Leaf Spot and Stem Blight of Sweetpotato Caused by *Alternaria bataticola*: A New Record to South America

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ABSTRACT

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A severe leaf spot and stem blight disease was observed on several sweetpotato genotypes at an experimental field and in commercial plantings of the cultivar Brazlandia Roxa in the Brasilia-DF area. An *Alternaria* sp. was consistently isolated from the lesions. Pathogenicity tests were done under greenhouse conditions (air temperature, 18–40 C) using a spore suspension adjusted to 5×10^4 conidia per milliliter. The same *Alternaria* sp. was reisolated from leaf and petiole lesions. Even though identified as *A. bataticola*, the Brazilian isolates completely lacked the forked beaks in the conidia that are characteristic of this species. This is apparently the first report of *A. bataticola* in South America, extending the geographic range of this pathogen to the New World.

In the summer of 1990, a severe outbreak of a previously unreported disease was observed in 79 of 496 sweetpotato (*Ipomoea batatas* (L.) Lam.) accessions maintained at the CNPH/EMBRAPA and also in two commercial plantings of the cultivar Brazlandia Roxa in Brasilia, the Federal District of Brazil. The most characteristic symptoms were necrotic, well-defined leaf spots, often surrounded by a wide yellow halo (Fig. 1A). Chlorosis of the whole leaf blade also was common as a result of pathogen development on the petiole, where elliptical brown lesions developed (Fig. 1B). The most susceptible genotypes had larger lesions that usually girdled the younger stem tissues (Fig. 1C), resulting in plant death.

The presence of *Alternaria* sp. has been reported associated with similar symptoms (2,9). Even though more than one *Alternaria* sp. can apparently induce identical disease symptoms on sweetpotatoes, those putative pathogens have not been properly identified at the species level (2). So far, only *A. bataticola* Ikata ex Yamamoto (10) has reliably been associated with sweetpotato leaf spot diseases, according to reports from Africa and Asia (3,4,10). The objective of the present study was to confirm the pathogenicity of *Alternaria* sp. on sweetpotato and to discuss the disease etiology at the species level.

MATERIALS AND METHODS

Isolation. Characteristic petiole and stem lesions were collected from five different accessions in the sweetpotato germ plasm collection maintained under field conditions at CNPH/EMBRAPA. Additional disease samples also were taken in two commercial fields of the cultivar Brazlandia Roxa in Brazlandia-Federal District of Brazil. Small portions on the border of individual lesions were removed, surface-sterilized in 0.5% NaOCl for 1 min, rinsed thoroughly in sterile distilled water, and plated in 9-cm-diameter petri plates containing potato-dextrose agar (PDA) and also in a spiced tomato juice (STJ) medium (7). In this latter medium, profuse sporulation of several *Stemphylium* and *Alternaria* spp. has been achieved (1). After incubation for 7 days at 25 C in the dark, single-spore cultures were obtained from 13 isolates.

Pathogenicity tests. Inoculum was prepared for all 13 isolates by transferring agar blocks from PDA and STJ growth media to Shahin and Shepard's calcium carbonate sporulation medium (8), where most of the isolates sporulated profusely after 4–5 days at 18 C in the dark. Vine tip cuttings of sweetpotato cultivars Brazlandia Roxa and Brazlandia Branca were taken from disease-free stocks in a screenhouse, planted in 2-L pots containing 1 kg of fertilized soil, and maintained in a greenhouse (air temperature, 18–40 C) for 25 days before inoculation. Five plants of each cultivar were inoculated with each isolate by atomizing the upper and lower surfaces of leaves with a hand sprayer with a spore suspension adjusted to 5×10^4 conidia per milliliter. Two control plants were sprayed with sterilized water. After inoculation, plants were held in a moist chamber for 2 days in the dark and then moved back to the greenhouse. The plants were inspected daily for symptom development up to 30 days after inoculation.

RESULTS AND DISCUSSION

Pathogen isolation and pathogenicity tests. Isolation from infected tissues yielded colonies of a typical *Alternaria* sp. Petiole lesions, however, were very often contaminated with a *Colletotrichum* sp. The latter fungus was considered to be a saprophyte, as demonstrated after unsuccessful attempts to induce disease symptoms by inoculating five isolates with a spore suspension adjusted to 10^6 conidia per milliliter on Brazlandia Roxa and Brazlandia Branca plants. The same inoculation methodology used for *Alternaria* sp. was employed for *Colletotrichum* sp. In addition, our experimental results strongly indicated that *Colletotrichum* sp. isolates do not have any effect on increasing or decreasing the infection rate or disease severity of *Alternaria* sp. whenever inoculum was prepared with mixed conidia of the two fungi. In this test, equal volume of the respective concentrations previously mentioned was used; the methodology was essentially the same as that for the single inoculations. Van Bruggen (9) also observed in Ethiopia that the perfect stage of *C. gloeosporioides* (Penz.) Penz. & Sacc. in Penz. (= *Glomerella cingulata* (Stoneman) Spauld. & H. Schrenk) often outgrew *Alternaria* sp. when surface-sterilized infected tissues were plated on PDA. The *G. cingulata* isolate from Ethiopia also failed to produced symptoms on sweetpotato after controlled inoculations (9).

All Brazlandia Roxa plants showed severe symptoms 3 days after inoculation with 12 of 13 *Alternaria* isolates from sweetpotatoes. Control plants remained healthy during the entire period of evaluation. The same *Alternaria* sp. was reisolated from leaf and stem lesions of inoculated plants. Brazlandia Branca plants were not affected by any of the isolates. This resistant response of Brazlandia Branca is in agreement with previous field observations. Van Bruggen (9) also observed differences in cultivar reaction to Alternaria leaf spot in Africa.

Pathogen identification. The 12 *Alternaria* isolates from sweetpotato patho-

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genic to Brazlandia Roxa plants were similar in colony appearance and in conidia shape and size. Conidia were solitary, elongate-obclavate, muriform, transversely five to eight septate, and longitudinally three to four septate. The morphometrical characteristics of these isolates fitted within the range of that described for *A. bataticola* (10). Average dimensions of 50 conidia obtained directly from the calcium carbonate sporulation medium (8) were 69 (34–160) × 24 (15–42) μm. The conidial beaks were long, filiform, and colorless with an average dimension of 8 (4–12) × 71 (32–129) μm. However, the Brazilian isolates differed from a recent description of *A. batatatícola* (3) by not forming conidia with branching beaks (Fig. 1D), regardless of the host source or culture medium employed. The presence of forked beaks is considered an important taxonomic feature of this species (3). Branched conidial beaks were also observed in sweetpotato isolates of *Alternaria* sp. from Ethiopia (9). Two of these isolates were sent to the International Mycological Institute (IMI) in Kew, England, for confirmation of their identity. Both were identified as *A. bataticola* (J. C. David, *personal communication*). However, this very stable morphological peculiarity of these isolates provides an indication that Alternaria leaf spot of sweetpotatoes may be a complex disease across the world, probably involving two or more distinct *Alternaria* spp. The Brazilian isolates are deposited at the IMI culture collection under numbers 357309 and 357310.

This sweetpotato leaf spot has been considered endemic in Brazil for a long time (5). The increase in disease incidence and severity observed in recent years may be explained partially by the predominance of a more virulent population of isolates, by peculiar environmental conditions favorable for disease onset and progression, or by the increased hectarage of susceptible cultivars. Considerable yield losses have recently been observed during wet summers in the Federal District wherever cv. Brazlandia Roxa is grown. This highly productive but *A. bataticola*-susceptible cultivar has been gradually replacing local, less-productive sweetpotato land races, which could result in an increase of importance of the disease. Application of costly inputs such as fungicides is not eco-

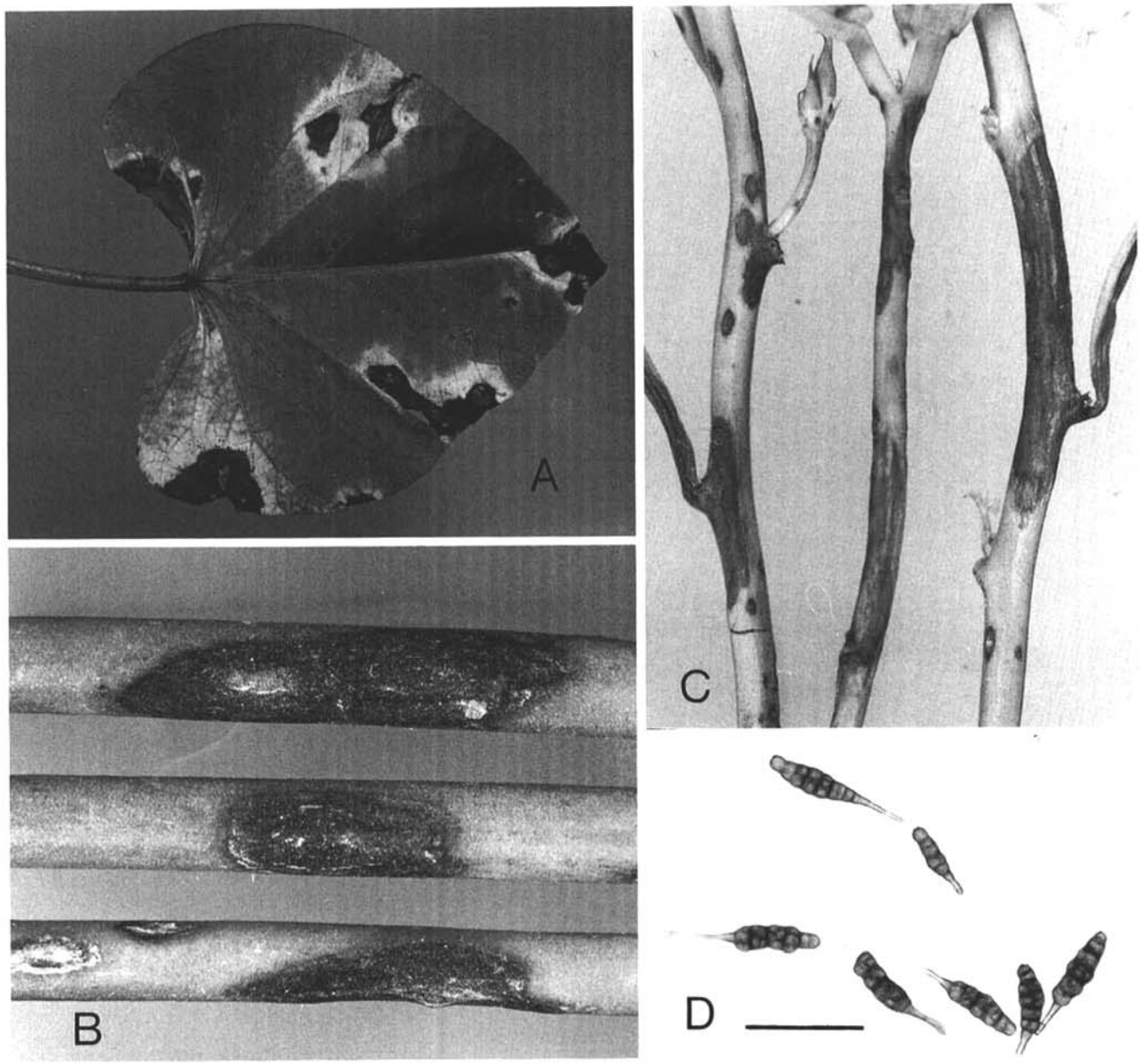

Fig. 1. Sweetpotato leaf spot and stem blight caused by *Alternaria bataticola:* **(A)** Naturally infected leaf of cultivar Brazlandia Roxa, **(B)** petiole lesions, **(C)** lesions on young stem tissues, and **(D)** light micrograph of a group of *A. bataticola* conidia produced on calcium carbonate sporulation medium. Scale bar = 100 μm.

nomically feasible in the sweetpotato cultivation system under Brazilian conditions. Therefore, screening trials for sources of resistance to *A. bataticola* and also *Plenodomus destruens* Harter are currently under way (6). According to the literature, this is apparently the first formal record of a sweetpotato leaf spot and stem blight disease caused by *A. bataticola* in South America, extending the geographic range of this pathogen to the New World.

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