Timing Fungicidal Control of *Sclerotinia minor* Causing Drop of Lettuce Grown on Organic Soils in New York

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ABSTRACT

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The dicarboximide fungicides vinclozolin (Ronilan 50WP) and iprodione (Rovral 50WP) were effective in controlling *Sclerotinia minor* causing drop of lettuce grown on organic soils in New York. Weekly sprays with vinclozolin at 1.12–1.68 kg/ha (2–3 lb/acre) beginning 3 wk after planting and continuing until 1 wk before harvest provided the best control of all fungicides and schedules tested. Infection of lettuce by *S. minor* generally did not occur until about 2.5 wk before harvest, and infections taking place less than 1 wk before harvest often did not result in unmarketable lettuce heads. Under these conditions, effective control of lettuce drop was achieved with as few as three sprays with vinclozolin beginning 1–2 wk after thinning and continuing for a total of three consecutive weekly sprays.

Additional key words: *Lactuca sativa*

Lettuce drop, caused by *Sclerotinia minor* Jagger and *S. sclerotiorum* (Lib.) de Bary, is an extremely destructive disease of lettuce (*Lactuca sativa* L.) grown on organic soils in Oswego County, New York. Although *S. sclerotiorum* can be found in many fields, most disease (>95%) is caused by *S. minor*. Losses in New York have been estimated to be as high as 25–30% per year (17). The disease is highly dependent on moisture, and in some fields in some years, losses may reach 100% (27). In such years, losses of marketable heads have been observed to be consistently 30% or more in many fields. Although much work has been done on this disease in other lettuce-growing areas, no highly effective control measures have been available to New York lettuce growers for use in Oswego County or elsewhere in the state until recently. No resistant cultivars of iceberg-type head lettuce are known, although sources of resistance have been identified in several *Lactuca* species (1). Cultural controls such as crop rotation and flooding are often prevented by other factors such as crop specialization and local drainage characteristics (27). Until recent years, the only fungicide labeled for lettuce in New York was dicloran, which is only moderately effective and not widely used.

Sclerotia of *S. minor* can germinate carpogenically in nature (8), but apothecia of *S. minor* were not observed in the present study despite repeated searches. Infection of lettuce by *S. minor* occurs by direct germination of sclerotia to produce hyphae that infect the main stem at or near the ground line, leaf margins or midribs in contact with the soil, and roots (7,15). Infection may also occur in leaf axils by sclerotia carried in organic soil that accumulates in leaf axils during cultivation or by wind or rain splash (26). Therefore, chemical pesticides need to be applied in such a way as to kill sclerotia in the soil and/or protect the lower leaves, stem, and leaf axils from direct infection by hyphae from sclerotia (24).

Among fungicides used as foliar protectants, weekly applications of PCNB were effective alone or in combination with other fungicides (3,5,21), but results were not consistent (22). Better control has been obtained with dicloran when applied as weekly or biweekly foliar sprays (4) or as a single spray applied to the soil immediately after lettuce plants were thinned (15). Cost-effective control with dicloran was obtained only when disease incidence was relatively high (5–30%), because a higher percentage of infections originated on the roots when disease incidence was low (1–2%) (15). The relative importance of root infection of lettuce grown on organic soil in New York is not known. Benomyl was effective in controlling lettuce drop when applied as a foliar spray (10,15,18,23), particularly when applied early in the lettuce-growing season (10,18). Control with benomyl, as with PCNB and dicloran, was variable, however, and often ineffective when disease incidence and severity were high, as is common in New York.

The dicarboximide fungicides, including vinclozolin (Ronilan), iprodione (Rovral), and procymidone (DPX 4424), are a new group of nonsystemic protectant fungicides that are very effective against *Sclerotinia* species and related fungi (19,20). All three fungicides were effective in controlling lettuce drop when applied as three or more foliar sprays (12,14,23). Reduced numbers of sprays were often not as effective unless disease incidence and/or severity were low (12,14).

Because of the lack of effective control measures available to New York lettuce growers and the destructiveness of this disease, field trials were conducted in commercial lettuce fields to determine the effectiveness of different fungicides and application timing schedules for controlling drop of lettuce grown on organic soils.

MATERIALS AND METHODS

Fungicide spray trials were established in commercial lettuce fields (organic soil) in Oswego County, New York. Nineteen trials were established from 1978 through 1982 in 10 fields belonging to six growers. Six lettuce cultivars were included. All trials were established in grower-seeded fields on raised beds at lettuce-thinning time (about 3 wk after planting). Normal cultural practices including fertilizer and pesticide applications were conducted by

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the grower-cooperators, except care was taken to prevent overspraying the plots with fungicides (4). All fields in which fungicide trials were established had a history of lettuce drop, and all lettuce drop in the plots resulted from naturally occurring infections. Plants infected with *S. minor* were observed at all farms on which trials were established; plants infected with *S. sclerotiorum* were observed at two farms.

Two types of trials were conducted: 1) spray trials that involved weekly sprays with different chemicals, combinations, and rates of application beginning at lettuce-thinning time and continuing until 1 wk before harvest; and 2) timing trials that involved different spray schedules and sometimes included different rates for the schedules.

All trials consisted of single-row treatments, each 7.7 m (25 ft, 4 in.) long and replicated four times in a randomized complete block design. There were usually 17–25 plants per treatment replicate. Sprays were applied with a hand-held CO_2-pressurized sprayer at 1×10^5 Pa (15 psi). The spray boom was equipped with two nozzles (TeeJet 8002, delivering a fan-shaped pattern) mounted so that spray was directed at the plants from the sides or at a 45° angle from above. Fungicides were applied at the rate of 935 L of water/ha (100 gal/acre). For treatments with wettable powder fungicides and without adjuvants, Triton B-1956 spreader-sticker at the rate of 438 ml/ha (6 oz/acre) was added. All control treatments except those in the 1982 trials were sprayed weekly with Triton B-1956 at the same rate.

Each lettuce plant in each trial was examined weekly beginning 4–5 wk before harvest. The plants were rated according to the presence or absence of infections by *S. minor* (as evidence by mycelium and/or sclerotia of *S. minor* on any plant part) and the degree of marketability of the lettuce head. Results for each treatment were expressed as mean percent infection and mean percent marketable heads. Marketable heads included lettuce heads not infected by *S. minor* and those with *S. minor* infections on stems or lower leaves that could be trimmed off during cutting and packing. Harvest data were analyzed by a two-way analysis of variance and Duncan's multiple range test. Regression analysis was used to analyze data collected over entire growing seasons.

Soil samples were collected from within plots and/or fields adjacent to the plots to determine an average inoculum density for the area on each farm on which trials were established. Sclerotia of *S. minor* were separated from the samples with the wet-sieve glycerine-flotation procedure (2), except four subsamples (25 g of oven-dry soil each) were assayed instead of three 10-g subsamples, and subsamples were not blended in the Waring Blendor before wet-sieving. Also, contents of the no. 10 soil sieve (2-mm opening, U.S. Standard Testing Sieve) used in this technique were examined for the presence of sclerotia of *S. sclerotiorum* before discarding this material.

RESULTS

Weather, inoculum density, and occurrence of disease. Incidence and severity of lettuce drop were generally very high in three of the five years during which the trials were conducted (1978, 1979, and 1981). Climatological records from the National Oceanic and Atmospheric Administration reporting stations nearest the lettuce-growing areas of Oswego County indicated more precipitation during the months preceding harvest during those years than during the two low-disease years (1980 and 1982). Twelve of the 19 trials had high disease levels (greater than 14% infection) in the unsprayed control treatments, whereas seven trials (six in 1980 and 1982 and one in 1981) had relatively low disease levels (less than 8% infection) in the controls and no significant differences between treatments. Sclerotia of *S. minor* were detected in samples from six of the eight fields that were sites for fungicide trials and for which data are available. Numbers of sclerotia per 100 g of oven-dry soil ranged from 0 to 25. When samples were collected from multiple sites within trials, there were never statistically significant differences between samples collected from different locations, indicating that plants in each treatment were exposed to the same inoculum density. Infections by *S. sclerotiorum* were extremely rare, occurring in only two trials and causing fewer than 1% of the infections in those trials. No sclerotia of *S. sclerotiorum* were ever detected in soil samples. Infections by *S. minor* occurred in all 19 trials, including the two trials in fields for which sclerotia were not detected by the wet-sieve glycerine-flotation procedure (although total numbers of infections in these two fields were extremely low). Although the wet-sieve glycerine-flotation technique is reasonably sensitive for determining numbers of sclerotia of *S. minor* in organic soils, detection of less than one sclerotium per 100 g of soil was not always possible because of sampling limitations.

Spray trials. In a representative spray trial in 1981, the control treatment had 76% of the plants infected at harvesttime, and only 41% of the lettuce heads were marketable (Table 1). Vinclozolin applied at 1.68 kg a.i./ha in each of five weekly sprays beginning 3 wk after planting and continuing until 1 wk before harvest provided the highest level of control. Vinclozolin was more effective than iprodione in reducing infection by *S. minor*, but there was no significant difference between the two treatments in losses of marketable heads. This result was consistently obtained in all other trials that included both chemicals. Benomyl at 1.12 kg a.i./ha (2 lb of formulation per acre) combined with

Table 1. Ferlito farm spray trial, 1981; control of lettuce drop with different fungicides and different fungicide rates

Treatment[w]		Rate (per application) kg a.i./ha	Rate (per application) Amount of (formulation per acre)	Plants infected[x,y] (%)	Marketable heads[x,z] (%)
Vinclozolin	Ronilan 50WP	1.68	3.0 lb	3 a	100 a
Benomyl	Benlate 50WP	1.12	2.0 lb		
+ vinclozolin	+ Ronilan 50WP	1.12	2.0 lb	3 a	99 a
Benomyl	Benlate 50WP	1.12	2.0 lb		
+ iprodione	+ Rovral 50WP	1.12	2.0 lb	15 ab	95 a
Benomyl	Benlate 50WP	1.12	2.0 lb		
+ dicloran	+ Botran 75WP	2.27	2.7 lb	20 ab	88 ab
Iprodione	Rovral 50WP	1.68	3.0 lb	30 b	93 a
Benomyl	Benlate 50WP	1.68	3.0 lb	48 c	77 bc
Benomyl	Benlate 50WP	1.12	2.0 lb	52 c	68 cd
Benomyl	DPX 3866 75DF	1.68	2.0 lb	57 c	75 c
Benomyl	DPX 3866 75DF	1.12	1.3 lb	58 c	69 cd
Control		···	···	76 d	41 f
Mancozeb	DPX 7331 3.8F	2.69	5.1 pt	78 d	52 ef
Mancozeb	Manzate 200 80WP	2.69	3.0 lb	83 d	61 de

[w] Each treatment (except DPX 7331 3.8F) included Triton B-1956 at 438 ml/ha in 935 L of water per hectare (6 oz/acre in 100 gal of water per acre). Plants were treated with the indicated fungicide in five weekly sprays beginning 3 wk after planting and ending 1 wk before harvest.

[x] Data were collected at harvesttime (25 August 1981), and values are means of four replicates. Values in a column followed by the same letter are not significantly different ($P = 0.05$).

[y] Plants were considered infected if mycelium of *Sclerotinia* was present on leaves and/or stem.

[z] Plants were considered marketable if they were in a condition acceptable for cutting and packing. Marketable heads included those not infected with *Sclerotinia* and those with *Sclerotinia* infections on lower leaves and/or stem.

vinclozolin, iprodione, or dicloran was also every effective but was much less so alone.

Results of other spray trials indicated that procymidone, myclozolin (BAS 436), propiconazole (Tilt), and combinations of benomyl plus procymidone and vinclozolin plus chlorothalonil (Bravo 500) were also very effective in reducing infection and maintaining high numbers of marketable heads compared with controls. Benomyl alone and dicloran alone were intermediately effective in controlling lettuce drop. Thiabendazole (Mertect 340), mancozeb (Manzate 200 or DPX 7331), chlorothalonil alone, and metalaxyl (CGA-48988) were ineffective, and applications of some of these fungicides sometimes resulted in more disease than occurred in control treatments.

Table 2. Marano farm timing trial, 1979; control of lettuce drop with different vinclozolin (Ronilan) spray schedules

Spray schedule[w]	Plants infected[x,y] (%)	Marketable heads[x,z] (%)
1, 8, 16, 22, 29 Aug., 5 Sept.	20 a	80 a
1, 16, 29 Aug.	36 ab	67 ab
8, 16, 22 Aug.	36 ab	72 ab
1, 8, 22, 29 Aug.	43 ab	66 ab
1, 8, 16 Aug.	44 ab	62 ab
8, 22 Aug., 5 Sept.	46 ab	58 ab
16, 22, 29 Aug.	48 ab	55 ab
1, 8, 29 Aug., 5 Sept.	57 b	63 ab
22, 29 Aug., 5 Sept.	59 bc	50 bc
Control	79 c	34 c

[w]Treatments were sprayed on the dates indicated with Ronilan 50WP at 1.12 kg active ingredient/ha (2 lb formulation per acre) plus Triton B-1956 at 438 ml/ha in 935 L of water per hectare (6 oz/acre in 100 gal of water per acre) per application.

[x]Data were collected at harvesttime (12 September 1979), and values are means of four replicates. Values in a column followed by the same letter are not significantly different ($P = 0.05$).

[y]Plants were considered infected if mycelium of *Sclerotinia* was present on leaves and/or stem.

[z]Plants were considered marketable if they were in a condition acceptable for cutting and packing. Marketable heads included those not infected with *Sclerotinia* and those with *Sclerotinia* infections on lower leaves and/or stem.

Phytotoxicity was observed on lettuce plants sprayed with dicloran (2.27 kg a.i./ha) in two trials and with PCNB (5.63 kg a.i./ha) in one trial. Phytotoxicity was expressed as bronzing of the frame leaves and necrotic lesions for dicloran and PCNB, respectively, but neither chemical appeared to reduce the size of individual heads. Foliar sprays with propiconazole (0.25 kg a.i./ha) in three trials, however, resulted in stunting and plants that were darker green than normal.

Timing trials and disease onset analysis. In a representative timing trial in 1979, a weekly spray schedule with vinclozolin was the most effective, but all schedules, except a 22 and 29 August and 5 September schedule were significantly better than the control (Table 2). Results of other timing trials confirmed that for vinclozolin, as the number of sprays and rates of application increased, the level of disease control also increased in any single trial.

Most lettuce grown in New York and maturing in August or September requires about 60 days from planting to harvest. The earliest observation of a lettuce plant infected by *Sclerotinia* in any of the 19 trials was 33 days after planting or about 55% of the way through the growing season. The mean number of days after planting before the first observation of an infected plant for those trials with high levels of infection and for which data are available (10 trials) was 42 days (70% of the growing season). For the seven trials with low levels of infection, the mean number of days after planting before the first infection was 51 days (85% of the growing season). The possibility of latent infection was discounted (7), and thus, the first infections in the lettuce plantings in which the trials were located generally did not occur until about 18 days before harvest.

Most plants infected by *S. minor* less than 1 wk before harvest were still marketable by harvesttime. In the control treatments of 10 trials with high levels of infection, only 19% (28 of 149) of the plants that became infected during the last week before harvest had become unmarketable by harvesttime (Table 3). More plants infected 7–13 days before harvest became unmarketable (145 of 192, or 76%) whereas almost all plants infected 14 or more days before harvest became unmarketable (56 of 61, or 92%). Even weekly sprays with fungicides highly effective in reducing final percent infection and losses of marketable heads (e.g., vinclozolin and iprodione) did not alter the numbers of plants becoming unmarketable after infection.

In a timing trial in 1979 in which one or two consecutive applications of vinclozolin were made at different times during the growing season, early applications (35, 42, 28 and 35, or 35 and 42 days after planting) resulted in higher percentages of marketable lettuce heads than the control, even though final percentages of infected plants in these treatments were not significantly different from the control (Fig. 1). Later applications reduced the final percentages of infected plants, but losses of marketable heads were similar to the control. Regression analysis of the percent infection data for this trial indicated that one or two early sprays (35, or 28 and 35 days after planting) and one or two late sprays (56, or 49 and 56 days after planting) were not significantly different from the unsprayed control treatment and resulted in the most rapid rate of disease increase and the highest levels of infection at harvesttime. One or two sprays applied 42, 49, 35 and 42, or 42 and 49 days after planting resulted in a lower rate of disease increase and less infection at harvesttime than in the control. These sprays were applied just before, at the time of, or just after the time of first infection.

When actual losses in marketable heads are considered, however, regression

Table 3. Summarized results of 10 trials in which more than 14% of the lettuce plants in the control treatments were infected by *Sclerotinia*[a] at harvesttime (percentages of plants in unsprayed control treatments that became unmarketable by harvesttime when infected at different times before harvest)

Trial	Total number of infected plants at harvesttime	Percentage of plants that became unmarketable by harvesttime when infected: 14 Or more days before harvest	7-13 Days before harvest	<7 Days before harvest
1979				
Spray trial 1	87	100 (2/2)[b]	74 (42/57)	21 (6/28)
Spray trial 2	62	100 (2/2)	88 (36/41)	16 (3/19)
Timing trial 1	34	100 (18/18)	85 (11/13)	0 (0/3)
Timing trial 2	60	91 (10/11)	63 (17/27)	14 (3/22)
1980				
Spray trial 1	12	··· (0/0)	100 (5/5)	29 (2/7)
Spray trial 2	15	··· (0/0)	100 (2/2)	0 (0/13)
1981				
Spray trial 1	64	92 (23/25)	81 (21/26)	23 (3/13)
Timing trial 1	15	0 (0/2)	83 (5/6)	14 (1/7)
Timing trial 2	50	100 (1/1)	40 (6/15)	24 (8/34)
1982				
Timing trial 1	2	··· (0/0)	··· (0/0)	100 (2/2)
Totals		92 (56/61)	76 (145/192)	19 (28/149)

[a]Most lettuce drop (>95%) was caused by *S. minor*.

[b]Numbers in parentheses represent the number of plants that became infected and unmarketable per total number of plants that became infected during the specified time period.

analysis indicated that only one or two late sprays (56, or 49 and 56 days after planting) were not significantly different from the control. One or two sprays applied 42, 49, 35 and 42, or 42 and 49 days after planting resulted in a lower rate of disease increase than the control and fewer actual losses at harvesttime. One or two early sprays (35, or 28 and 35 days after planting), however, also reduced the rate of disease increase and resulted in lower losses at harvesttime compared with the control. Weekly sprays resulted in very low percent infection at harvesttime, and actual losses of marketable heads with the weekly spray were negligible. Similar results were detected by regression analysis of the data from another timing trial in 1979.

DISCUSSION

Dicarboximide fungicides were highly effective in controlling *S. minor* causing drop of lettuce grown on the organic soils of Oswego County, New York. Slightly better control (expressed as percent infection) was consistently obtained with vinclozolin (Ronilan) than with iprodione (Rovral). There was, however, often very little difference between the two fungicides when control was expressed as percent marketable heads. Combinations of benomyl (Benlate) with dicarboximide fungicides were also very effective in reducing infection and maintaining yield.

Several other fungicides commonly used alone to control lettuce drop such as benomyl or dicloran (Botran) also provided control of drop in the trials but were not as effective as the dicarboximides. Perhaps one reason those compounds are not as effective for control of drop in New York as they are in other areas is the high disease incidence and severity that can occur on New York organic soils. Although benomyl and dicloran were effective in other areas when disease incidence was low (3,9), high disease levels and yield losses occurred when these fungicides were used under conditions highly favorable for lettuce drop (9,18). Losses of marketable heads in the control treatments of the trials in New York reached 69% and were often near 50%.

Applications of some fungicides, including mancozeb, metalaxyl, and chlorothalonil resulted in increased levels of drop compared with the controls in some trials in this study. The use of chlorothalonil and captafol to control Cercospora leaf spot of peanuts has been reported to result in an increase in disease caused by *S. minor* (6). A similar chlorothalonil-induced increase in lettuce drop was observed by Johnston and Springer (13), although the increase was not statistically significant. The reason for increased drop with the three fungicides in this study is not known but may involve inhibition of potential antagonists, the development of fungicide-insensitive strains, and an alteration in suscept and/or pathogen physiology (6).

The highest level of lettuce drop control was obtained with weekly sprays of vinclozolin beginning at thinning time (about 3 wk after planting) and continuing until 1 wk before harvest for a total of five or six sprays at either 1.12 or 1.68 kg a.i./ha. When disease incidence and severity are low, however, such as during a relatively dry year and/or in a field with a low inoculum density, fewer sprays and lower rates may be effective. Dicarboximide fungicide-tolerant strains of *S. minor* have been reported (16), and fewer sprays should result in reduced selection pressure for tolerant strains. Environmental and cost factors also demand reduced rates and fewer applications of vinclozolin, and thus, the timing of these sprays is of paramount importance.

Infection of young lettuce seedlings has been observed in New York and undoubtedly occurs whenever environmental conditions allow germination of sclerotia. Analysis of disease onset for individual plants in our trials, however, indicated that infections of lettuce plants by *S. minor* did not occur until harvesttime approached. Infections were never observed until almost 2 wk after thinning time (about 35 days after planting and 25 days before harvest) and usually did not appear until 3 wk after thinning (about 42 days after planting and 18 days before harvest) or later. In all but one of the trials, the percentage of uninfected plants becoming infected continued to increase as harvesttime approached. In side-by-side lettuce plantings that differed by a few days in planting date, higher levels of disease often occurred in the earlier planted lettuce while very little occurred in immediately adjacent lettuce that had

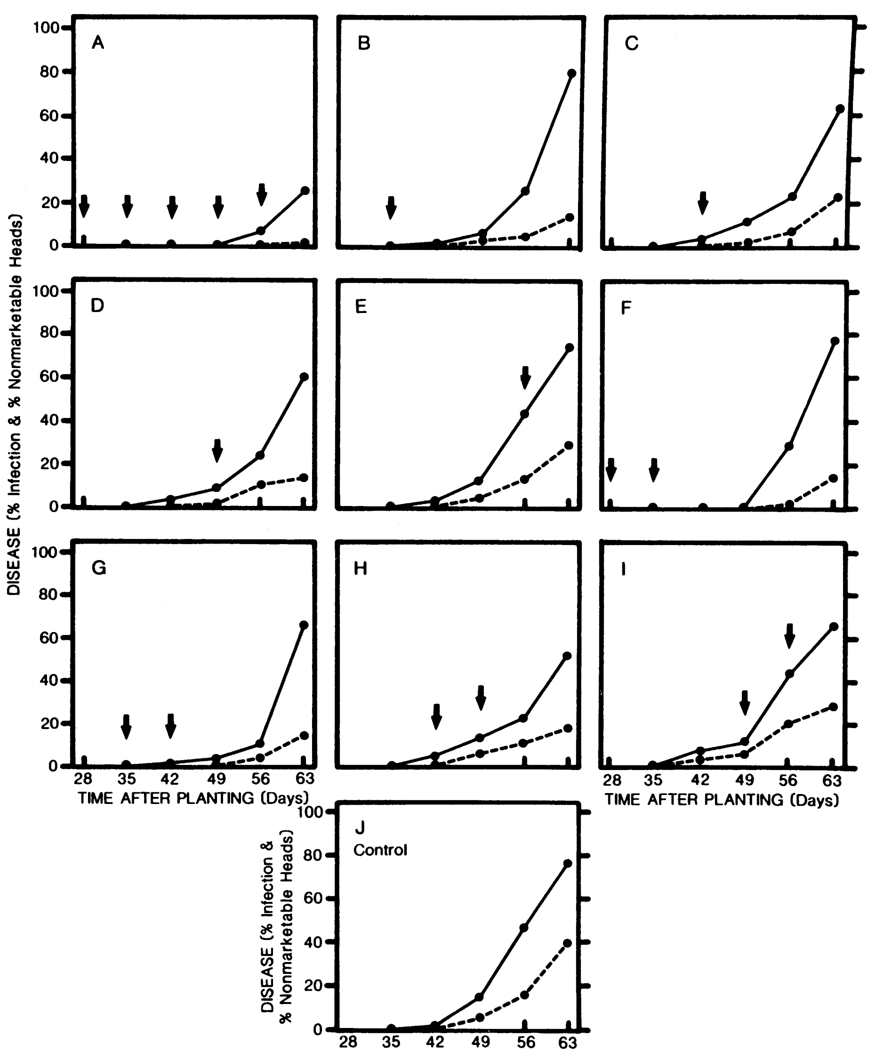

Fig. 1. Disease (percent infection and percent unmarketable heads) progression in individual treatments **(A–J)** of the 1979 Sorbello timing trial. Ronilan 50WP at 1.12 kg a.i./ha (2 lb of formulation per acre) per application was applied on the dates indicated (arrows) as well as at 21 days after planting for the weekly spray treatment **(A)**. ●——● = Percent infection and ●---● = percent unmarketable heads. Most lettuce drop (>95%) was caused by *Sclerotinia minor*.

been seeded a few days later. This difference, when it occurred, usually was detected during the last 25 days of lettuce plant growth. Hawthorne (7) observed that peak infection did not occur until 2 wk after the "log" phase of growth (3- to 6-wk period beginning at thinning) of lettuce plants on successive plantings in New Zealand, and others have noted a similar pattern (3,11,25). The observation that infection of lettuce plants by *S. minor* in New York occurs primarily during the last 18 days of plant growth may be explained by the finding that sclerotia of many New York isolates of *S. minor* require up to 2 wk or more of continuous moisture under laboratory conditions before undergoing high levels of mycelial germination (26). The top 1 or 2 cm of the profile in a New York organic soil becomes very dry between rains and most likely will not support germination of sclerotia of *S. minor* unless the soil in some way is protected from drying. The growth of lettuce plants and the production of large frame leaves provides a microclimate beneath the plants that remains moist between rains and allows germination of sclerotia to occur (7). Also, as the plants grow, they produce more surface area in contact with soil, thus increasing the numbers of potential infection sites.

Regression analysis of the data from one timing trial in 1979 indicated that even single sprays of vinclozolin applied 35, 42, or 49 days after planting resulted in higher yields of marketable lettuce heads than the control. These sprays were applied either on the same day infected plants were first observed in this trial (42 days after planting), 1 wk before the first observation of infected plants (35 days after planting), or 1 wk after the first observation of infected plants (49 days after planting). These sprays were apparently protecting the lettuce plants from potential infections during the period from 35 to 49 days after planting, and it is these infections that will almost certainly result in unmarketable lettuce heads by harvesttime. Sprays applied 1 wk before harvest were ineffective in reducing actual yield losses. Sprays applied before or at the onset of first infection did not reduce final percent infection but did help prevent some of the first-occurring infections, thus increasing final yield over that of the unsprayed control. Rainbow (18) made similar observations in New Zealand. The period from 35 to 49 days after planting thus is considered the critical period with respect to fungicide applications in New York. It is probably not necessary to spray plants as late as 1 wk before harvest, because many of these plants will not become unmarketable even if sclerotia germinate and successfully infect plants during the final week. In another timing trial in 1979, each treatment included sprays during the critical period, and all treatments were significantly better than the control in both yield and percent infection.

On the basis of results from this study, we suggest that the first spray with a dicarboximide fungicide such as vinclozolin need not be applied until 1 or 2 wk after lettuce thinning (28–35 days after planting). This should be followed with one or two additional sprays at weekly intervals depending on whether two or three sprays are desired. In the future, the choices of application rate (2 or 3 lb of formulation per acre), total number of sprays, and time of first application might be based on precipitation during the growing season and inoculum density as determined by soil sampling. Monitoring soil moisture beneath lettuce plants also would provide benchmark data for timing and predictive schemes.

Ronilan and Rovral recently received registration approval on lettuce. The Ronilan label indicates that three applications may be made on direct-seeded lettuce on a 2-wk schedule beginning at thinning time. The label also states that Ronilan may not be applied within 28 days of harvest. Because most lettuce maturing in August or September in New York requires only 60 days from planting to harvest, only two applications of Ronilan could be made and still abide by the label restrictions. The last allowable spray would be at 35 days after planting. Thus, modification should be made in the Ronilan label for New York to allow three consecutive weekly sprays beginning as late as 28 or 35 days after planting. The Roval label prohibits sprays only 14 days before harvest and thus fits well in a control program in New York. With changes in the Ronilan label, both Ronilan and Rovral should prove to be highly effective in controlling lettuce drop caused by *S. minor* under field conditions in New York.

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