Incidence of bacterial blight of field beans in southwestern Ontario in 1975'

V.R. ***Wallen and D.A. Galway***

Bacterial blight ***[Xanthornonas phaseoli]*** was detected by aerial infrared photography in 83% of the field bean ***(Phaseolus vulgaris)*** fields surveyed in the Hensall, Ontario, area in 1975. The prevalence of blight in pedigreed seed crops in the area has increased since 1973, with 46% of the Select plots and 52% of the Foundation fields affected in 1975; however, the incidence of blight per field has remained at a low level. In the Chatham area only 7% of the fields examined were affected.

Can. Plant Dis. Surv. 56: 85-87. 1976

En 1975, on a decele, par photographie aerienne a l'infrarouge, la presence de brûlure bacterienne ***(Xanthornonas phaseoli***) dans 83% des champs de haricots secs ***(Phaseolus vulgaris)*** etudies dans la region de Hensall (Ontario). La frequence de la maladie dans les cultures de semences genealogiques s'est accrue dans la region depuis 1973, atteignant 46 et 52% respectivement dans les superficies en semences selectes et de fondation. Toutefois, la frequence de la brûlure par champ est demeurée faible. Dans la region de Chatham (Ontario), seulement 7% des champs etudies etaient atteints.

Bacterial blight ***[Xanthomonas phaseoli*** (E.F.Sm.) Dows., common blight, and ***Xanthomonas phaseoli*** var. ***fuscans*** (Burkh.) Starr. & Burkh., fuscous blight] has remained at a low level in the Ontario field bean crop for the past few years (1,2), due primarily to the Select Seed Program whereby basically healthy breeder-seed stocks of field beans are imported from Idaho. By rigid inspection of the Select plots, the progeny of breeder seed, and by rejection of any plots showing infection, initial seed stocks for Foundation seed fields have been, for the most part, disease-free. Trace infections in the Select seed may occur because of plants that do not exhibit infection at inspection time or are not detected in laboratory analysis.

Aerial infrared photography and a drum scanner technique (5) have been used to monitor the Ontario field bean crop for a number of years. At the same time, extensive ground surveys have been made to support the interpretation of the aerial photographs. In the first years of the survey, 1968 and 1970, 4.63% and 6.56% of the crop was affected by blight (3,4). Blight declined to 0.67% in 1972 (1), was too low to measure in 1973, and was less than 0.2% in 1974 (2).

Methods

In 1975, 28 fields (282 hectares) in the Chatham area and 59 fields (519 hectares) in the Hensall area were aerially photographed and ground surveyed for the incidence of bacterial blight. All photography was taken at a scale of 1:6,000 at an altitude of 6,900 ft above sea level. A Zeiss camera with a 12-inch focal length and Kodak Aerochrome Infrared 2443 film, 9 x 9 format, developed as a positive, were used. The photographs were taken on August 12 in the Hensall area and on August 14 in the Chatham area. The ground truth surveys commenced on July 28 and ended on August 21. Three hectares or more were examined in each field for blight and samples from infected leaves were forwarded to the Ottawa laboratory for identification of the causal organism.

For proof of pathogenicity, aqueous suspensions of colonies produced on nutrient agar were injected by means of a sterile hypodermic syringe into the primary leaf nodes of 2-week-old bean ***(Phaseolus vulgaris*** **L.** 'Seafarer') seedlings maintained in controlled environment growth chambers at close to 100% relative humidity, with a 16-h photoperiod at 26°C and an 8-h dark period at 18°C.

Disease interpretations were made from 9 x 9 inch color IR prints and from ground truth notes. Field infection percentages were determined using the drum scanner method (5).

Results and discussion

In contrast to the results of 1974, when blight was found in only 4 of 97 fields, measurable blight was detected by aerial photography in 49 of 59 fields surveyed in the Hensall area in 1975. The ground truth survey reported 21 fields affected. Of the 21 fields that were sampled, 16 yielded pathogenic cultures of ***Xanthomonas phaseoli*** and 4 yielded pathogenic cultures of ***Xanthomonas phaseoli*** var. ***fuscans*** (Table I). Despite the high number of fields with blight, the amount per field was low because of a low seed-borne incidence in the Foundation seed stock used for planting

[1] ***Contribution No.459, Ottawa Research Station, Agriculture Canada, Ottawa, Ontario K1A 0C6***

Table 1. Incidence of bacterial blight of field beans in the Hensall and Chatham areas in Ontario, 1975

Location	No. fields surveyed	Area (ha)	No. of fields affected: Ground truth survey	No. of fields affected: Aerial IR survey	Causal organism: *X. phaseoli*	Causal organism: *X. phaseoli var. fuscans*
Hensall	59	519	21	49	16*	4
Chatham	28	282	2	__**	2	

* In addition to the 16 pathogenic *X. phaseoli* types, one nonpathogenic *X. phaseoli* culture was isolated.
** Infection level in trace amounts, not detected by aerial photography.

Table 2. Incidence of bacterial blight in the Hensall, Ontario, area, 1975, as determined from aerial IR photographs

Field no.	Total area (ha)	Infected area (ha)	Percent infection
1	7.85	0.0133	0.170
2	1.90	0.0072	0.377
3	3.56	0.0190	0.533
4	8.46	0.0632	0.747
5	19.28	0.0393	0.204
6	8.18	0.3107	3.798
7	2.33	0.0062	0.266
8	9.44	0.0690	0.731
9	13.08	0.1338	1.022
10	35.11	0.0477	0.136
11	15.01	0.0076	0.051
12	3.24	0.1096	3.387
13	0.49		
14	2.11	0.0161	0.764
15	4.32		
16	0.90		
17	5.21	0.0222	0.425
18	8.46		
19	9.63	0.0039	0.040
20	1.11	0.0067	0.604
21	2.89	0.0148	0.511
22	10.76	0.0029	0.027
23	5.62	0.0277	0.492
24	4.85	0.0319	0.657
25	0.74		
26	3.78	0.0066	0.175
27	6.87	0.0046	0.068
28	12.29	0.0263	0.214
29	12.14	0.0597	0.492
30	7.30	0.0350	0.480
31	2.22	0.0072	0.323
32	0.22		
33	11.68	0.0626	0.536
34	9.00	0.0465	0.516
35	16.17	0.0462	0.286
36	14.01	0.0469	0.335
37	11.12	0.0053	0.048
38	5.08	0.0037	0.072
39	11.22	0.0256	0.228
40	23.58	0.0213	0.090
41	2.26	0.0037	0.162
42	0.81	0.0032	0.391
43	7.47		
44	7.47		
45	3.44	0.0094	0.273
46	17.69	0.0935	0.528
47	14.95	0.0193	0.129
48	4.63	0.0075	0.162
49	5.99	0.0032	0.0533
50	26.86	0.0318	0.118
51	26.76	0.0807	0.302
52	13.06	0.0178	0.136
53	8.40	0.0096	0.115
54	2.89	0.0457	1.584
55	6.82	0.2472	3.624
56	6.82	0.0617	0.905
57	13.54	0.0024	0.018
58	4.85		
59	11.86		
Total	519.24	1.9870	
Overall percent infection			0.383

Table 2. (Cont'd)

most of the commercial seed fields in the area. The overall percent infection in the Hensall area was 0.383 and the highest infection level ih any one field was 3.798% (Table 2).

The increase in the number of fields with blight, as compared to 1974, can possibly be explained by the increasing number of Foundation fields affected since 1973: 5.8% in 1973, 22.1% in 1974, 51.8% in

1975. The percentage of Select plots affected by blight was low in 1973 and 1974, 5.7% and 12.2% respectively, but increased dramatically in 1975 to 46.5%. Despite the increase in the number of affected fields, the incidence per field has remained at a low level. At present we have no explanation for the sudden increase in prevalence of the disease.

In the Chatham area blight was at an extremely low level with only 2 of 28 fields affected, both by common blight.

Literature cited

1. Wallen, V.R., and D. Galway. 1974. Monitoring field beans in Ontario for bacterial blight and root rot by aerial photography-1972. Can. Plant Dis. Surv. 54:61-63.
2. Wallen, V.R., and D.A. Galway. 1975. Incidence of bacterial blight of field beans in southwestern Ontario in 1973 and 1974. Can. Plant Dis. Surv. 55:73-74.
3. Wallen, V.R., D. Galway, H.R. Jackson, and L.E. Philpotts. 1973. Aerial survey for bacterial blight, 1970. Can. Plant Dis. Surv. 53:96-98.
4. Wallen, V.R., and H.R. Jackson. 1971. Aerial photography as a survey technique for the assessment of bacterial blight of field beans. Can. Plant Dis. Surv. 51:163-169.
5. Wallen, V.R., and L.E. Philpotts. 1971. Disease assessment with IR-color. Photogramm. Eng. 37:443-446.