

PHYTOPATHOLOGICAL NOTES

**Bacterial Wilt of Enset (*Ensete ventricosum*)
Incited by *Xanthomonas musacearum* sp. n.**

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Enset (*Ensete ventricosum* [Welw.] Cheesman), a member of the Musaceae, is the most important staple crop in many areas of central and southern Ethiopia. The major part of the diet of more than a million people comprises cooked products obtained from the rhizome and parenchymatous tissues of the pseudostem. This note describes a wilt disease causing heavy losses of enset at many localities in Ethiopia.

Symptoms first appear on the heartleaf or on one of the inner leaves whose tips become limp and droop. The inner folds of a drooping heartleaf have grayish-brown, rotting patches covered with a slimy secretion.

In a more advanced stage of disease development, the leaf breaks at the petiole. In cross section, yellowish masses of bacteria ooze from the vascular bundles. Gradually all leaves wilt, bend over, and wither. Cross sections at the base of the pseudostem show discoloration of the vascular bundles and often large bacterial pockets (Fig. 1-A, B, C). Cross sections of the rhizome also show grayish or yellowish bacterial exudate and brownish to bluish-black spots and streaks. Eventually the plant dies and rots to the ground in a putrid mass.

Bacterial exudate was invariably associated with the disease. Both banana and enset inoculated with the exudate wilted. Pure cultures of bacteria isolated from diseased enset plants produced typical symptoms when inoculated into healthy plants of that species. A disease of enset with similar symptoms was attributed to *Pseudomonas solanacearum* (E.F.Sm.) E.F.Sm. by Castellani (1); however, the bacterium was not isolated nor were pathogenicity tests carried out.

THE CAUSAL ORGANISM.—*Morphology and cultural characteristics.*—The bacteria are rods, $0.7-0.9 \mu \times 1.8-2.0 \mu$, and motile with a single polar flagellum. On glucose peptone agar, colonies appear distinct after 48 hr at 25-28 C. On nutrient agar and on glucose and

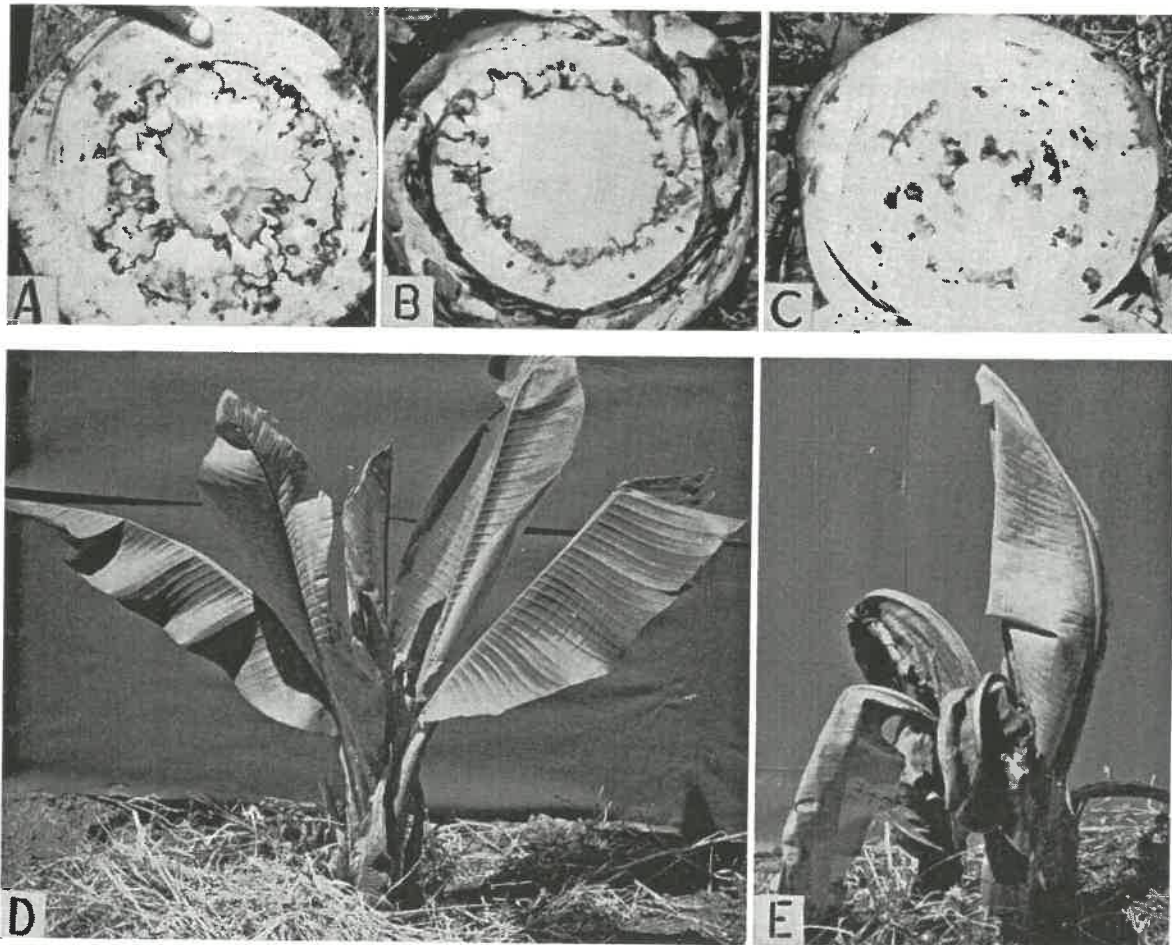


Fig. 1. A, B) Discolored cross sections of enset pseudostem. C) Bacterial pockets on cross section of enset pseudostem. D) Normal enset shoot. E) Enset shoot 4 weeks after inoculation with *Xanthomonas musacearum*.

sucrose peptone agar, colonies are light yellow, high convex, and very mucoid. After prolonged maintenance on nutrient agar, colonies become less mucoid and more butyrous. On King's medium B (5) colonies are deeper yellow, but produce no diffusible fluorescent pigment. On potato plugs, honey-colored, slimy growth is produced. The potato is darkened. No brown pigment is produced in media containing tyrosine, and no sudanophilic inclusions are observed in cells grown on either sucrose or glucose peptone agars.

Physiological and biochemical characteristics.—The bacterium is aerobic and gram negative. Using the methods of Hayward (4) and Dowson (3), acid is produced from glucose, mannose, galactose, and sucrose, but not from lactose, xylose, maltose, mannitol, sorbitol, or salicin within 1 month. Gas is not produced.

Gelatin is slowly liquefied; H₂S and NH₃ are produced; lipase activity and aesculin hydrolysis are shown by the methods of Sierra (8) and Sneath (9). Starch is not hydrolyzed, nitrate is not reduced, nor is nitrite decomposed. Indole and acetoin are not produced. Tests for methyl red reaction, pectinase, lecithinase or egg yolk reaction (7), Kovacs' oxidase (6), and arginine dihydrolase (10) are negative. Litmus milk becomes white within 3 days and then turns pink. It is neither coagulated nor cleared. Growth in nutrient broth is retarded by 3% and suppressed by 4% NaCl. Growth is optimal at 25-28 C, and absent at 39 C. The bacteria remained viable for 51 days at room temperature on dry glass capillary tubes.

Host range.—Bacterial suspensions were injected into various organs of 21 species of plants. Leaves of enset and banana became flaccid and then appeared scalded within 2-3 weeks after inoculation. They gradually turned pale yellow, drooped, and withered (Fig. 1-E). None of the following plants showed symptoms within 5-6 weeks: *Arachis hypogaea* L., *Phaseolus vulgaris* L., *Medicago sativa* L., *Vicia faba* L., *Triticum aestivum* L., *Hordeum vulgare* L., *Sorghum* sp., *Zea mays* L., *Datura stramonium* L., *Capsicum frutescens* L., *Solanum tuberosum* L., *Lycopersicon esculentum* Mill., *Solanum melongena* L., *Nicotiana tabacum* L., *Helianthus annuus* L., *Lactuca sativa* L., *Ricinus communis* L., *Citrus sinensis* (L.) Osbeck, and *Pelargonium* sp.

Taxonomy.—As the bacterium is a gram-negative rod with one polar flagellum and produces a yellow pigment on many media and a slimy, yellow growth on potato plugs, it belongs to the genus *Xanthomonas* Dowson (2). The physiological and biochemical characteristics of this bacterium are distinct from other described plant pathogenic bacteria, and since it attacked only enset and banana among the several species of plants artificially inoculated, it is considered a hitherto undescribed species and the epithet *Xanthomonas musacearum* sp. n. is proposed.

Cultures of *X. musacearum* have been deposited with the National Collection of Plant Pathogenic Bacteria, Hatching Green, Harpenden, England.

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