A Mugita • *A Musisi* • A Masinde • *BE Sekitoleko* • C Mulusa • *C Kute*
D Asena • D Yiga • *D Wekesa* • E Wanyama • *E Lunzalu* • E Manono • *E Limo*
F. Lusweti • *F Kabeere* • F Muyekho • *F Tumuramye* • G. Mulira • *G Sebutare*
H Opolot • H Wambani • *J Nakaziinga* • J Wanyama • *J Chesoro* • JN Coabo
J Kamau • *J Mulati* • J Kasule • *K Wairimu* • KN Wekulo • *K Nicodemus*
K Justus • Lokwaleput • *L Ddumba* • Macosore • *M Kamidi* • M Mulaa
M Mwania • *M Wanyonyi* • M Powon • *N Akinyi* • N Makete • *O Simanto*
P Imbali • P Kalama • *P Wang'unda* • R Toromo • *R Kaggwa* • R Onyango
S Rono • *T Mwangi* • T Lobeta • *W Jotham* • W Kiiya

by EXTENSIONISTS

16 Fact Sheets

UGANDA AND KENYA

for FARMERS

NAKIFUMO Agnes Naguko > Hubaga Ibra > Kitela Richard > Mdagire Eva > **LUBAO** Margaret Juma > Florence Atieno > Peter Orika > John Wesonga **NABUMALI** Difasi Klekosa > Kibuwo Joshuwa > Waniale Alon > Kasimu Watzala **BUSIA** Nerbert Bulima > Peris Achieka > James Mukhwana > Josephat Ndabu **SOROTI** Helen Apigo > Ajepo Betty > Alado Garety > Nayaja Sarah **IGANGA** Lawrence Balirine > Lukatu Waiswa > David Kazungu **MUKONO** Vulandi Kyakwena > Vincent Ntuluma > Lesa Kafeero **and others**…

Edited by Jeffery Bentley, Rob Reeder and Eric Boa

July 2006

GLOBAL PLANT CLINIC

AUTHORS

The 54 people who wrote these fact sheets are extension workers, researchers and farmers. They work for the Ministry of Agriculture, Animal Industries and Fisheries (MAAIF) in Uganda, the Kenya Agriculture Research Institute (KARI), Socadido, Caritas and SG2000. Contact details are given on each fact sheet. They attended two training courses run by Jeffery Bentley and Rob Reeder of the GLOBAL PLANT CLINIC in July 2006.

TOPICS

The topics for each fact sheet were selected by the authors and based on their personal experiences of working with farmers and local agriculture. Each fact sheet offers advice to farmers on a problem, mostly major pests and diseases of crops but also including a chicken disease and how to plant carrots. The information and advice provided is also based on local experience and available technologies. Please contact authors directly with any improvements or additional information.

READERS

The fact sheets are written for farmers. Each fact sheet was reviewed by farmers before the final version was printed. The farmer peer review allowed authors to correct mistakes, add and ensure that the best advice was made available clearly and simply. Fact sheets can be used in other countries but should be checked for suitability by scientists as well as another short farmer peer review.

WRITING

The fact sheets are written using a technique or model first used in Bolivia, and later improved in Nicaragua. They are produced in Word and are available as PDFs. Each fact sheet has a similar three-part structure, beginning with a description of the problem, then background details and finally the recommendations for the farmer. The training course explains how to use this model for other problems so that the authors are able to write, review and produce their own fact sheets in future.

GLOBAL PLANT CLINIC

The GPC is alliance of CABI, Rothamsted Research and the Central Science Laboratory, all based in the UK. We help growers identify the cause of diseases and suggest how to control them. Our role is to encourage and support organisations who want to run mobile clinics. We also provide expert technical support for all crops and their pests and diseases and train plant doctors. Visit our website for more information and similar reports from Uganda, Bolivia, Nicaragua, Kenya and other countries in Africa and Asia.

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FACT SHEETS: UGANDA

1	**Banana nematode**	*Bintubizibu Edward Sekitoleko*
2	**Tomato wilt or kiwotoka**	*Kasule John*
3	**Potato wilt**	*Gilbert Sebutare*
4	**Correct planting of carrots**	*Lydia Ddumba*
5	**Pigeon pea storage pests**	*Ruth Kaggwa*
6	**Maize weevil in storage**	*Francoe Tumuramye*
7	**Good groundnut seed**	*Flavia Kabeere*
8	**Cultural control of cowpea aphids**	*Henry Opolot*
9	**Cultural control of banana weevil**	*Alex Musisi*
10	**Striga weed in sorghum**	*Asio Teddy*
11	**Banana bacterial wilt**	*Jane Nakaziinga*
12	**Banana slim and kiwotoka**	*Dennis Viga*

FACT SHEETS: KENYA

1	**Potato blight**	*M Powon, H Wambani, A Masinde, N Makete, N Toromo, O Simanto, W Kiiya*
2	**Newcastle disease in chickens**	*G. Mulira, F. Lusweti, Lokwaleput, Macosore, C. Mulusa, KN Wekulo, K Nicodemus, K Justus, W Jotham, D Wekesa, E Limo, M Mwania*
3	**Osama destroys maize**	*K Wairimu, M Wanyonyi, J Wanyama, P Kalama, W Kiiya, R Onyango, M Kamidi, J Chesoro, S Rono, T Mwangi, J Mulati, E Manono, E Lunzalu, A Mugita, E Wanyama, P Wang'unda, T Lobeta*
4	**Napier stunting disease**	*M Mulaa, F Muyekho, JN Coabo, C Kute, N Akinyi, D Asena, P Imbali, J Kamau*

Banana nematodes

Fact Sheet 1

Problem

Nematodes are very small worms, commonly known as *lusensera*. The nematode worms are too small to be seen with the naked eye. They often attack cooking varieties of bananas, but they attack other varieties as well.

Banana plants attacked by nematodes have yellow leaves and small bunches. When the attack is very bad, the plant topples over.

How the worms live

Mature nematode worms lay eggs in the banana roots. When the worms hatch, they move within the roots, creating wounds as they feed, destroying the plant, blocking the flow of water and nutrients up the banana stem.

When a plant is attacked by nematode worms, the worms remain in the soil even after the plant is removed. The worms can then attack the next plant that is planted there.

The nematode worm is favoured by continuous planting of bananas in the same piece of land.

Nematodes are spread by planting diseased suckers.

When many nematode worms attack a banana plant, the whole plant may topple

Control

There are no chemicals to control nematode worms. However, there are several ways to keep our banana plants healthy:

- Do not plant bananas for many years in the same soil. After removing bananas, plant another crop in their place, so that the nematode worms in the soil cannot multiply.
- If you have enough land, you can let it rest for around three years after removing diseased bananas. This will let the nematodes in the soil die.
- Plant clean materials. When you get suckers, do not get them from affected gardens. Look for signs of nematode attack, and avoid those gardens. Only get suckers from gardens you trust, or from agricultural research stations.

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Tomato wilt or kiwotoka

Fact Sheet 2

Tomato wilt

This is a disease called kiwotoka in Luganda. It is a common problem in tomatoes. The tomato plant wilts suddenly, even if the weather has been favourable, and even if the soil has plenty of manure. The plant stops growing and dries up and dies.

If the tomatoes wilt, even though they have had plenty of water, they probably have kiwotoka caused by bacteria.

Collapsed tomato

The cause

Kiwotoka is caused by bacteria, which are very small living things. The bacteria are too small to see, but they live in the soil. The bacteria attack the roots of the tomato plant and prevent water from moving up the stem. This causes the plant to wilt and dry up.

When one plants tomatoes in the same land, for year after year, it allows the bacteria to multiply and to grow in the soil. The disease can also be spread on infected tools such as hoes and pangas.

Control

Some varieties of tomato may be resistant to the disease. Try planting several kinds of tomatoes to see if some of them stay healthier than others.

- Rotate your crops. That is, instead of planting tomatoes every year, plant maize, beans, sweet potatoes or some other crops for several years. This way the bacteria that attack tomato will not be able to multiply.
- Plant tomatoes in a different place every year, and do not plant tomatoes in the same land until several years have passed.
- When you see a wilting tomato plant in your field, pull it up. If possible, burn it. This will help to keep your soil healthy, and will help prevent the disease from spreading to healthy plant.

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Potato wilt

Fact Sheet 3

The wilt

Potato plants may wilt prematurely as if they lack water. When you cut open an affected tuber, you will see a ring inside the tuber. The ring oozes pus which gives the potato a bad taste. When potatoes are very sick, pus oozes from their eyes when squeezed.

Potatoes with wilt have low yields, and they rot soon after being harvested.

Ring of pus caused by bacteria

What causes wilt?

Wilt in potato is caused by bacteria, which are very small, living things. The bacteria live in infected potato seed, in infected soil and in water running off infected soil, or in other infected weeds.

The bacteria live inside the plant. The bacteria feed on the plant and stop the flow of juice up the stem, so the plant wilts because it cannot absorb water and nutrients.

The pus that oozes from the tubers is bacteria and rotten tissue.

How to control wilt

- Never plant potatoes that have pus.
- Plant disease-free seed from Kalengeri Research Station, in Kabale District, or plant seed from fields that you know are healthy.
- Even if your potatoes are healthy, do not plant potatoes in the same soil every year. After growing potatoes one year, plant something else for at least one year, so the bacteria will not have a chance to build up in the soil.
- Visit your garden often to identify and remove diseased plants as they appear. When you see a wilting plant, dig it out with a spade or hoe and bury it deep or burn it to remove the bacteria from the garden.
- Keep your potato farm free from weeds as they keep the bacteria.
- Prevent soil and water from running off your land. This will help to keep away infected soil from neighbouring gardens.
- After harvest sort and destroy infected tubers and tops by burying or burning them.

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Correct planting of carrots

Fact Sheet 4

Problem

Sometimes when we plant carrots, many of the seeds do not sprout. Often the carrots are small, or the leaves have brown spots.

Seed and sunlight

Direct sunlight always damages the seed, so that many do not sprout. To have healthy seed, avoid direct sunlight, so that our seeds come out well.

Sometimes there are too many seeds per hole. I have noticed that this reduces the size of the fruit.

Each carrot needs to have enough soil to grow well. Like other vegetables, carrots need to have proper spacing. When they are too close together, the leaves may get brown spots.

Planting carrots properly helps avoid brown spots

How to grow healthy carrots

- Plant in the middle of the rainy season, from 15 March to 15 May, then from 15 August to 15 November.
- Space the seed well. Make each line one foot apart. Mix the seed with ash or soil to help spread the seed. The ash also helps to avoid the small black ants which can attack the seed before it sprouts.
- Control soil erosion. Do not let running water wash away the topsoil. If you have a small garden, fill a polythene bag with water and poke a tiny hole in the bottom of the bag to allow water drops to fall onto the soil.
- Cover the soil with mulch for one week, or until germination, to prevent direct sunlight from damaging the seed. Put a thin layer of dry grass over the soil after planting. Do not use fresh grass, because it heats as it rots, which can destroy the seeds.

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Pigeon pea storage pests

Fact Sheet 5

Problem

In storage, pigeon pea is attacked by small black beetles, which look like very much like weevils. If these beetles are not checked, they feed and multiply rapidly in storage by boring seeds and chewing on the seed. The little beetles can destroy almost all of the grain in a store.

How weevils and other small beetles live

Dry grain is more difficult for insects and diseases to attack. The weevils and other small beetles that live in grain need a little moisture to live.

Grain that is damaged during threshing is more easily eaten by insects.

Chemicals are expensive, but there are other things that farmers can do to keep pests out of their stores, without spending money.

Keep grains stored in a clean, dry granary, off the ground, to keep out insects and rats

Control

- Use good agronomic practices like optimum spacing (60 by 30 centimetres), and weeding, which kills other plants the weevils live on.
- Thresh grain by putting it in a sack before beating it. This will keep some of the grains from being broken.
- If your grain has weevils, spread it in the sun. When the grain gets hot, the weevils will run away.
- Dry the pigeon pea until the pods are dry enough to split easily during threshing.
- Store in clean, well-sealed waterproof sacks.
- Store in a raised, granary which is free of insect pests. A raised granary keeps out some pests, especially rats and mice.

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Maize weevil in storage

Fact Sheet 6

Weevils

Maize weevils are brown and black insect pests. Weevils are also called emungu in Rukiga, and they are called kaukumi in Luganda. One can see the weevils, their eggs, and also their dung in infested maize grain. Weevils bore holes in the maize grains.

When there are many weevils, they turn grains into flour and spoil the whole maize store. Weevils reduce grain quality and quantity and so farmers earn less money when they sell their crop.

How weevils live

Weevils start to get into the maize right in the field, especially when harvesting is delayed. But the weevils also find the maize in the store or granary. They lay many eggs and build up rapidly.

Bags of maize, covered with transparent polythene sheeting. Three tablets of aluminium phosphide is enough to treat 10 bags of grain

Control

The chemical method of control is fast and effective.

- Fumigation by aluminium phosphide is very effective. Just three grams of aluminium phosphide is enough for a whole ton of grain. Aluminium phosphide comes in tablets.
- For 10 bags of 100 kilograms each, make a pile of the bags, and put three tablets at well distributed places, so that you have three tablets for every ten bags of grain.
- Do not put the tablets inside the bags, because they are poisonous and the residues of the tablets should not be mixed with the grain. Put the tablets between the bags, on top of the first layer.
- Cover the grain bags tightly with a tarpaulin, canvas sheet or a polythene sheet. Secure the sheet by putting heavy objects around it. Keep the grain covered for three whole days. While the tablets are evaporating, they release a poisonous gas.
- For at least three days, while the tablets are evaporating, no person should enter the store. As the aluminium phosphide evaporates, it kills the weevils. But after three days, more weevils may enter the maize, and survive. So the maize must be stored so that more weevils cannot get into it.

BE CAREFUL

The tablets are very poisonous and may kill a person who eats one.
If you want to use the tablets, get some advice on how to use them safely.

The Ugandan Ministry of Agriculture and Makerere University give training to farmers on safe use and handling of agrochemicals.

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Good groundnut seed

Fact Sheet 7

Problem

Many farmers complain about poor germination of groundnut seeds, especially of the variety Igola. Fields planted with recently harvested seed or those stored for some time have gaps or bare spaces without seedlings.

When groundnut seed is mature, there are brown spots inside the shell

Background

Groundnut seeds are difficult to store. They lose strength quickly because they have a lot of oil. Igola is an oily variety. Farmers' methods of harvesting and drying groundnuts, especially in Central Uganda, often leave the seeds too moist.

Moist seeds breathe too rapidly, which depletes seed energy, needed for germination. Moisture also allows the seed to be spoiled (kuwumba) or to rot.

Recommendation

Groundnut seeds should be harvested when the nuts are mature, that is, when the shells are hard. Mature seeds dry fast.

When the groundnut seed is dry, it makes a cracking sound when you bite it

- In humid areas, like Central Uganda, pods should be plucked from the plants immediately after uprooting. However, in dry areas such as Eastern Uganda, uprooted plants can be spread in the field to dry.
- When pods are plucked fresh, they should not be kept in the bag overnight. When groundnuts are kept in the bag too long, they heat up, breath too rapidly, and mould attacks them. The pods should be dried by spreading them out sparsely on a dry compound.
- To check whether they are dry, pods should make a loud noise when the shell is squeezed at the beak end. And the seed should not be very soft. The naked seed should be hard enough to make a cracking noise when you bite it.
- Dry seeds should be stored in shells in a dry, cool store or house, free from rats, and on a raised platform, to keep them dry.
- Seeds should be stored for not more than 12 months (two planting seasons).

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Cultural control of cowpea aphids

Fact Sheet 8

Aphids

Cowpea aphids are small, black insect pests which suck sap from cowpea leaves and pods. Aphids cause the leaves to curl.

The aphids also spread viruses which cause diseases. Aphids damage the pods and leaves so that they cannot be eaten as vegetables.

Background

Cowpea aphids set early in the crop life and multiply very fast, especially when the cowpea is widely spaced and dry.

The aphids hop over the ground to move from plant to plant. Dry ground favours their movement between plants.

Farmers often apply a lot of pesticide sprays which are expensive and environmentally unfriendly. There are very small wasps which attack and kill aphids.

When people spray insecticides, they kill the wasps, which favours the aphids. Insecticides also poison the cowpea leaves, and makes them unfit to eat. Yet other methods which do not use pesticides are effective.

Aphids are small insects, which can be controlled by close spacing and early planting. Insecticides may only make the problem worse. (Photo: Michael Amphlett. CABI CPC)

Control

- Cowpea aphids can be controlled effectively by close spacing.
- Plant 60 centimetres between rows, and 20 centimetres between plants. Close spacing increases humidity around the plants which is not good for the aphids' survival and reproduction.
- Planting early allows the plants to grow before the aphids have a chance to build up. Plant two or three weeks after the onset of the rains.

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Cultural control of banana weevil

Fact Sheet 9

Problem

Banana weevils, also known as kayoovu (small elephant) is a deadly pest in bananas, especially matooke (cooking varieties). It bores holes in the stem, blocking the water and nutrients from the roots, so they do not reach the leaves and the bunch. The bunch grows too small, the leaves become yellow, and the banana plant may topple.

Banana weevils, or kayoovu bore holes in the banana stem

The weevil needs moisture

The banana weevil needs moisture, so it likes to live in damp places. That is why it is usually found in rotten banana trunks.

The female weevils lay eggs in the banana trunk. The eggs hatch into small worms, which eat the banana plant and later turn into kayoovu.

Control

Weevil traps made from pieces of banana stem. Turn them over every day and kill the weevils that hide underneath them

- Keep the stool dry by mulching at least 15 centimetres away from the stem. If the stool has mulch, weevils may come to live there.
- Plant clean materials. Remove all the roots and pare the dead parts from the stem.
- When you harvest bananas, chop the stem into small pieces. This way, the pieces will dry easily, and the weevils will not be able to live in them.
- Use weevil traps. To make a weevil trap, cut a slice of banana trunk, about three inches thick. Place the piece of banana trunk on the ground, near the stool. Visit it again the following day. Turn it over and kill the weevils that have crawled under it.
- Burn the trap, or bury it deeply: some banana weevils may have laid their eggs in it.

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Striga weed in sorghum

Fact Sheet 10

What is striga?

Striga or emoto is a weed that attacks cereal crops like sorghum, maize, millet and rice.

If striga is not controlled it can kill all of the plants in the field.

How does striga affect the crops?

Striga parasitizes the cereal crops, by attaching its roots onto the roots of the crop. Then it depends on the crop for food, competing for the food reserves of the crop, so the crop gets stunted and fails to develop or form grain.

The sorghum plant turns yellow and wilts. When the striga plant grows big enough, the plant dies. Emoto leaves its seeds in the soil.

Striga attacks cereal crops

Control

- Striga can be controlled by planting tolerant varieties like sekedo and seredo of sorghum.
- Rotate the cereals with legume crops like beans, groundnuts and cowpea, because the striga cannot parasitize them.
- One can also use trap crops like cotton and sunflower, which allow striga to germinate, but do not support it, and so it dies.
- Weed regularly, at least twice a season. Weed two weeks after the crop sprouts, before the striga reaches the roots of the crop. Then weed again six to eight weeks after sprouting.
- Apply nitrogen as fertilizer, such as calcium ammonium nitrate (CAN). Use 30 kilograms per acre.

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Banana bacterial wilt

Fact Sheet 11

The wilt

Banana bacterial wilt is also called banana slim. Bacterial wilt looks like several other diseases, for example Fusarium wilt, which is also called kiwotoka.

With bacterial wilt, the fruit ripens, but when you pick the fruit, you find it hard and even if you boil it, it remains hard.

Another symptom is drying of leaves. Here the banana leaves dry as if they have been affected by droughts, even if it is the rainy season.

Another sign is rotting of fruits. With bacterial wilt, as soon as the fruits start ripening, they start rotting at the early stage. Lastly is when you cut the banana stem of the affected plant, the middle of the stem is brown, and it often has a bad smell.

How the disease spreads

The bacteria are very small, living things. In banana, bacteria which cause wilt are spread by planting suckers from an affected mother garden.

Another means of spreading banana bacterial wilt is bees. When collecting nectar from the male bud or empumumpu, the bee transfers nectar from affected male bud to a healthy one. In such a way it spreads the bacteria to all neighbouring plantations. Since these bees fly from plant to plant, it is easy for them to spread the disease in a wide area in a short time.

Another way of spreading is transporting of infected products to another area. For example, by taking banana to the market, by selling banana leaves or fibres for making crafts.

Premature yellowing of fruit

Banana bacterial wilt is also spread by farmers themselves, by their pangas and other farm tools tools. As the farmers work on one plant and then another, they spread the bacteria from diseased plants to healthy ones.

Control

- The first measure of controlling bacterial wilt is planting clean suckers. Always make sure that the suckers come from a healthy plantation.
- Uproot the affected plants from each garden, and bury them. If you do not bury them, the bacteria can move from the affected plants into healthy plants. Uprooting diseased plants helps prevent the spread of disease.
- Avoid transporting affected products from one place to another.
- After using a panga on affected plants, put the tool in a burning fire, to kill the bacteria on the tool.

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Banana slim and kiwotoka

Fact Sheet 12

Two similar diseases

Banana bacterial wilt disease, commonly known as banana slim, is a new disease in Uganda, and it is easy to confuse with banana Fusarium wilt, which is also called kiwotoka.

With slim, leaves look burnt (dull yellow), starting with the youngest

Slim for bananas vs. kiwotoka

Both diseases cause yellow leaves. The difference is that with slim disease, the leaves look burnt, then turn dull yellow. With kiwotoka the leaves turn deep yellow evenly, with some brown or black spots, or sometimes streaks. The leaves of slim die suddenly, sometimes starting with the youngest, while Kiwotoka leaves die slowly, beginning with the oldest leaf.

When you cut a stem infected by the slim, a liquid which looks like pus flows from the cut. Kiwotoka does not have this liquid, but may have a fish smell. With slim, the banana's male bud, or empumumpu, dries and eventually dies.

With kiwotoka, the whole bunch fails to grow and so there is no empumumpu to observe. Observe the ripening of the fingers in a cluster. With slim, the bunch ripens unevenly, and prematurely. With kiwotoka, the plant steadily dies.

Slim is caused by bacteria, and kiwotoka is caused by a fungus called Fusarium. Both are living things, but too small to see with the naked eye.

With kiwotoka, leaves turn deep yellow, beginning with the oldest

Control

There are different ways to manage the two diseases.

- Slim can be prevented by twisting off the male bud, which is often where the bacteria enter the plant. Do not cut it off, since bacteria may be carried on the panga. Rather, twist off the empumumpu with a forked stick. If the banana plant has slim, destroy the plant and bury it, to prevent nearby plants from getting the disease. Always plant clean suckers, from plantations which you know are healthy.
- For Fusarium, or kiwotoka, it is also important to remove diseased plants, and to plant healthy suckers.
- Both diseases can be contained with proper cultural control practices that ensure the garden is clean of weeds, broken stems, excess suckers and no pests.

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Potato blight

Fact Sheet 1

Potato blight, also called barafu, chelalit, eparafu makes the potato's leaves and stems look burnt. The tubers are tiny and the leaves turn brown. Blight leads to low yields.

There are two kinds of blight, late blight and early blight. Early blight attacks the area between leaf veins, forming rings. Late blight crushes the whole plant.

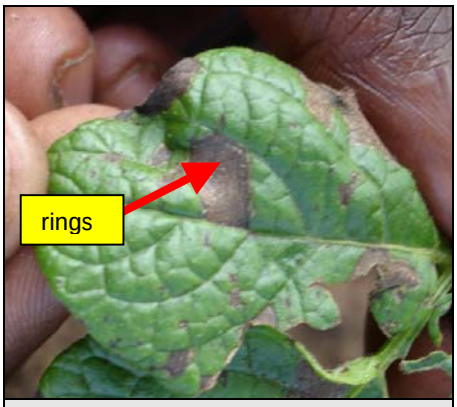
The whole plant collapses with late blight

Background

Potato blight is caused by fungi which are too small to see. Potatoes get blight when the weather is cold and wet and when the plants are too close together.

Solutions

- Plant potatoes far apart so that the air and sun can dry the ground a bit. Plant at 60 by 30 centimetres for small varieties and 90 by 45 centimetres for tall varieties. This way the fungus does not spread from plant to plant.
- Prevent blight by spraying with fungicides, like Dithane M45 or Antracol. Put 50 grams of fungicide in 20 litres of water, making sure that the chemical reaches every part of the plant. Spray after every two weeks.
- If you notice affected plants, spray with Ridomil or Milraz at a rate of 40 grams in 20 litres of water.
- Do not let many people enter your field, because they may bring in the fungus on their feet, or their clothing or their tools.
- Use clean jembes to avoid spreading the fungus.
- Keep the crop free of weeds to reduce moisture around the plants.
- Spray in the morning when it is still calm. Avoid windy days so you do not waste chemicals.
- Put a sticker, such as Aquawet, with the fungicide so the chemical sticks on the plant.



Early blight has small rings that do not cross the vein of the leaf

Warning

Chemicals are dangerous. Do not breathe them.
Do not eat while you are spraying. Keep out of children's reach.
Crush and bury empty containers.

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Healthy Plants for Healthy People

Edited by Jeffery Bentley
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GLOBAL PLANT CLINIC

Newcastle disease in chickens

Fact Sheet 2

How to recognize Newcastle disease

Newcastle disease is also known as breki. It attacks chickens at the beginning of the short rains and the long rains. A chicken with breki has drowsy nodding and a nervous twisting of the neck. It also has ruffled feathers and drooping wings, so it looks like it is wearing a warm jacket (kabuti).

When a chicken is held with the head down, mucus oozes out of its nose. The chicken also has green diarrhoea, but other colours of diarrhoea are signs of other diseases. White diarrhoea is are a sign of fowl typhoid. And bloody diarrhoea is a sign of coccidiocis.

There is no connection between Newcastle disease and bird flu.

Background

The disease is caused by a virus. It is spread through the air. Newcastle is the most serious disease of chickens. Almost all of the sick chickens die, so the farmers may lose the whole flock. Since the whole region is affected, getting replacement is difficult.

Vaccinate healthy chickens so they do not get Newcastle disease

Recommendations

There is no cure once the chickens are affected.

- To keep your chickens healthy, you must vaccinate them with Newcastle disease vaccine, starting when the chicks are 3 weeks old. Repeat every 4 months, till they are killed. The vaccines is available in the agro-vet shop.
- The vaccine must be stored in refrigerators till time to use, because the vaccine is alive, and if it is kept at room temperature, it will be killed.
- The vaccine is available in the dry form in doses of 50, 100, 250 and 1000. You may buy a bottle of 50 doses even if you have fewer than 50 chickens. It only costs about 150 shillings, so it pays for itself if it saves the lives of even four chickens.
- Add water to the dry form as instructed on the label, and give through the nose or eyes. Put one drop in each nostril or each eye. The chicken may be eaten anytime after the vaccine.

Other diseases which are prevented with vaccines are:
fowl typhoid, fowl pox, gumboro, and merrik.

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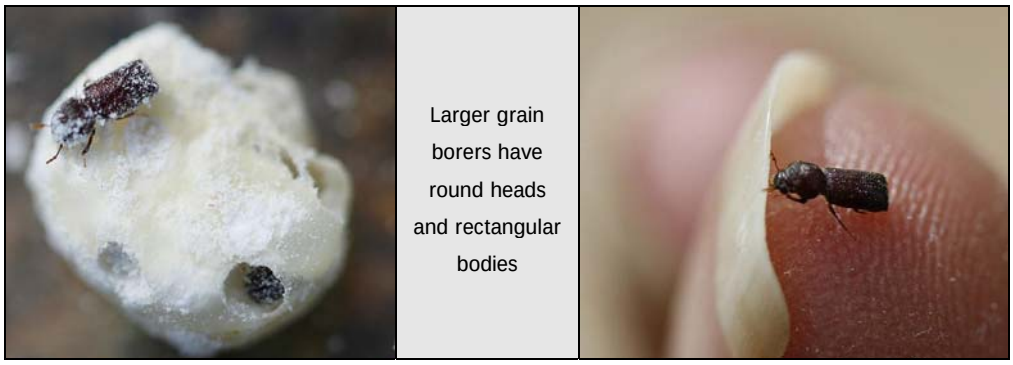
GLOBAL PLANT CLINIC

Osama destroys maize

Fact Sheet 3

Osama is also known as larger grain borer, scania or dumusi. Osama can ruin all of the food in a store. Osama is a dark brown beetle, with two body parts. The head is round and the stomach is rectangular, unlike the maize weevil, also known as nondo. The weevil is black and has a pointed mouth.



Larger grain borers have round heads and rectangular bodies

How Osama destroys

Osama attacks maize right from the field and continues in the store. It also feeds on wood, plastics, storage bags and cassava. Osama bores into the grain, and feeds, leaving an empty shell, while the weevil only feeds on the heart of the grain. Osama also lives in the granary, especially in old maize, and is ready to attack as soon as you put your maize in the store.

Control

- Harvest early, before Osama has a chance to get into the grain. Harvest maize as soon as the black layer has formed between the tip of the maize grain and the cob.
- Shell and dry it until it is very dry. The maize must be so dry that when you bite it, it is hard to break. Dry maize is harder for Osama to enter.
- Clean your store thoroughly. Then dust or spray your store with insecticide (Actellic Super EC). Use 10 teaspoonfuls of Actellic in 20 litres of water. Follow the instructions on the label. Only buy products in original packages, from recognized shops. This way you will avoid buying fake or expired products.

Weevils have a long pointed face and a round body

- Dust the storage bags before and after filling them. Use a grain dust which is not poisonous to people, such as Skana Super, Spintor Dust, Sumicombi, Super Grain dust, Actellic, Super Malpa Dust. Dust the grain thoroughly with 50 grams for a 90 kilo bag. Keep in a well-ventilated store. Use new bags to avoid contamination.

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GLOBAL PLANT CLINIC

Napier stunting disease
Ugonjwa hatari wa Napier

Fact Sheet 4

Napier stunting disease is a new disease. If you do not control it, you may lose over half of your yield of Napier grass.

The affected plants are small, and yellow. The sick plants have many leaves, but they are very thin. The plant eventually dries and dies.

The small, yellow Napier grass is diseased (white circle). The large, green ones are healthy

Background

The disease is caused by germs (viini), called phytoplasma, which do not let food and water reach the top of the plant.

The germs are spread by small insects called leafhoppers, or kamatete that feed on diseased plants.

The stunting disease is also spread by planting diseased stems and root splits. The germs do not live in the soil. They only lives in grass and in small insects.

The diseased grass is safe for livestock to eat. The germs only affects grass and will not make animals sick.

Recommendations

The leafhopper carries the germs that cause stunt

- Plant grass from healthy fields. Check your grass frequently and uproot diseased plants. Replant with healthy grass.
- Burn the sick plants, or bury them deeply. If you feed the diseased grass to animals, be sure to bury the parts they do not eat.
- Plant grass at one meter by one meter so each plant will have room to grow healthy.
- Well-fed plants are healthier, so fertilize your Napier grass with one 50 kilo bag of TSP at planting and top-dress with 2 bags of CAN per acre. Or, you may fertilize with 4 tons of manure per acre. Cut the grass 10 centimetres above the ground.
- Cut healthy grass only every 8 weeks, because frequent cuts attract the insects which carry the germs and cutting near the ground makes the plants weaker.
- Tell your neighbours to also control the disease. Insects feeding on diseased plants in the neighbours' fields can spread the disease to your farm.

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