



Cassava brown streak viruses (Cassava brown streak disease-CBSD)

1. Identity

Preferred Scientific Name:

- *Cassava brown streak viruses*

Preferred Common Names:

- Cassava brown streak disease

Other Scientific Names:

- *Cassava brown streak carlavirus*
- *Cassava brown streak potyvirus*
- *Cassava brown streak virus*
- *Cassava brown streak-associated carlavirus*
- *Ugandan cassava brown streak virus*

Taxonomic Position: Domain: Virus Group: "Positive sense ssRNA viruses" Group: "RNA viruses" Family: Potyviridae Genus: Ipomovirus Species: Cassava brown streak viruses



Figure 1. Cassava brown streak disease symptoms on cassava roots (J.P. Legg and R.J. Hillocks)

2. Hosts/species affected

Cassava (*Manihot esculenta*) and Ceara Rubber (*Manihot glaziovii*)

3. Growth stages affected

Vegetative growing stage, flowering stage, fruiting stage, post-harvest

4. Biology and Ecology

The disease is caused by two viruses, *Cassava brown streak virus* (CBSV) and *Ugandan cassava brown streak virus* (UCBSV) which belongs to the genus *Ipomovirus* and the family *Potyviridae*. They have a genome of positive sense single-stranded RNA (Rwegasira et al., 2011). The disease is spread through planting of stem cuttings from CBSV infected plants and vectors. Whitefly, *Bemisia tabaci* has been reported as the main insect vector of the virus (Maruthi et al., 2005; Mware et al., 2009).

5. Symptoms

Cassava brown streak disease produces characteristic symptoms on leaves, stems and cassava roots. CBSD is characterized by severe chlorosis and necrosis on infected leaves. Some cassava plants or varieties have been reported to exhibit varied symptom expression where some plants do not show symptoms on leaves nor tubers, other varieties may only express symptoms on leaves and not on roots; while others do not show symptoms on leaves but on roots only. The symptoms may appear and disappear in young plants, but re-appear again in cassava plants at a later stage.

Symptoms of Cassava brown streak disease on leaves

- Symptoms of Cassava brown streak disease appear as patches of yellow areas mixed with normal green colour a phenomenon referred to as chlorosis.
- It produces characteristic yellow or necrotic vein banding on leaves which may enlarge and join to form comparatively large yellow or necrotic patches.
- The yellow patches are more prominent on mature (bottom) leaves than younger ones



Figure 2. Chlorotic mottling characteristic of CBSD (photo by J.P. Legg)

Symptoms of Cassava brown streak disease on stems

The disease appears as dark brown streaks and spots on stems, with dead spots on leaf scars. The name brown streak was given to the disease based on the brown lesions appearing on the young stems. The streaks are most prominent on upper, green portions of the stem. Streak may appear as scratch-like wounds on stems. The diseased plants may show shoot tip death, *Cassava brown streak viruses* version 001

which may progress into cassava stem die-back. In severe cases there may be leaf drying and shoot die-back.



Figure 4. Cassava brown streak disease symptoms (spots and streaks) on stems (R.J Hillocks)



Figure 5. Cassava brown streak disease symptoms on cassava roots (J.P. Legg and R.J. Hillocks)

root/tuber is cut across with a knife.

Symptoms on storage roots

The disease may cause cracks and discoloration in the storage roots. It causes root constriction and malformation. The harvested roots have yellow-brown necrotic spots. In the roots of a susceptible variety, the disease causes a dry, hard rot which is irregular. Necrosis is most pronounced in the edges of the root when the

6.Means of movement and dispersal

Planting cassava cuttings from infected cassava plants is the major means through which CBSD spreads. CBSD is graft transmissible and cuttings from infected plants gives rise to plants showing symptoms of the disease. As cassava is usually propagated by stem cuttings,

the disease is readily introduced into newly planted areas through the use of infected planting material.

Sharing and distribution of infected planting materials causes rapid spread of the disease in areas where it is re-emerging. CBSD is also spread by white-flies (*B. tabaci*) and by infested farm implements such as knives used for cutting cassava stems but research is still on-going to determine its efficiency in transmission. It also spreads through multiplication centers if the original source of cassava materials were infested or if the planting materials being distributed are not checked for the presence of CBSD (Bigirimana et al., 2011; Mulimbi et al., 2012). There is no evidence of transmission in or on true seed.

7. Impact

CBSD is widely distributed. The disease can decrease cassava production up to 70 %.(Hillocks et al., 2003) while recent records indicate up to 100% yield losses in susceptible cultivars (Mbanzibwa et al., 2011).

8. Movement in trade

Infected cassava plants or cuttings are the major ways through which CBSD spreads in trade. There is no evidence of transmission in or on true seed.

9. Detection and inspection

Manifestation of CBSD symptoms on the leaves, stems and roots of sensitive cultivars is used in diagnosing for infections. Reverse transcription-PCR protocols are used on confirmation tests for the presence of the virus in young symptomless leaves (Abarshi et al., 2010; Adams et al., 2013).

10. Phytosanitary significance

CBSD is included in EPPO list as a quarantine pest. It is a regulated non quarantine pest in Kenya .

11. Management

- Planting of clean cassava cuttings is the main way of controlling CBSD.
- Use of tolerant cassava varieties like Siri, Shibe, Tajirika and Nzalauka which are listed as tolerant varieties in Kenya
- Field hygiene is an important way of managing CBSD. This involves uprooting and destroying all cassava plants which are showing disease symptoms, which helps to avoid disease build up and spreading CBSD in the multiplication blocks.
- Cassava plants should be regularly checked for symptoms of CBSD on the mature (lower) leaves, stems and storage roots.
- Selection and use of disease free cuttings for planting material is recommended. Clean planting materials such as Tissue culture plants can be obtained from KEPHIS Plant Quarantine Station among other sources.
- Eradication of CBSD is not easy therefore it is important to take common action by all stakeholders to restrict the movement of cassava cuttings through the open quarantine system (Bock, 1994) such that only virus-tested tissue culture materials can be used for inter country cassava germplasm movement. Siri, Shibe, Tajirika and Nzalauka are listed as tolerant varieties in Kenya
- Management of white-flies (*B.tabaci*) to slow their activity in the spread of the disease.

12. References

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