NATURAL INSECT PEST CONTROL

Some of the most **common** insect pests in Tanzania, particularly found on cotton, maize, sugarcane, pumpkin, okra and bean plants are:

APHIDS
Aphidoidea

MEALYBUGS
Pseudococcidae

LEAFHOPPERS
Cicadellidae

Natural pest control is essential to ensure that both **quantity** and **quality** of crop production is at its highest potential. It is more beneficial than chemical pest control, which often contaminates and damages non-target species (including humans), soil/water quality and the surrounding environment.

The use of **agroforestry landscapes** is beneficial to both crop and farmer. Integrating trees and other plants with crops is advantageous because:

- Increase **natural enemies** to control pests
- increase **pollinators** to increase crop yield
- increase **microorganism abundance** in soil to increase soil productivity
- Promotes balanced ecosystem

The use of local natural enemies and botanical plants (natural pesticides) is important as they are generally **affordable**, **effective** and **efficient** methods of pest control.

AGRISYS Tanzania is a project led by Dr Marion Pfeifer (agrisystanzania@gmail.com) alongside a large team, to research biological and human well-being benefits that can be provided by agroforestry in tropical landscapes. They work to:

1. Identify the key benefits of agroforestry
2. Identify the agronomic potential of agroforestry landscapes
3. Validate sustainable intensification practices in the area, including biological and human well-being factors
4. Adapt agronomic practices & management, taking into account land potential and the social & governance framework

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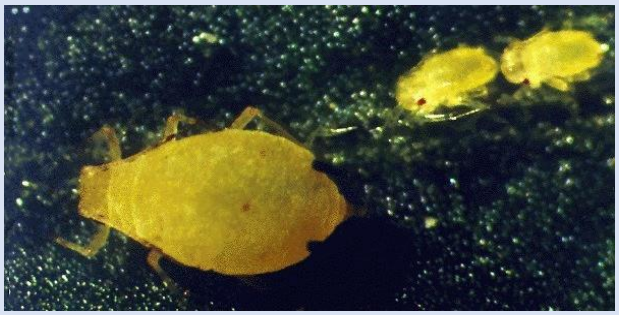
REFOREST AFRICA

COTTON APHID

(*Aphis gossypii*)

The cotton aphid is one of the most **common**, **adaptable** and **widely spread** pests. It feeds on the sap of young plants, deposits honeydew, can transmit viruses and, in high populations, can kill the crop.

- range from **yellow** to very **dark (almost black) green**
- Yellow in hot, dry seasons & pale-dark green in cooler seasons
- **Very small** aphid- adults range from below 1-1.5mm in length and 0.34mm in width
- Most adults are **wingless**



©Timothy A. Elbert- *Aphis gossypii* adult and nymph

The pest is mainly found on crops such as **cotton, pumpkin** and **tomatoes**, but can also be found on **okra, beans, sugarcane, maize**, among many others.

©CABI- Left: black sooty mould found after pest have populated & Right: wilting of leaves

SYMPTOMS on crop:

1. **yellowing** of leaves
2. **puckering/curling** of leaves
3. plants become covered with **black sooty mould**
4. plants become **stunted** & stems **twisted**
5. sometimes, virus **cotton blue disease**
6. sometimes, presence of **ants** can be associated with cotton aphid

Natural enemies can be used to reduce the numbers of cotton aphids in the crop and reduce loss of crop yield, by **predation**. The ***Chrysoperla carnea*** (green lacewing) has shown to be very effective in controlling the aphid population in cotton.

Above: adult green lacewing; Below: green lacewing larvae

The adult green lacewings are pale green in colour and around 12-20mm in length. The adults only feed on nectar, pollen and aphid honeydew but their **larvae** are the active predators of the cotton aphid. In order to survive, the lacewings require:

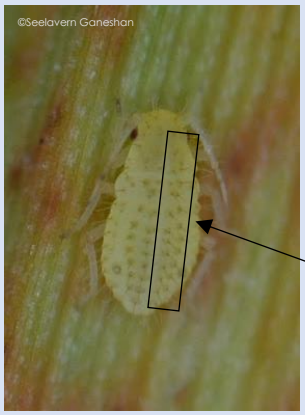
- A source of **moisture**, so larvae do not desiccate
- Planting of **flowering plants**, so adults can feed on pollen & nectar like
- Low level of **aphids** already, so adults can feed on honeydew deposits

Lacewings particularly like ***Asteracae*** flowers (sunflower, cosmos, dandelion) or ***Apiaceae*** flowers (dill, fennel, angelica) so planting **along the margins** of the field or in **nearby** fields would be helpful for pest control.

YELLOW SUGARCANE APHID

(*Sipha flava*)

The yellow sugarcane aphids are **widespread** in warmer climates, feed on the lower side of crop leaves, **inject toxins** in them and produce **honeydew**.

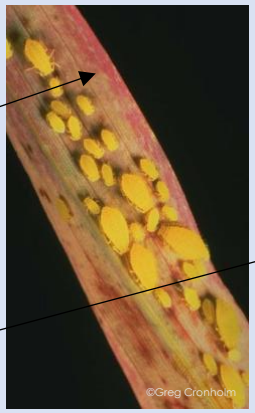


- Commonly **lemon yellow** but sometimes pale green in colour
- **Small** pests- around 2mm long
- Covered in **small spines**
- Two double rows of **dark spots** on back
- Both **winged** and **wingless** forms

The yellow sugarcane aphid is most found as a pest on crops like **sugarcane**, **millet**, **maize**, **rice** and **sorghum**.

Symptoms of infestation include:

- Abnormal colouration of leaves (**purple**)
- **Yellowed/red** or **dead** leaves
- Can **reduce growth**
- **Sooty mould fungus** on honeydew
- Severe damage, plant **lodging** or stalk **rot**
- Damage on **underside** of leaves



Cheilomenes lunata

Sunflower

To reduce numbers of yellow sugarcane aphids and loss of crop, some **ladybird** species in Tanzania such as ***Cheilomenes lunata***, and species of ***Scymnus***, among many others, should be protected, as they are natural enemies. Both adult and nymph forms are predators and in order for them to survive and aid pest control, they require:

- **Moisture** for survival of larvae
- **Shelter** from harsh climate
- Source of **pollen**, so **flowering plants** required

Similarly, to the green lacewing, most species of ladybird are attracted to ***Asteracae*** flowers (sunflower, cosmos, dandelion) or ***Apiaceae*** flowers (dill, fennel, angelica). Making sure plants like these are present will help keep the local natural enemies control the pests.

INDIAN COTTON JASSID

(*Amrasca biguttula biguttula*)

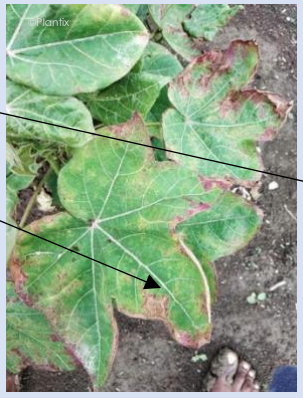
The Indian cotton jassid is also known as the Indian cotton leafhopper, green jassid, cotton leafhopper or okra leafhopper. It attacks the crop all year round by **sucking its sap** and **laying eggs** within the soft plant tissue.

- **small** (adults ~0.6-3mm long)
- **winged** species (both jump & fly)
- **yellowish green** in colour with **black spots**
- shiny & almost transparent

The cotton jassid feed on the underside of crops like **beans**, **sorghum**, **maize**, **cotton** and **okra**, among others.

SYMPTOMS of infestation:

- **discoloration** of leaves
- **curling** of leaves sometimes resulting in **dropping** off
- outer zones turn **yellow-red-white**
- can retard plant growth & **reduce yield**
- **sooty mould** can grow from secreted honeydew



Jumping spider (*Saltcidae)*

Angelica flowering plant

To reduce green jassid populations, natural enemies like the species of **ladybird**, **ants** and **spiders**, should be encouraged to remain in the environment. To support these species to feed on the jassids:

- **flowering plants** like sunflowers or angelica should be planted nearby (either along the margins of the field crop or in neighbouring fields)
- sources of **water/moisture** must be present (to support eggs, nymphs & adults)
- **established crop pests** (honeydew is a source of food for some)

Biological pesticides that come from plants like the **neem** tree, have also proved useful as a form of pest control, to increase crop yields.

NEEM PLANT

(*Azadirachta indica*)

The neem plant is very **resilient**, **inexpensive**, can grow in almost anywhere and is usually grown from the seed (but can do from cuttings or root suckers). Most of the parts of the tree can be used, for **medicinal**, **cosmetic** and **natural insecticide** purposes. The products of the neem tree also generally have a **low toxicity** to non-target organisms.

- Can grow up to 30m tall with deep roots
- **Flowers** which attracts **pollinators**
- Ripe fruit are **yellow-green** and have a seed which contains kernels
- Can live up to more than **two centuries**
- Thrives under **hottest conditions**
- Grows well on **dry, infertile sites**, above sea level
- Require **sunlight** and regular moisture

The neem tree is important as it is very useful in the form of a **biopesticide**, to control crop pests, by:

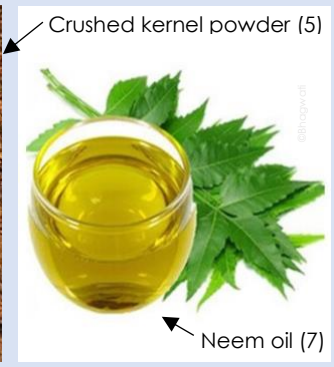
- **Repelling** insects from crop
- **Preventing feeding** on the crop
- **Disrupting** insect **growth**, **metamorphosis** and **reproduction**

How to extract the biopesticide compounds from the neem plant:

1. **Collect** the matured fruit and remove seeds
2. **Clean** the seeds and **dry** them out (spread out in sun)
3. **Pound** the seeds to remove the shell and get the kernels
4. **Crush** the kernels by pounding (using pestle and mortar)
5. **Sieve** through the pounded pulp to get greenish brown powder
6. **Stream** the powder by placing over boiling water for 15-20 minutes
7. **Press** the product to extract the oil
8. **Dilute** 0.25ml of the neem oil with 20litres of water as an aerial spray
9. **Spray** over the crop leaves

Mature neem fruit (1)

Neem dried seeds (2)



Crushed kernel powder (5)

Neem oil (7)

The neem spray will be particularly beneficial to insect pests such as the **cotton jassid**, the **cotton aphid** and the **yellow sugarcane aphid**, among many others, to reduce their populations and increase crop yield.