Groundnut rosette disease

Groundnut rosette virus

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Groundnut with small distorted leaves and severe mosaic symptoms.

SUMMARY: Groundnut rosette disease is the most important disease of groundnuts of sub-Saharan Africa. Epidemics occur without warning. It is caused by a virus complex – two viruses and a virus-like nucleic acid molecule called satellite RNA. The satellite RNA occurs in different forms and results in at least three types of field symptoms: chlorotic (yellowing), mosaic and green rosette. These diseases differ in the patterns of yellow and green on the leaves, but all cause stunting and severe loss of pod yield. The groundnut diseases are spread by the aphid, *Aphis craccivora*. Management is mainly dependent on use of tolerant varieties. Cultural measures can also be helpful, including removing volunteer and diseased groundnut and weeds, early planting, intercropping with other legumes and cereals, and crop rotation.

KEY SIGNS

Groundnut rosette disease is not one but three diseases: chlorotic rosette, mosaic rosette and green rosette.

Plants with chlorotic rosette have bright yellow leaves, except for small parts that remain green; these are known as 'green islands'. The yellowing may affect the whole plant or only some shoots, or parts of shoots. Early infections result in severely stunted plants with small, deformed leaves.

Plants with mosaic rosette have yellow and dark green areas on the leaves. Plants are stunted, although less than those with chlorotic rosette.

Plants with green mosaic have very dark green small leaves, or they have a light and dark green mosaic, and margins that are rolled downward. They, too, are stunted if infected early. In all forms of the disease early infection causes severe pod loss.

MANAGEMENT

Prevention – what to do before signs are seen

Cultural approaches: A number of measures help to delay infection: (i) removing volunteer plants (self-sown groundnuts) from the last crop; (ii) planting at high densities, to cover the soil as quickly as possible (the landing behaviour of aphids, which spread the disease, is disturbed when the soil is covered); (iii) sowing early in order to produce a crop before the arrival of winged aphids; (iv) intercropping with beans, maize or sorghum; and (v) rotating with maize or sorghum.

The most reliable method of control, however, is to plant resistant varieties. High-yielding, long duration varieties for medium and high rainfall areas were the first to be bred. More recently short duration Spanish types, suitable for eastern and southern Africa, have become available.

In recent years, the international agricultural research centres have released rosette resistant groundnut varieties in many African countries, e.g. Ghana, Malawi, Niger, Tanzania and Uganda. A survey conducted in Uganda in the last three years found that more than 50% of the groundnut area was occupied by improved varieties. The release in 2010 of the new red-seeded rosette resistant variety, ICGV-SM 93535, will likely have stimulated increased adoption of improved cultivars in Uganda. In Malawi, improved groundnut varieties currently occupy more than 60% of the total area under groundnuts. Check if these are available from local retailers or research institutes.

Control – what to do after signs are seen

Cultural approaches: Remove rosette-diseased groundnuts as soon as they are seen, and destroy them.

Remove weeds from within and around the plots.

After harvest, collect all the plant debris and destroy it, or use it as fodder if this is usual practice in the area.

CAUSE

Groundnut rosette diseases are caused by two viruses and a particle which is just nucleic acid – ribonucleic acid – and is called a satellite RNA. The two viruses belong to different virus families. One is called *Groundnut rosette virus*, and is an umbravirus; the other is *Groundnut rosette assistor virus*, a luteovirus. *Groundnut rosette virus* needs this so-called assistor or helper virus for transmission. The satellite RNA comes in different forms, and this is the reason why there are different rosette diseases.

All three components are spread by the aphid *Aphis craccivora*. The aphid picks up the viruses and satellite RNA as it feeds on infected plants; about 18 hours later it can infect other groundnuts and continue doing so for at least 15 days. The viruses and satellite RNA do not multiply in the aphid.

Neither of the viruses causes symptoms in groundnuts when alone, or only very slight symptoms. It is the satellite RNA with its different forms that causes the symptoms. However, the satellite RNA depends on *Groundnut rosette virus* for multiplication and *Groundnut rosette assistor virus* for spread by aphids.

Only groundnuts have been found naturally infected with the either of the viruses or the satellite RNA, although other crop plants can be infected experimentally. As the viruses are not seed-borne, it may mean that volunteer (self-seeded) groundnuts are the source of infection, which is carried to crops by winged aphids. Where volunteer groundnuts do not survive the dry season, aphids on the wind may bring the viruses from others parts of the continent.

IMPACT

Groundnut rosette disease is the most important of all diseases of the crop. Although not present every year, when epidemics occur they can result in devastating losses. For example, the disease affected 0.7 million ha of groundnut in Nigeria in 1975 and caused an estimated yield loss of 0.5 million tonne valued at US$250 million. Twenty years later, in Zambia, some 43,000 ha were affected and losses for 1995-1996 were estimated to be US$5 million. Importantly, the outbreaks are unpredictable, and the sudden loss of an important source of protein, cooking oil, income, and seed for the next year results in farmers abandoning the crop. This is what happened in Malawi in 1994/95 when, following an epidemic, the area under groundnut shrank by 23%. In the 1990s, the annual loss from the disease in Africa was put at about US$155 million.

DISTRIBUTION

Groundnut rosette disease occurs throughout sub-Saharan Africa. Green rosette disease occurs in West Africa and Angola, Malawi, Swaziland and Uganda. Mosaic rosette is found only in East Africa. Reports of the disease from South America, South and Southeast Asia and Oceania are now thought to be incorrect.

FURTHER READING

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