CONTROL OF SCLEROTINIA ROT OF FRENCH BEAN

Sclerotinia rot, caused by the fungus *Sclerotinia sclerotiorum* (Lib.) de Bary, is at present the most important disease problem of French bean production and marketing in Queensland. Field infections range from occasional plants to 100 per cent. of the stand. Serious losses are also encountered in market consignments, when the disease is commonly known as "nest". The chemical control of Sclerotinia rot was investigated at Nambour during the 1962 winter bean season.

Post-Harvest Chemical Treatment

When pods infected with *S. sclerotiorum* are introduced into market containers the fungus rapidly infects and decays adjacent pods. Infected pods may be easily overlooked by the grower. Also pods with incipient, invisible infection may result in eventual decay of the consignment.

Selected fungicides were tested for their efficacy in controlling the disease when used as post-harvest dips. Bean pods were harvested from plantings with a high incidence of Sclerotinia rot and where there was ample evidence of recent ascospore infection.

The fungicides used were—

(*a*) "Allisan"—a 50 per cent. wettable powder formulation of 2,6-dichloro-4-nitroaniline.

(*b*) "Shirlan" W.S. with 95 per cent. sodium salicylanilide tetrahydrate.

(*c*) Mycostatin 20.

There were five treatments with four replications. Each application was made to 5 lb. of pods. After being dipped in the chemicals for 5–10 sec. the pods were stored in perforated plastic bags under conditions of high humidity at 58°F to 65°F. Evaluations were made after 3, 6, 8 and 11 days' storage. On each occasion the infected pods were counted and discarded. The results (Table 1) show that "Allisan" at 2 lb/100 gal gave outstanding control of Sclerotinia "nest". Mycostatin and "Shirlan" were ineffective.

TABLE 1

AVERAGE NUMBERS OF INFECTED PODS AT VARIOUS INTERVALS AFTER A POST-HARVEST DIP WITH VARIOUS CHEMICALS

Treatment	3 Days	6 Days	8 Days	11 Days	Total
Control (not dipped)	12	10	9	50	81
Water dip	17	15	15	86	133
"Allisan," 2 lb/100 gal	0·5	0	0·1	0	0·75
"Mycostatin 20" 200 p.p.m.	3	10	7	45	65
"Shirlan" 10·7 oz/100 gal	4	7	0·25	25	36·25

It was also decided to check the efficacy of "Allisan" in controlling the mycelial spread of *S. sclerotiorum* in harvested pods. In this trial five infected pods with active lesions more than 10 cm in length were placed in the centre of 1-lb lots of bean pods harvested from a Sclerotinia-free planting. Three treatments were used with three replications. Evaluation and dipping were as in the previous experiment except that infected pods were not discarded but were replaced in their relevant bags. Results are given in Table 2.

TABLE 2

AVERAGE NUMBERS OF INFECTED PODS AT VARIOUS INTERVALS FOLLOWING POST-HARVEST CHEMICAL DIPS

Treatment	3 Days	5 Days	10 Days
Control (not dipped)	32	54	63
"Mycostatin 20" 200 p.p.m. ..	21	41	58
"Allisan," 2 lb/100 gal	0	0	0

In another experiment "Allisan" at a concentration of 1 lb/100 gal also gave good control of nestiness. This time each of the applications involved 4 lb of pods. The average numbers of infected pods after 11 days were:—"Allisan" (2 lb/100 gal) 0·25; "Allisan" (1 lb/100 gal) 0·5; untreated 26.

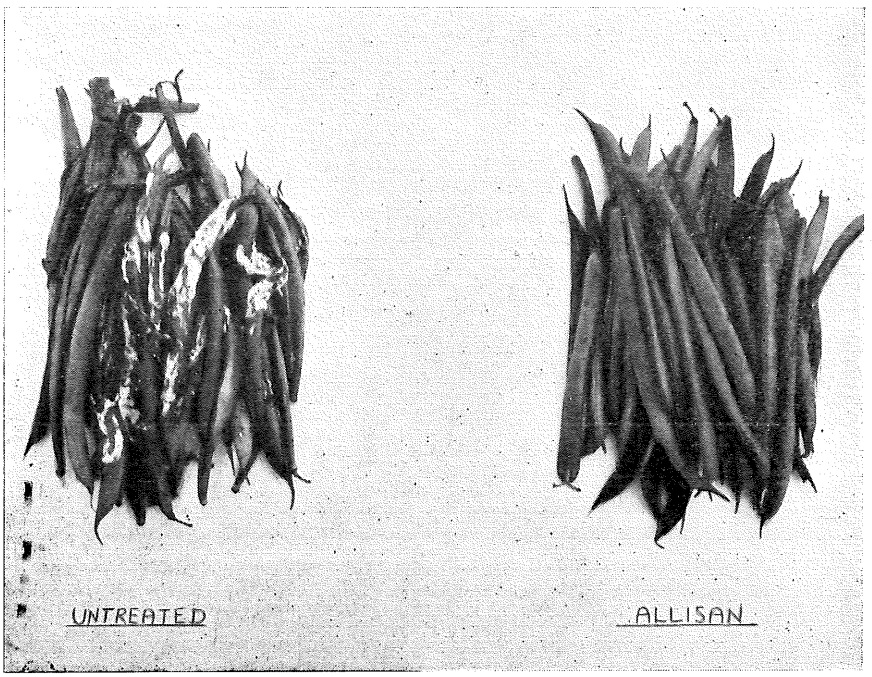

Fig. 1—Typical samples of bean pods harvested from infected bushes. Left, untreated. Right, dipped in "Allisan"

Captan was also compared with "Allisan" as a post-harvest dip in an experiment in which there were four replications, each application involving 7 lb of pods. The average numbers of infected pods after 6 days were:— "Allisan" (2 lb/100 gal) 0·5; Captan (2 lb/100 gal) 34; untreated 50.

In a further trial actual market consignments of beans were treated with "Allisan". Bags containing 50 lb of beans were dipped in the fungicide, which again gave outstanding results. One disadvantage of this treatment was the yellow discolouration of the bag and the yellow deposit remaining on the pods, which were too tightly packed to allow adequate drainage. In the several experiments reported here, "Allisan" proved to be particularly effective as a short-time post-harvest dip for the control of Sclerotinia rot of beans. There could be a public health hazard with such a treatment of edible produce and this aspect is at present under consideration by the Queensland Department of Health and Home Affairs.

Cover Spraying

In the field Sclerotinia rot is most destructive in the post-flowering phase of autumn and winter bean plantings. During moist, cool conditions the ascospores germinate quite readily on the fallen petals adhering to the plant and infections progress from these sites. When fungus invades portion of the stem, the part of the plant beyond the point of entry quickly wilts and dies. This is most serious when the basal portion of the stem is attacked, because death of the whole plant soon eventuates.

A planting of the bean variety Redlands Greenleaf was used to test the efficacy of three fungicidal preparations as cover sprays. The experimental design was a randomized block containing five replications of five treatments. The component plots measured 15 ft in length by four rows wide. The treatments were:—

(1) Control (untreated).

(2) Captan at 2 lb/100 gal—2 applications.

(3) Ferric Omadine at 2 lb/gal—2 applications.

(4) "Allisan" at 2 lb/100 gal—2 applications.

(5) "Allisan" at 2 lb/100 gal—3 applications.

Cover sprays were first applied when the plants were in full blossom. Sprays were repeated one week later. A third application of "Allisan" was applied to Treatment 5 12 days later.

The disease incidence in relation to treatment was assessed on the yield on healthy pods from the two datum rows of each plot, the percentage of plants with basal stem infection, the percentage of plants with top infection, and the percentage of healthy pods developing nest in storage. The results with any necessary analyses are contained in Table 3.

TABLE 3

EFFECT OF COVER SPRAYS ON INCIDENCE OF SCLEROTINIA ROT

Treatment	Mean Yield of Healthy Pods	Mean Percentage of Healthy Plants	Mean Percentage of Plants with Basal Stem Rot	Mean Percentage of Plants with Top Infection	Mean Percentage of Pods Developing "Nest" in Storage from		
					1st Pick 22.viii.62	2nd Pick 28.viii.62	3rd Pick 4.ix.62
	lb oz						
Control	7 9	5·2	21·0	73·8	40·6	23·0	*
Ferric Omadine	7 8	3·0	28·0	69·0	45·0	Not kept	*
Captan	7 9	1·2	33·8	65·0	48·2	Not kept	*
"Allisan," 2 sprays	12 6	19·2	0	76·6	40·2	27·6	26·0
"Allisan," 3 sprays	14 5	52·6	0	47·4	2·2	4·4	23·0

* No healthy pods in these treatments at the time of third harvest

ANALYSIS OF TABLE 3

—	"Allisan," 2 sprays	"Allisan," 3 sprays	Mean Difference, 3 sprays v. 2 sprays	Significance
Total yield healthy pods ..	12 lb 6 oz	14 lb 5 oz	1·94 ± 0·794 lb	Not significant
Percentage plants top infected ..	76·6	47·4	—29·2 ± 10·12	5% level
Percentage pods from 1st pick developing "nest" in storage	40·2	2·2	—38·0 ± 5·54	1% level

"Allisan" increased yields significantly and eliminated basal infection of the plants. Top infection (infection of flower, stem and petiole, etc.) was not adequately controlled. However, three applications of "Allisan" significantly reduced the percentage of plants with top infection. This type of infection could possibly be controlled by correct timing of fungicidal applications. There was a significant reduction in the amount of "nest" developing on pods harvested from those plots which received three applications of "Allisan". This control did not carry through to the third harvest.

In a further trial, a 4 per cent. dust formulation of "Allisan" proved ineffective. Also, "Allisan" when applied at 1 lb/100 gal did not give the same control as when used at 2 lb/100 gal.

Further work will be conducted next season with the emphasis on spray application timing, row spacings and seedling distances within the row.

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