Wireworm	Widespread in areas where cotton, tobacco and maize are grown
Cutworm	Africa, Australia, Pacific Islands, southern Europe, Asia
Aphids	Worldwide
Cotton bollworm	Canada, South America, USA, Asia
Mealybug	Worldwide
Spider mites	Worldwide
Whitefly	Worldwide
Cotton boll weevil	Africa, Europe, USA, Western Hemisphere
Cotton stainer	Asia, Australia, Central and South America, Africa

Source: [www.oisat.org/crops/economic\\_crops/cotton.html](http://www.oisat.org/crops/economic_crops/cotton.html) und [www.oisat.org/pests-map.htm](http://www.oisat.org/pests-map.htm)



There is always the question of economic viability of the other plants in the rotation plan, as farmers not only cultivate to provide for themselves but also as source of income. This point requires further investigation regarding the sustainability of organic cultivation and its economic aspects in tropic and sub-tropical regions.

#### “Push and Pull” – Guiding the pests

Another aid to avoiding pest damage to cotton plants is the cultivation of interim crops. The “push and pull” method means that certain plants drive the pest out of the fields (push) and others draw them on to the fields (pull). Sunflowers or black-eyed peas, for example, which are planted after every 5th row of cotton plants act as “catching plants” as they attract certain caterpillars. Or okra plants which are planted on the edges of the fields attract the cotton boll weevil. During the rotation of rice, mung beans and cotton, the varying plants interrupt the life cycle of the pests. The cultivation of interim crops, catcher plants and bordering plants must be well-timed and coordinated to enable simultaneous growth and bloom with the cotton plants.

This also applies to the planting of green manures: grain or pulses are set between the rows of cotton plants after the cotton seedlings have sprouted and before their own bloom they are used as mulch or are ploughed in to the soil.

#### Illustration: Crop rotation on the bioRe demonstration farm for the Meatu-Projekt, Tanzania

Cotton	Cotton	Cotton
Millet	Housing	Pigeon peas
Sesame		Mung beans
Safflower		Clotalaria

Source: Ratter S. (2005)

#### Alternative methods of pest control

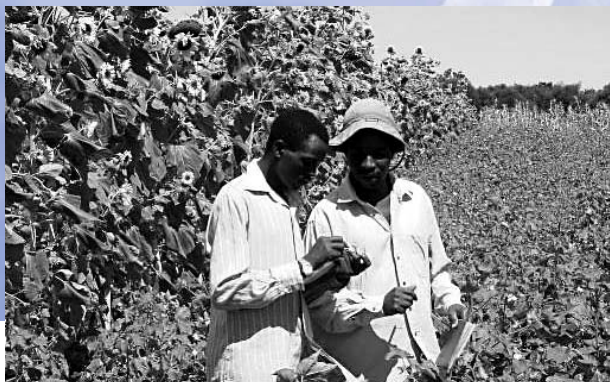
Apart from good cultivation practice, other plant protection methods are available which help avoid pest attacks. Maintaining biological balance plays an important role.

Natural enemies can prevent pests from spreading on a large scale. Parasites or rivals for food are possibilities. Ladybirds which eat aphids are common example of food rivals.

In addition, micro-organisms can be used to target pests. An example from this category is the soil bacteria *Bacillus thuringiensis*, for short Bt, which has become quite well-known. The activated agent has been integrated into some genetically modified plants to produce a poisonous substance in the plant cells which affects certain types of caterpillars. The use of this Bt micro-organism in organic cultivation has, however, nothing in common with genetic engineering. In fact, there are fears that natural methods will lose their effectiveness mid- or long-term due to the use of genetic modification when the targeted pests develop resistance to the active agent.

As an additional aid, physical measures can be instigated. Attractants or light traps are examples of such measures. Even small farmers can easily make such traps themselves, only the attractants have to be obtained externally, respectively a source of energy must be secured. The cotton boll weevil and the cotton bollworm can be controlled well with attractants.

Plant extracts which farmers themselves make, also play an important role. Here, very often, local knowledge is employed. Traditional knowledge can be preserved and passed on via an organised exchange between farmers. An organisation in Benin, West Africa, organizes so-called Farmer Field Schools where farmers from all regions of the country can meet and exchange their experiences and methods. In this manner a formula for a special extract made from various plants, seed extracts, ash, cow urine and the grease from a local plant was spread throughout different regions of the country.



## Instructions for construction and use of a pheromone trap

### I. Construction

- Make 10-12 holes into an old 1 litre plastic bottle, to allow moths to enter;
- Heat a small piece of metal to make the holes easily;
- Put a wire from the bottle cap to suspend the bait;
- Make a rectangular opening into the lower part of the bottle for removing the moths caught.

### II Usage

- Half-fill the bottle with soapy water;
- Put bait in the pheromone dispenser or suspend the pheromone capsule from the lid using string or wire;
- Close the bottle cap or lid;
- Attach the trap to a bamboo or wooden stake or hand on the branch of a tree;
- Place traps for different pests at least 3 metres apart.

Other methods include the use of manure, animal urine, various ash mixtures, treatment of seed with natural products or spraying with milk to prevent certain fungi infections.

## „Recipe example“ – Plant extract to reduce infestation with the cotton stainer

### Material

- 500 g fresh custard apple leaves (*Annona reticulata*)
- 12-17 litres of water
- Pail
- Knife
- Cooking pot
- Strainer

### Preparation and use

- Boil leaves in 2 litres of water until the remaining liquid is about 0,5 litre.
- Strain.
- Dilute filtrate with 10-15 litres of water.
- Fill the sprayer.
- Spray on infested plants thoroughly.



**Literature:**

OISAT (2004): diverse information at [www.oisat.org](http://www.oisat.org), mainly at [http://www.oisat.org/crops/economic\\_crops/cotton.html](http://www.oisat.org/crops/economic_crops/cotton.html) as well as the links on this homepage.

Ratter S.G. (2005): Commercialisation of other crops of the organic production system. In: Baier A., Hammer J. (2005): Proceedings – Back to the roots: The farmers perspective on organic cotton production and marketing, PAN Germany, Hamburg

Eyhorn F., Ratter S.G., Weidmann G., Baruah R., Ramakrishnan M. (2004): IFOAM Training Manual for Organic Agriculture in the Arid and Semiarid Tropics – Chapter on Organic Cotton, Draft version, IFOAM

<http://www.fibl.org/international/projekte/documents/ifoam-training-manual-cotton-chapter000.pdf#search='IFOAM%20%20cotton%20training%20manual>



*Pictures:*

© Saro Ratter: page 1,2,3

© Jörg Böhling: page 4

