

Mosaic diseases of cowpea

Multiple viruses



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Advanced, non-specific mosaic symptoms: this could be one of several different viruses.

Mosaic viruses can also reduce and distort growth – note the rough surface of smaller infected leaves.

SUMMARY: There are several viruses associated with mosaic symptoms on cowpea. The two most important ones in Africa are blackeye cowpea mosaic virus (BICMV) and cowpea aphid-borne mosaic virus (CABMV). There are at least seven other viruses which infect cowpea in Africa, including some that produce a mottling of leaves similar to a mosaic. More than one virus can be present and additive effects increase the damage to cowpea and subsequent yield losses. The control of viruses in cowpea is fundamentally about prevention: use of resistant varieties and healthy seed. Both BICMV and CABMV are seed-borne and transmitted by aphids. The opportunities for vector control are limited and only effective in the early stages of symptom development.

KEY SIGNS

Mosaic refers to a patchwork of irregular light-coloured areas scattered across the surface of the normal green leaf. Mosaic symptoms are easier to see with the leaf held against the light. The discoloured areas in a leaf mosaic disease have a clearly defined boundary corresponding to leaf veins and differ from mottling, caused by different viruses on cowpea, where similar areas are not defined by veins. Also look out for leaves that are smaller than expected. They may have a wrinkled appearance and loss of colour.

In the field it will be difficult to differentiate mosaics and mottling caused by different viruses (or combinations of them). All cowpea viruses will affect the growth and development of the plant though not all pose a serious threat. CABMV can cause severe losses by itself or together with other viruses. Both CABMV and BICMV, and other viruses on cowpea are seed borne. CABMV and BICMV are transmitted by aphids, as is cowpea mosaic virus (CPMV). Other viruses are transmitted by beetles or by whitefly.

Laboratory testing is essential if the precise identification of viruses is required, for example in phytosanitary regulation. Good general advice on control can be given, however, based on a reliable field diagnosis of general virus attack. Leaf mosaic symptoms are relatively easy to detect, though their importance as an indicator of reduced yields may not be fully appreciated by farmers, let alone extension agents.

MANAGEMENT

Prevention – what to do before signs are seen

Cultural approaches: The threat from cowpea viruses is constant in all countries where cowpea is grown. The best and most effective way to reduce damage is to plant cowpea varieties with known resistance to the main virus diseases, such as BICMV and CABMV. Ask for advice from research stations and seed sellers on available varieties and their disease resistance.

Farmer-saved seed is a potential source of new infections. Seeds should be taken only from healthy plants, those which lack obvious virus symptoms, particularly leaf mosaics and mottling.

Removal of weeds which harbour aphids or other insect vectors is recommended but has to be thorough and done every season to influence disease spread.

Avoid planting in the dry season when plants may be more stressed and aphid vectors, for example, more likely to feed on plants.

Chemical approaches: Vector control will reduce the spread of the disease but if seeds are already infected it is unlikely that reducing insect populations will have much effect. Insecticides can be used to reduce if not eliminate potential vectors but this must be done before populations increase and at the early stages of the insect life cycle.

Apply cypermethrin or dimethoate, by themselves or in combination, early in the morning or late in the evening, no more than twice in the growing season. Botanical preparations containing, for example, leaf extracts of papaya, neem or other plants with known activity against aphids can also be used.

It is important to stress that the cost of buying, preparing and applying natural and synthetic insecticides at optimal times during the early growth of cowpea plants should be carefully weighed against the expected gains in yields. Vigorously growing cowpea plants of varieties resistant to viruses (and their vectors) are the best method for limiting yield losses.

Control – what to do after signs are seen

There are no treatments for plants that already have mosaic disease.

CAUSE

The two most important mosaic-inducing viruses of cowpea in Africa are blackeye cowpea mosaic virus (BICMV) and cowpea aphid-borne mosaic virus (CABMV). Scientific advances in characterising plant viruses has led to many changes in original names and BICMV is now officially bean common mosaic virus (blackeye strain), but this new name is still uncommon in publications. BICMV may also appear as cowpea (blackeye) mosaic virus.

Other viruses of importance are cowpea mosaic virus (CPMV) also described incorrectly as cowpea yellow mosaic virus. Both names are used in publications.

Cowpea mottle virus occurs in West Africa and cowpea mild mottle virus in East Africa also, but little information about their importance has been found.

Nine different viruses have been recorded on cowpea in Africa and multiple viruses sometimes co-infect plants.

IMPACT

Although there is limited data on yield losses there can be little doubt that virus infections, particularly those associated with BICMV and CABMV, will seriously affect production. The reduction in area of healthy leaves together with smaller sized plants will inevitably affect pod and bean production, particularly when at least one of these two major viruses has spread to whole fields.

DISTRIBUTION

CABMV has been studied more than BICMV and has been recorded in 16 sub-Saharan countries in Africa, including Sierra Leone, Ghana, Nigeria, Kenya, Tanzania, Uganda, Zimbabwe and South Africa.

BICMV has an apparently narrow distribution, with confirmed records from Burkina Faso, Ghana, Nigeria, Kenya, Botswana and Zambia. However, it is likely that BICMV is present in other countries and that the threat of virus infection on cowpea is both widespread and constant.

FURTHER READING

Crop Protection Compendium online (www.cabi.org/cpc).

Plantwise (www.plantwise.org).

PMDG on aphids that transmit cowpea mosaic virus.

<http://www.plantwise.org/FullTextPDF/2013/20137804290.pdf>