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CONTROL OF LETTUCE DISEASES BY FUNGICID SPRAYS AND SOIL DRENCH

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AERIAL FUNGAL DISEASES ON LETTUCE IN THE CARIBBEAN

Only two fungal diseases of aerial parts of lettuce have been found as yet in Guadeloupe and Martinique:

Septoria lactucae PASS. causes diffuse yellowings on the leaves, where minute black dots (pycnides) can be seen very early. A few days later, these yellow areas become necrotic; under severe attacks, the whole leave may dry off. Some inoculation experiments showed that the incubation time was rather long: 8-10 days in the field, and up to 15 days under glasshouse conditions.

Cercospora longissima (COGINI) SACC. causes conspicuous, circular, dark-brown to black leaf spots, the diameter of which ranges from 2 to 12 mm.

Although epidemiological trials were not carried out it seems probable from the general properties of Septoria and Cercospora genus, that septoriose on lettuce is more severe under rainy conditions whereas cercosporiose could be a problem even under drier conditions.

FUNGICID SCREENING

In a first trial, the following chemicals were compared:

Mancozeb	300g/hl	Commercial	formulation
Propineb (Antracol)	300g/hl	"	"
Benomyl (Benelate)	100g/hl	"	"
Cupric hydroxide (Kocide)	223g/hl	"	"
Copper oxychloride (Cupravit)	250g/hl	"	"

By each treatment, 3 liters were spread on 60 plants.

The trial was done as a randomized design replicated 4 times each chemical being tested with and without a surfacting agent (Triton X 114:2.5 cm^3/).

The seeds were sown on July 17th, 1971. The seedlings were transplanted into small pots on August 4th, and in the field (lateritic soil, spacing 20 x 25 cm) on September 7th. Two successive inoculations with Septoria lactucae were carried out on September 10th and 17th (first symptoms on Sept. 19th). Two sprays were made: September 28th and October 6th. The harvest occurred from October 13th to 18th.

The Cercospora occurred spontaneously in the trial.

The total weight harvested and the commercial weight were noted, as well as the diseases severity (scale ranging from 0 to 4).

The results are summarized in Table 1. Benelate is clearly the best chemical against both diseases. The total and commercial weight are much higher, the rubbish (diseased leaves), is much less important, which corresponds to much less severe attacks by both pathogens. The addition of a surfacting agent is not necessary. In addition, it can be said that the Benomyl treated plants seemed to have a better heading than the others. Benomyl treated plants not in the experiment showed a flowering delayed by 6-8 days.

BENOMYL TREATMENTS

A second trial was carried out in order to determine the optimal mode of treatment by Benomyl. A split-plot pattern was adopted: in a plot, half the plants had received a Benomyl soil drench in their nursery pots (4.5 mg active substance per plant). Three types of aerial sprays (50g active substance per hl.) were compared with a control:

An early spray: 8 days after transplanting
A late spray : 16 days " "
Two sprays : 8 and 16 days "

Sowing 14/12/71. Transplanting into pots: 6/1/72. Pot drench 12/1/72. Field transplanting: 24/1/72. Septoria inoculation 28/1/ and 4/2/72. First spray 1/2/72. Second spray 9/2/72. Harvest 21-25/2/72.)

In this trial, only Septoria lactucae occurred.

The results are summarized in Table 2.

It can be said from the figures that a nursery pot soil drench is sufficient for the protection of the plant until harvest.

Without any nursery soil drench, two sprays should be done before harvest. In the case of a single spray, an early spray is not significantly better than a late one though it would be advisable to spray rather early for fear of the presence of a massive inoculum.

In this trial, the soil treated plants showed a conspicuously better heading.

An estimation of the total dose of Benomyl for each plant (45 mg for the soil drench, 2 mg for each aerial spray) plotted against yields and disease prevalence shows that the optimal doses are between 4 and 65 mg per plant (active substance). It should be pointed out that these doses refer to the whole life of the plant. A dose higher than 65 mg in a single application is dangerous, particularly in the soil.

In order to determine the effectiveness of Benomyl, used as a soil drench, a third trial was carried out, in which a naked roots field transplantation was made. There was no pot transplantation: the sowing was made in a seedbed on which several doses of Benomyl were applied (0, 0.25, 0.5, 1,2,4, and 8g commercial formulation per square meter). The germination was better with all Benomyl doses than in the control, which shows that certain seedbed soil fungi were controlled. But the $8g/m^2$ dose was highly phytotoxic. The plants having received the other doses, and the control plants were transplanted (naked roots transplantation). No aerial spray was used. No disease prevalence was noted; which seemed to be quite uniform in the plots. The total and commercial weights results are summarized in Table 3. The highest dose of Benomyl gives slightly better results than the other ones; but this result does not indicate a residual of the fungicide in the plant, since the disease prevalence was rather high even with this dose as shown by the high percentage of rubbish. The highest dose transplants were much bigger than the other ones, which could explain these results. The figures demonstrate than the effect of a Benomyl seedbed drech is mainly due to the remanence of the fungicide in the soil transplanted with the plant, rather than in the plant itself.

CONCLUSION

Benomyl is very efficient against the lettuce fungal diseases which occur in the Caribbean (mainly Septoriose), both as aerial sprays or as a seedbed soil drench. In the latter case, the dose should be about 2 g Benomyl (active substance) per square meter or (if in small pots) about 3-4 mg/plant. The field transportation should be made with some soil around the root system, which warrants both a better survival of transplants and the remanence of Benomyl. This method uses about 0.7g commercial formulation for 100 plants, instead of 10 g for two aerial sprays, and requires less work too. We think it would be very interesting for lettuce growers.

TABLE 1

Results of a Screening Trial

Treatment*		Total weight (in g. harvested per plant)	Commercial weight (in g. per 1 plant)	Disease prevalence (scale 0-4) Septoria	Cercospora
Kocide	M+	74.6 b c	29.8 c (40%)	0.4	2.45
	M-	64.2 b c	28.4 c (44.2%)	0.4	1.90
Cupravit	M+	54.7 b c	22.9 c (41.9%)	0.4	2.20
	M-	72.5 b c	25.6 c (35.3%)	0.4	2.55
Mancozeb	M+	63.2 b c	26.9 c (42.5%)	0.8	2.40
	M-	68.5 b c	25.8 c (37.7%)	0.2	2.25
Benelate	M+	95.8 ab	69.0 b (72%)	0	0.67
	M-	121.1 a	98.1 a (81%)	0	0.26
Antracol	M+	68.4 b c	28.3 c (41.4%)	0.1	2
	M-	70.9 b c	34.0 c (47.9%)	0.2	1.85
Control	M+	45.1 c	14.6 c (32.4%)	0.75	2.30
	M-	57.9 b c	17.5 c (30.2%)	0.2	1.75

*M+ = surfactant added
M- = no surfactant
Percentage in the second column= commercial weight as a percentage of the total weight

TABLE 2

Results of a Trial on the Optimal Benomyl Treatment

Treatment*		Total weight (g. per plant)	Commercial weight (g. per plant)	Disease prevalence (scale 0-5)
Control	B+	197 ab	177 a (89.8%)	0.26 ab
	B-	97 c	72 c (74.2%)	3.62 d
Early spray	B+	189 ab	168 a (88.9%)	0.14 a
	B-	175 ab	139 ab (79.4%)	2.64 c
Late spray	B+	202 a	183 a (90.6%)	0.06 a
	B-	150 b	122 b (81.3%)	1.01 b
Both sprays	B+	185 ab	167 a (90.3%)	0.09 a
	B-	198 ab	176 a (88.9%)	0.34 ab

*B+ = Benomyl as a nursery pot drench
B- = no Benomyl drench
% in the second column = commercial weight as a percentage of the total weight

TABLE 3

Effect of Several Doses of Benomyl Applied as a Seedbed Soil Drench

Dose of Benomyl	Total weight (g) per plant	Commercial weight (g) per plant
Control	55.6 bc	37.0 b (66.5%)*
0.25 g/m^2	60.9 ab	38.1 ab (62.5%)
0.50 g/m^2	73.4 ab	45.9 ab (62.5%)
1 g/m^2	45.7 c	30.4 b (66.5%)
2 g/m^2	51.5 bc	33.0 b (64.0%)
4 g/m^2	87.3 a	56.7 a (64.9%)

* Commercial weight as a percent of total weight