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Survey of tomato diseases in Cameroon

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Keywords: Tomato — Diseases — Early blight — Late blight.

Summary

*Tomato (*Lycopersicon esculentum *Mill.) is the most widely cultivated field vegetable crop in Cameroon. On-farm surveys were undertaken from November 1988 to October 1991 to identify nursery and field diseases in major tomato producing areas of Cameroon. Damping-off and seedling blights were the main seedling diseases. Of the eleven diseases observed in the field, the most widely distributed and severe on the foliage and fruits were early* (Alternaria solani) *and late* (Phytophthora infestans) *blights. Late blight was the most severe disease in the wet season while early blight was most severe in the dry season. Nine pathogens were associated with various fruit rots. This study indicates the need for an identification of appropriate control methods for early and late blights of tomato in Cameroon.*

Résumé

*La tomate (*Lycopersicon esculentum *Mill.) est la plante maraîchère la plus cultivée au Cameroun. Une enquête a été conduite entre novembre 1988 et octobre 1991 dans les champs des principales localités de production de tomate au Cameroun. L'objectif était d'identifier les maladies rencontrées dans les pépinières et/ou dans les champs. En pépinière, la fonte de semis et les brûlures des plants étaient plus répandues. Parmi les onze maladies inventoriées dans les champs, les attaques d'alternariose* (Alternaria solani) *et du mildiou* (Phytophthora infestans) *étaient les plus fréquentes et les plus sévères sur le feuillage et les fruits. Le mildiou était plus sévère en saison des pluies et l'alternariose en saison sèche. Neuf agents pathogènes ont été associés aux diverses pourritures des fruits. Cette étude suggère la nécessité d'identifier des méthodes appropriées pour la lutte contre l'alternariose et le mildiou de la tomate au Cameroun.*

1. Introduction

Tomato (*Lycopersicon esculentum* Mill.) is the most widely cultivated field vegetable crop in Cameroon. It is grown primarily as a subsistent crop, although in the western highlands of the west and north west provinces, commercial production is practiced. Both these provinces account for more than 54% of the tomatoes produced in Cameroon (7).

Tomato is susceptible to many diseases which contribute to high losses in yields especially in periods of excessive late season rainfall.

The identification of disease management methods can solve some of the growers' problems. However, up to now no attempt has been made to identify tomato diseases in Cameroon. The main objective of this study was, therefore, to identify tomato diseases in the major tomato growing areas of Cameroon.

2. Material and methods

An on-farm survey of tomato diseases was conducted in Foumbot (1000 m), Dschang (1400 m), and Djuttitsa (1600 m) in the west province, and in Santa (1800 m) in the north west province of Cameroon, as indicated in Fig. 1. These areas were characterized by an annual rainfall of 1800-2500 mm while mean annual temperatures ranged from 19°C in Santa to 26°C in Foumbot. The soils are predominantly ferralitic (ultisols). The survey covered the period from November 1988 to October 1991 and 14 nurseries and 67 fields were visited. Most of the fields surveyed varied from 300-1500 m^2. Observations were made on both the dry (November-March) and the wet (April-October) season crops and each site was visited at least twice per season.

Nurseries were examined about 3 wk after sowing and field crops were surveyed from transplants to harvest. In each nursery of field, plants were observed along a serpentine course. Assessments of disease prevalence (percentage of

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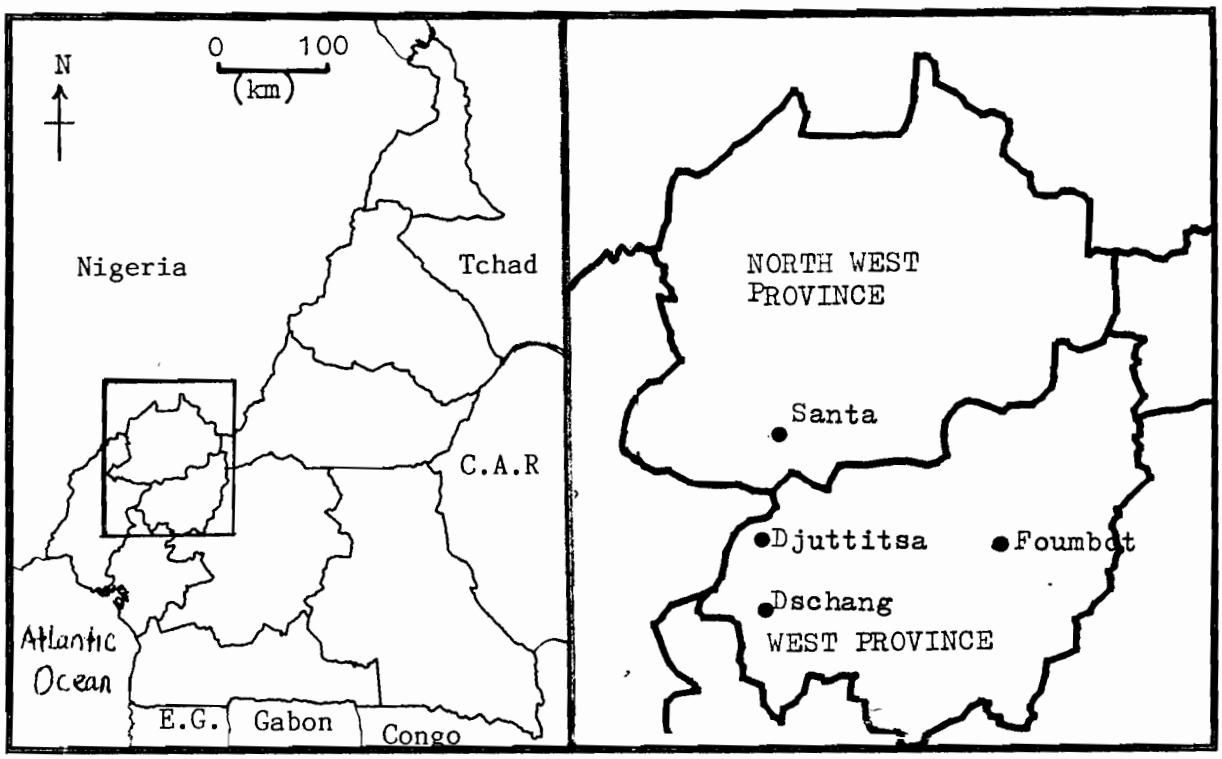

Fig. 1 - Survey sites of tomato diseases in Cameroon.

fields with symptoms) and visual scores of disease severity (percentage of tissue area diseased) were recorded. Disease severity was scored for each field on a 0-4 scale where 0 = no disease present, 1 = trace to 10%, 2 = 11-25%, 3 = 26-50%, and 4 = > 50% of tissue area diseased.

Diseases were identified on the basis of field symptoms followed by laboratory diagnoses. Diseased plants or plant organs were identified directly in the microscope or after spore induction or pathogen culture (1, 8, 9).

Specimens were observed for fruiting bodies or placed on wet filter paper in Petri dishes for 1-3 days to encourage sporulation. Some specimens were surface-disinfected for 1 mn in 70% ethanol and for 2 mn in 0.5% sodium hypochlorite followed by a quick rinse in sterile distilled water. Fragments (1-2 mm) were cultured on potato dextrose agar (9) at 25°C until colonies matured. Pathogens were identified in the plant pathology laboratory of the University of Dschang.

3. Results and Discussion

All the nurseries visited had seedling blight and damping-off problems. Seedling blights were the most prevalent and severe diseases in nurseries. They were often incited by the late blight pathogen (*Phytophthora infestans* (Mont.) dBy) in the wet season and the early blight organism (*Alternaria solani* (Ell. & G. Martin) Sor.) in the dry season.

Organisms isolated from the roots and stems of damped-off seedlings were *Pythium* spp., *Rhizoctonia solani* Kuhn, and *Verticillium albo-atrum* Rke & Berth. Mean prevalence of seedling blight and damping-off were 71.4% and 57.1% respectively while the mean severity of the diseases were 3.0 and 2.5, respectively (Table 1).

TABLE 1
Percent disease prevalence and severity of tomato diseases in Cameroon during 1988-1991

Disease Pathogen(s)	Disease Prevalence [a]	Disease Incidence [b]
Damping-off *Pythium* spp., *Rhizoctonia solani* Kuhn Verticillium albo-atrium Rke & Berth.	57.1	2.5
Seedling blight *Phytophthora infestans* (Mont.) dBy, *Alternaria solani* (Ell. & Martin) Sor.	71.4	3.0
Late blight *Phytophthora infestans*	89.6	3.1
Early blight *Alternaria solani*	82.1	3.3
Root rots *Pythium* spp., *Rhizoctonia solani* *Fusarium oxysporum* (Sacc.) Snyd. & Hans.	29.8	1.6
Wilts *Fusarium oxysporum* *Pseudomonas solanacearum* (Smith) Smith	26.9	2.0
Septoria leafspot *Septoria lycopersici* Speg.	18.3	1.8
Leaf mould *Cladosporium fulvum* Cke.	13.4	1.5
Grey leafspot *Stemphylium solani* Weber	9.0	1.2
Crown rot *Rhizoctonia solani*	7.5	1.0
Grey mould *Botrytis cinerea* Pers. ex. Fr	4.5	1.0
Bacterial spot *Xanthomonas campestris* pv. *vesicatoria* (Doidge) Dye	4.5	0.8
Fruit rot complex	37.3	2.7

[a] Percentage of 14 nurseries or 67 fields in which the disease was present.
[b] Disease severity (percentage of tissue area diseased) was scored on a 0-4 scale (0 = no disease present, 4 = > 50% of tissue area diseased).

The most prevalent field disease was late blight *(Phytophthora infestans)* which was observed in 89.6% of the fields inspected with a mean severity of 3.1 (Table 1). Severe symptoms were always encountered on the stem, foliage, and on fruits. Fruit infection resulted to premature abscision. During the survey period, there were cases of total loss of tomato fruits attributable to late blight especially during periods of intensive rainfall in Dschang. Although no variety was resistant to late blight, varieties Heinz 1370 and Roma VF were observed to be less susceptible to late blight compared to other commercial varieties.

Early blight caused by *Alternaria solani* was the second most prevalent disease after late blight. It was observed in 82.1% of the fields inspected with a mean severity of 3.3 (Table 1). Symptoms were first observed on the lower mature leaves which eventually spread to the upper leaves, the stem, blossom, and the fruits. Most fruit infections started from the stem end and lead to early fruit abscision. Varieties such as St. Pierre, Heinz 1370, Roma VF, and Marmande were always observed with severe symptoms of early blight.

Both early and late blights are endemic to the surveyed areas of Cameroon. They infect all the above-ground parts of the plant causing severe losses (3, 6, 10). Their relative severities varied according to the cropping season and altitude. Late blight was less prevalent on dry season crops than on wet season crops. Moreover, it was more severe in high altitude areas such as in Santa than in lower elevations. Contrarily, early blight was more prevalent in lower elevations than in the highland areas and the severity was more pronounced on dry season crops than on wet season crops (Fig. 2). According to Messiaen and Lafon (6), late blight

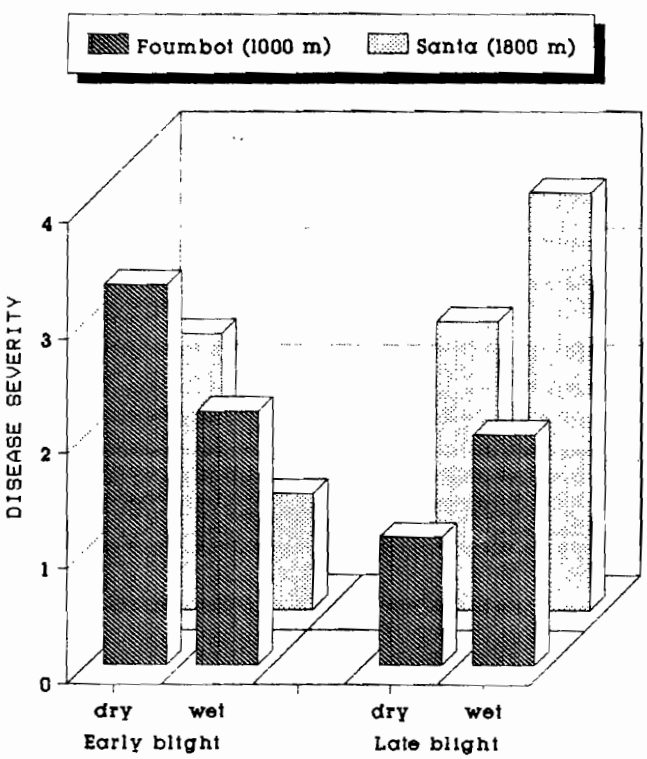

Fig. 2 - Relative severities of early and late blights of tomato in the dry and wet seasons in Foumbot and Santa

infection is less frequent than that of early blight but more damaging when it breaks out. In poorly maintained farms, early and late blight infections resulted to a total loss of fruits.

Wilts were common in all surveyed areas; 26.9% of the fields were infected with fusarium (*Fusarium oxysporum* f. sp. *lycopersici* (Sacc.) Snyd. & Han.) or bacterial (*Pseudomonas solanacearum* (Smith) Smith) wilt.

Fusarium wilt was most prevalent in Santa whereas, bacterial wilt was more common in Foumbot. Root rots, incited by *Pythium* spp., *Rhizoctonia solani,* or *Fusarium oxysporum,* were observed in 29.8% of the fields with a mean severity of 1.6 (Table 1). Crown rot induced by *Rhizoctonia solani* infected mostly young transplants at soil level and caused extensive decay and toppling over.

Septoria leafspot caused by *Septoria lycopersici* Speg. occurred in 18.3% of the fields while leaf mould (caused by *Cladosporium fulvum* Cke.) occurred in 13.4% of the fields (Table 1). Other foliage diseases were grey leafspot (*Stemphylium solani* Weber), grey mould (*Botrytis cinerea* Pers. ex Fr.), and bacterial spot (*Xanthomonas campestris* pv. *vesicatoria* (Doidge) Dye with a mean prevalence of < 10% and severity of < 1.5 (Table 1). Symptoms of grey mould were encountered on both the foliage and young fruits while those of leaf mould were only observed on the leaves.

Fruit rots were observed in all the fields at fruiting stage. Although nine fruit rots were identified on the fruits, the most important fruit diseases were early and late blight rots which infected fruits at any age following foliage infection.

Other fruit diseases were sour rot *(Geotrichum candidum),* bacterial soft rots *(Erwinia carotovora* pv. *carotovora* (Jones) Bergey et al.), fusarium rot *(Fusarium oxysporum),* grey mould rot, black mould rot (*Alternaria alternata* (Fr.) Keissl.), black dot (*Colletotrichum atramentarium* (Berk. & Br.) Taub., black spot (*Phoma destructiva* Plow.), and soft rot *(Rhizopus nigricans).*

Black mould rot, black dot, soft rot, and fusarium rot were often associated with insect or mechanical injuries on fruits. Buckeye rot (*Phytophthora nicotianae* B. de Haan. var. *parasitica* (Dast.) Waterh. was often isolated from fruits that had already fallen to the ground.

These results indicate that many pathogens are associated with tomato fruit damage. Ceponis et al. (2) reported 26 diseases of tomato fruits in shipments to the New York market during 1972-1984. The most important of these were sour/watery rot, grey mould rot, bacterial soft rot, and unidentified decays.

All the diseases observed in this survey have previously been reported on tomatoes in the tropics (10). Of the diseases surveyed, only seedling diseases, early blight, late blight, root rots, and fruit rots were observed in all the survey sites (Table 2).

This survey indicates that tomato growers may be more concerned with management of seedlings diseases in nurseries, and the control of early and late blights in the field. No commercial cultivars were resistant to early or late blight. These diseases have a wide distribution in Cameroon infec-

ting potato and other solanaceous crops as well (4, 5). They are also difficult to control especially during periods of frequent rainfall which favour rapid disease development. As noted in a previous report on potato (4), research is needed to be carried out to identify appropriate control measures for early and late blights of tomato in Cameroon.

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TABLE 2
Distribution of tomato diseases in Cameroon

Disease	Foumbot	Dschang	Djuttitsa	Santa
Damping-off	+	+	+	+
Seedling blight	+	+	+	+
Late blight	+	+	+	+
Early blight	+	+	+	+
Root rots	+	+	+	+
Bacterial wilt	+	+	+	-
Fusarium wilt	-	-	+	+
Septoria leafspot	+	+	-	-
Leaf mould	-	+	-	-
Grey leafspot	-	-	-	+
Grown rot	-	+	-	-
Grey mould	-	-	+	+
Bacterial spot	+	-	-	-
Fruit rot complex	+	+	+	+

+ = Disease present, - = No disease detected.

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