CASSAVA BACTERIAL BLIGHT

report of an interdisciplinary workshop held at IITA, Ibadan, Nigeria, 1-4 November 1976.

Cosponsored by the International Development Research Centre and the International Institute of Tropical Agriculture

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/IDRC publication/. Report of a workshop on the/cassava/ /bacteria/ /plant disease/ in /Africa south of Sahara/ — discusses the /diagnosis/ and /geographic distribution/ of CBB, influence of shade (/solar radiation/) and /intercropping/ on its incidence, /plant breeding/ for /disease resistance/; /disease control/ efforts in /Nigeria/, /Zaire/ and /Ghana/. Includes /bibliography/s, /list of participants/ and country statements from /Benin PR/, /Congo PR/, Ghana, and /Togo/.

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Diagnosis of Cassava Bacterial Blight Disease

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Cassava bacterial blight (CBB), Xanthomonas manihotis (Arthaud-Berthet) Starr, has been observed within the last 5 yr in Zaire (Hahn and Williams 1973; Maraite and Meyer 1975), Nigeria (Williams et al. 1973), Cameroon (Terry and Ezumah 1974), Togo and Ghana (Persley 1975), and Benin (Desmidts, personal communication). This paper covers those aspects necessary for rapid and accurate diagnosis of the disease, with the view to instigating timely and proper control measures.

Symptoms

The characteristic symptoms of CBB are:

1. Angular, “water-soaked” leaf spots that are initially small but later enlarge, coalesce, and eventually turn brown; the affected leaves become blighted and eventually abscise (Fig. 1, top);
2. Degrees of leaf wilt ranging from one wilted lamina lobe to many whole leaves (Fig. 1, bottom);
3. Yellow-orange gum exudation on the leaf petiole and young shoots (Fig. 2, left);
4. Severe defoliation;
5. Tip dieback resulting from vascular necrosis and death of the growing points.

All of the above symptoms except angular leaf spots may be caused by other diseases or adverse conditions, and therefore are not specific for CBB. Their occurrence in the absence of the characteristic water-soaked angular leaf spots should never be the basis for diagnosing the disease as CBB.

Because angular leaf spots are the most definite diagnostic feature of CBB, the following relevant observations may aid accurate diagnosis. The bacterium normally penetrates the host via stomatal openings or through epidermal wounds (Lozano and Sequeira 1974), and initial symptoms appear as water-soaked angular spots that often exude yellowish sticky droplets mostly on the lower leaf surface and along the veins (Fig. 2, right). These droplets may dry to form tiny pellets (Terry 1974; Fig. 3, right). The spots eventually turn brown, enlarge, and coalesce forming large necrotic areas. These affected areas later turn purplish-brown. When one or more lobes or the entire leaf lamina become necrotic as a result of this disease, the manifestation is called a “blight.”

The development of the disease and the pattern of symptom expression resulting from propagating infected cuttings differs from that that occurs after stomatal penetration by the bacterium. With the former, the following may be observed: first, loss of turgidity of one or a few leaves located often on the same side of the stem, followed by rapid wilting. Afterwards, the base of the petiole collapses but the dried leaf remains attached for some time. All leaves located above those showing the first symptoms wilt progressively (Maraite and Meyer 1975). Gum exudation may be observed on the stem near the first wilted leaf. Finally, the un lignified tops or young branches die, while new shoots appear at the junction of the dead and healthy woody stem (Fig. 3, left).

Isolation of the Causal Agent

The next important diagnostic step is the isolation of the causal agent in pure culture and the subsequent inducement of the disease.

The following procedure is recommended for the isolation of X. manihotis: Nutrient Agar, (Difco) containing 100 ppm Actidione (Cycloheximide) is a suitable isolation medium. The bacterium can be isolated from diseased leaves and stem pieces by the following methods:

**Diseased Leaves**

A small (1 x 2 mm) portion is cut from the margin of an angular leaf spot, transferred aseptically to a drop of sterile distilled water in a petri dish, and macerated. The macerate is allowed to stand for a few minutes and then a few loopfuls are streaked over the surface of dried agar plates.

**Stem Pieces**

A portion of stem showing bacterial exudate is surface sterilized by dipping in ethyl alcohol and flaming. A small internal portion (1 x 2 mm) showing brown discoloration is transferred aseptically to a drop of sterile distilled water in a petri dish, and macerated. The macerate is allowed to stand for a few minutes and then a few loopfuls are streaked over the surface of dried agar plates.

Pathogenicity

The following methods may be used to confirm
Fig. 1. Top — angular leaf spot; bottom — leaf wilt.
pathogenicity. In all cases, plants are kept at 100% relative humidity for 24–48 h, and then placed in the greenhouse at 25–28 °C.

1) Spray inoculation — A bacterial suspension in sterile distilled water is sprayed on cassava leaves.

2) Leaf rubbing — Leaves are rubbed with cheesecloth moistened with a suspension of the bacterium.

3) Stem puncture — Plants are inoculated at the third and fourth leaf axils from the apex by forcing a sharp needle through a drop of the bacterial suspension into the stem.

4) Petiole puncture — Petioles are punctured as in (3).

5) Leaf clipping — Scissors dipped in the bacterial suspension are used to cut portions of the leaf lamina.

The successful inducement of the characteristic CBB symptoms after inoculation with the isolated bacterium is proof of correct diagnosis of the disease and pathogenicity of the isolated bacterium.

Accordingly, the following reactions may occur as a result of the five methods of inoculation listed above. Leaves sprayed with bacterial suspension exhibit water-soaked angular spots 5 days after inoculation. Three days later, exudates appear, and after 14 days, the leaf spots enlarge and coalesce, resulting in a blight. By the 20th day after inoculation, all the inoculated leaves may abscise. Stem dieback may occur at about 28 days after inoculation. A similar pattern of reaction occurs when plants are inoculated by the leaf rubbing method.

With plants inoculated by the stem puncture method, bacterial exudation and leaf wilt may occur near the point of inoculation 6–8 days after inoculation. Leaves distant from the point of inoculation, stem dieback also may appear during the same period. With petiole puncture inoculation, exudation along the inoculated petioles occurs 6 days after inoculation and leaf wilting about 2 days later. Eventually, exudation appears on the stem and dieback occurs (in about 20 days).

Leaf clipping with contaminated scissors produces water-soaked angular leaf spots 7 days after inoculation and the entire lobes of clipped leaves may be blighted after 15 days. All inoculated leaves may abscise. Bacterial exudation
may appear on the stems and dieback may be observed after 33 days.

References


