An Epiphytotic of Late Blight of Tomatoes in Nigeria

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ABSTRACT

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Late blight, caused by *Phytophthora infestans*, was epiphytotic in fields of tomatoes in Samaru in northern Nigeria between July and September 1978. This is the first time the disease has been reported outside the cool Jos Plateau. Preliminary screening indicated that some cultivars had tolerance to blight. When low volumes of captafol were applied at 7, 10, and 14 day intervals on 1.8 and 3.6 m swaths, none of the treatments was significantly different in the control of foliar, stem, and fruit infection.

Foliar diseases constitute a serious limiting factor to tomato production during the rains in the savannas of Nigeria (4,7). If fungicides are not applied, early blight (*Alternaria solani* Sorauer), Septoria leaf spot (*Septoria lycopersici* Speg.), and leaf mold (*Cladosporium fulvum* Cooke) may defoliate the crop by first harvest. In some years bacterial spot (*Xanthomonas vesicatoria* (Doidge) Dows.) disfigures the fruits. In the elevated (1,500 m) plateau areas, late blight (*Phytophthora infestans* (Mont.) d By.) often causes crop failure even when fungicides are applied. In 1978, at a low elevation (686 m) at Samaru, an epiphytotic of late blight occurred. This article traces the development and effect of the outbreak at Samaru.

MATERIALS AND METHODS

Two replicated field trials were conducted at the Institute for Agricultural Research, Samaru, during the 1978 wet season. Samaru (11° 11′N, 7° 38′W) is in the Northern Guinea Zone at an altitude of 686 m and has a mean annual rainfall of 1,102 mm, most of which falls between 2 May and 29 September (6).

The seeds of 49 cultivars or selections were sown in beds on 14 June and transplanted on 10 July 1978 in double rows on raised beds 3.0 m long, 1.2 m wide, and 10 cm high.

A 12:24:12 NPK fertilizer (250 kg/ha) was incorporated before planting, and nitrochalk (calcium ammonium nitrate, 26% N, 125 kg/ha) was applied 3 and 6 wk after planting. The crop was not supported, but the beds were heavily mulched with grass to prevent direct contact of fruit and soil. Each cultivar trial was replicated four times in a 7 × 7 triple lattice design. No fungicide sprays were applied.

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Fungicide sprays. A very low volume formulation of captafol (Ortho Difolatan 5, flowable, 50% a.i.) was applied at 7, 10, and 14 day intervals on 1.8 and 3.6 m swaths in a randomized block design with five replications. All aspects of field management were as previously reported (8) except that the paste cultivar Roma VFN was used. The spray was made of 2:1 captafol/water and was applied with a hand-held, battery-operated rotary atomizer (Micron ULVA 16, Micron, Bromyard, England) at a flow rate of 1 ml/sec.

Disease assessment. Blight was assessed in both trials by initially counting the number of infected leaves on a sample of plants in each treatment. When the disease became well established, a percentage scale (5) was also used.

Weather records. For both experiments, no meteorological data were taken in the experimental fields. Data were from the meteorological station about 0.1 and 1.8 km away from the two fields.

RESULTS

Reaction of cultivars to blight. Late blight was first observed on 30 July 1978, as the first trusses were being formed. The disease started at the western side of the field and spread to other parts of the crop within a week. The prevailing southwest wind contributed to spread from the original foci, and defoliation and stem and fruit infection were quite severe by the middle of August, which was a period of heavy prolonged rains (Fig. 1). There was, however, a steep infection gradient along the east-west axis of the field. The severity of the disease is shown in Table 1. Fruit yield was very severely affected, but because other diseases such as Septoria leaf spot, leaf mold, and root-knot nematode infestation also contributed to yield loss, the yields are not shown in Table 1.

Some tomatoes for processing (eg, Napoli VF, Piacenza 0164, Rossol VFN, and Roma) appeared to have some tolerance to the complex of leaf diseases.

Effect of fungicide sprays. Five irregularly distributed foci of late blight were observed toward the end of July 1978, and within two weeks all plots were infected. The weekly disease scores did not reveal significant differences among the treatments, although the tomatoes sprayed weekly were less infected (Table 2). The fruit was also much affected by

Table 1. Severity of late blight on unsprayed tomatoes in 1978 in Samaru, Nigeria

Cultivar	No. of infected leaves/plant[a]	Blight (%)[b]
Arc	11.5	90.0
Campbell 37	8.6	78.8
Floramerica	3.8	75.0
Laurano	11.9	68.8
Sanguinario	5.3	68.8
Cal J	4.7	68.8
Red River	2.7	68.8
VF 105J	11.2	62.5
Calypso	7.3	62.5
72 NR-12-2	3.3	62.5
Red Rock	12.7	56.3
Ace	5.4	56.3
Petogrow	4.3	56.3
Earlystone	4.0	56.3
Rutgers	2.2	56.3
Florida MH 1	1.4	56.3
Campbell 28	1.2	56.3
Lafayette	5.0	51.3
Cal Ace	7.4	50.0
Carette	6.8	50.0
NC 1965-54	4.8	50.0
Walter	3.4	50.0
Tamiami	2.9	50.0
Marglobe	2.7	50.0
584-1	2.3	50.0
583-1	5.2	46.3
53 RC	7.7	45.0
Super California	9.9	43.8
585-1	6.0	43.8
Merit	6.0	43.8
Floralou	3.2	43.8
Pavebo	2.3	43.8
NC 1965-51	2.1	43.8
Napoli VF	5.1	38.8
Atkinson	3.3	38.8
Marion	8.2	37.5
Tropic VFS	3.6	37.5
Ronita	2.2	37.5
Monterey	8.4	32.5
AT 70/24	3.0	32.5
Bonny Best	2.8	27.5
Florida Improved	9.3	26.3
Romulus VFN	9.0	26.3
Piacenza 0164	5.3	26.3
Roma	4.2	26.3
Local Hyi (control)	3.4	21.3
Roma VF	4.8	20.0
Rossol	4.8	20.0
AT 70/11	10.8	19.0
S.E. ±	3.9	12.4

[a] Mean of four replicates, 2 wk after onset of blight.
[b] Based on 0–100 scale in which 0 = no disease observed in plot and 100 = all leaves dead and stems dead or dying.

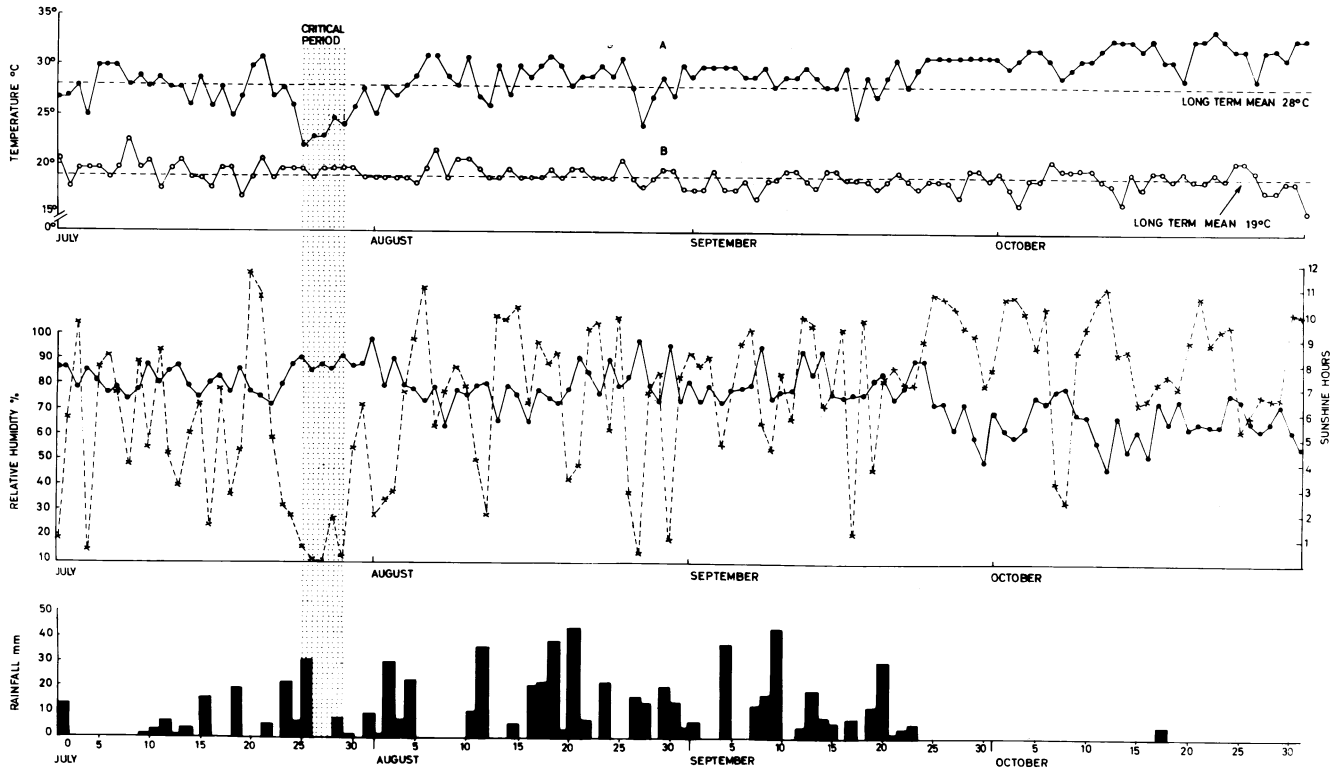

Fig. 1. Weather data for Samaru from July to October 1978: **(Top)** Long-term (50-yr average) maximum **(A)** and minimum **(B)** temperatures. **(Middle)** Number of hours of sunshine is shown as broken line.

Table 2. Severity of late blight in the tomato cultivar Roma VFN sprayed during the 1978 wet season with captafol at 7, 10, and 14 day intervals at 1.8 and 3.6 m swath widths

Swath width (m)	Volume (L/ha)	Spraying intervals (days)	No. of applications	Infected leaves on August: 12	19	25
1.8	10	7	8	2.0	7.4	22.6
1.8	10	10	6	5.1	12.5	24.1
1.8	10	14	4	3.3	11.3	23.6
3.6	5	7	8	3.2	9.8	22.3
3.6	5	10	6	6.1	15.8	27.6
3.6	5	14	4	6.5	11.8	25.1
S.E. ±				1.9	2.8	2.6

[a]Mean number.

late blight, and none of the treatments gave satisfactory control. As in the unsprayed experiment, there were other foliar diseases in that field, so differences in yield could not be apportioned to control of late blight alone.

DISCUSSION

Weather factors in relation to outbreak of potato blight have been studied in temperate countries (1,2,9). Examination of the weather in July 1978 (when blight was first observed) at Samaru showed that maximum temperatures were about 2.3 C lower than the long-term average for the month (Fig. 1).

The critical period apparently came on 25 July 1978 when 31.8 mm rain fell and the maximum temperature dropped to 22 C and did not rise above 25 C for the next four days. Furthermore, the sky was overcast during most of that period (mean sunshine from 25–30 July was 0.3 hr/day) and relative humidity was 82–94% (Fig. 1). Once the blight became established, further spread was probably encouraged by the high rainfall (324.9 mm) in August (the long-term average for the month is 280.4 mm). Although maximum temperatures rose to 28–30 C in September, infection continued into this period, suggesting that the strain(s) of *P. infestans* might have tolerance to higher temperatures.

The origin of the primary inoculum responsible for the 1978 epiphytotic is unknown. Late blight had not been reported before on tomato outside the cool Jos Plateau, although the disease had been found previously on a few isolated Irish potato plants in 1971 at a location 25 km away from the experimental station. It is therefore possible that infected potato plants or tubers in the Samaru area may have been the source of the primary inoculum since the fungus is known to be tuber-borne (3).

It can be concluded that the 1978 outbreak of late blight occurred because of the peculiar weather in the Samaru area. This pattern of weather apparently did not extend as far as a traditionally important potato-growing area 25 km north of Samaru where a survey showed that late blight was absent.

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