

# Hypersensitivity of lettuce leaves inoculated with *Bremia lactucae*

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Local necrosis, produced soon after plant infection by a pathogen, is usually called a hypersensitive reaction and is considered an important feature of incompatibility.

During their study on downy mildew in lettuce (*Lactuca sativa* L.), Maclean et al. (1974) detected necrotic host cells after penetration by *Bremia lactucae* Regel. This hypersensitive reaction only occurred in case of an incompatible host-pathogen combination.

We investigated two Dutch races of *B. lactucae* (NL-2 and NL-3) and two lettuce cultivars ('Caravan' and 'Solito'). According to some earlier data 'Caravan' is resistant to NL-2, but susceptible to NL-3, and 'Solito' is resistant to both races (Globerson et al., 1974). Small leaf discs (10 mm in diameter) were inoculated with a spore suspension and incubated in the dark at 17°C. Samples were taken 10, 24, 48, 72, 96 and 120 h after inoculation, fixed in acetic acid and ethanol (1:3), washed in lactophenol-ethanol and stained with cotton blue in lactophenol. Results are summarized in Table 1.

Ten hours after inoculation, primary and secondary vesicles had developed in each of the samples, proving that penetration took place. After one day the epidermal cells

Table 1. Number of penetrated (pen.) and dead cells of the host in various combinations of lettuce and downy mildew.

Lettuce cultivar	<i>B. lactucae</i> race	Compati-bility	Hours after inoculation							
			24		48		72		120	
			pen.	dead	pen.	dead	pen.	dead	pen.	dead
Caravan	NL-3	+	2	–	4–5	1–2	many	1–3	many	1–3
Solito	NL-3	–	1	–	1–2	1–2	1–2	1–2	1–3	1–3
Caravan	NL-2	–	2	1	2–4	2–3	2–6	2–4	2–10	4–8
Solito	NL-2	–	1	1	1–3	1–3	1–3	1–3	1–6	1–6

Tabel 1. Aantal binnengedrongen en gedode gastheercellen in verschillende combinaties van valse meeldauw en sla.

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of 'Caravan' and 'Solito' plants, penetrated by NL-2, became granular and turned yellowish. After 48 h cell necrosis occurred not only in the incompatible combinations (NL-2 on 'Solito' and 'Caravan', NL-3 on 'Solito'), but also in the compatible one (NL-3 on 'Caravan', Fig. 1). Three or more days after penetration the differences in fungal growth and in extent of tissue necrosis became more evident. By the end of the fifth day NL-3 colonized the whole leaf discs of 'Caravan' plants and formed conidiophores on them, while its growth on 'Solito' leaf discs was limited to one to three cells. In both cases, however, hypersensitive reactions of the penetrated and some adjacent cells were observed. Reaction of NL-2 on 'Caravan' plants seemed to represent an intermediate form with hyphal growth extending eight to ten cells accompanied by heavy necrosis (Fig. 2). Occasionally the fungus was able to overgrow the dead cells; moreover, initials of conidiophores could also be detected in the stomatal cavities of the invaded leaves. Race NL-2 behaved similarly to NL-3 on 'Solito' plants in that hyphal growth was severely limited and penetrated cells died.

These observations indicate that the different host-pathogen interactions of lettuce downy mildew may be characterized by the intensity of fungal penetration and the extent of necrosis of the host plant. In contrast to Maclean et al. (1974), we found a hypersensitive reaction in both compatible and incompatible host-pathogen com-

Fig. 1. Cell necrosis of lettuce 'Caravan' due to penetration by *B. lactucae* race NL-3, 48 hours after inoculation (compatible).

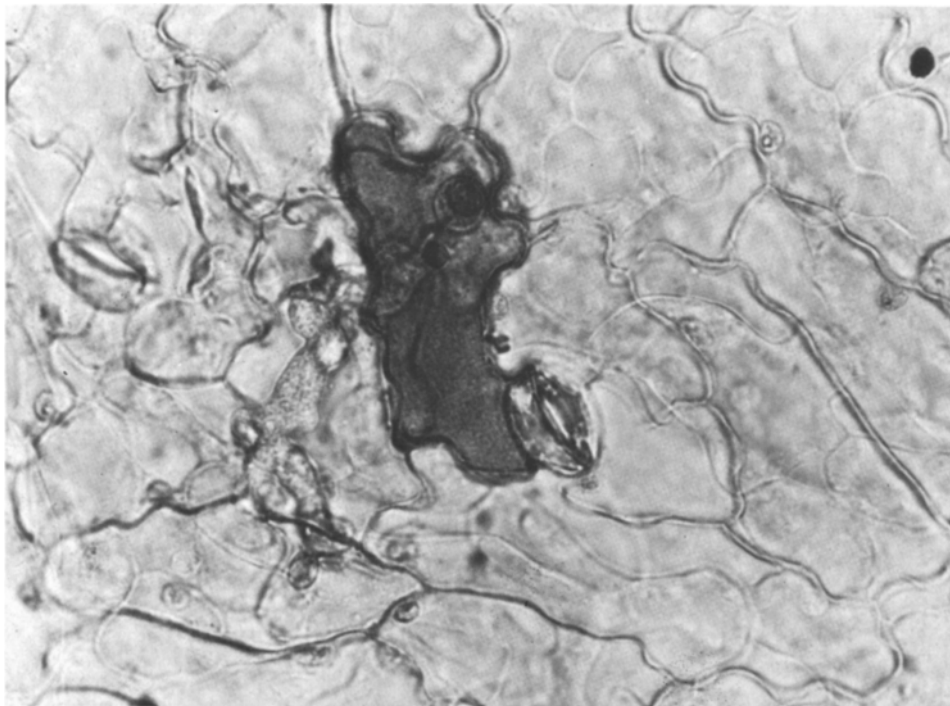


Fig. 1. Celnecrose in sla 'Caravan', veroorzaakt door binnendringing door *B. lactucae* fysio NL-3, 48 uur na inoculatie.

Fig. 2. Restricted hyphal growth of *B. lactucae* race NL-2 in lettuce 'Caravan' accompanied by heavy tissue necrosis, 5 days after inoculation. (incompatible).

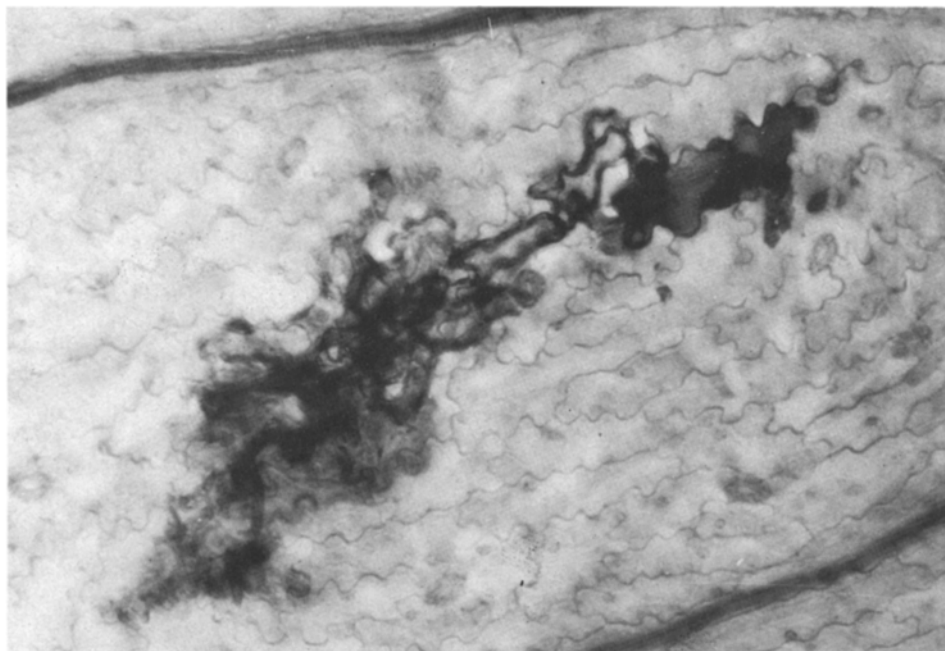


Fig. 2. Beperkte myceliumgroei van *B. lactucae* fysio NL-2 in sla 'Caravan', vergezeld van hevige weefselnecrose, 5 dagen na inoculatie.

binations. Further investigations are needed to determine whether this hypersensitivity generally occurs in lettuce cultivars infected by *Bremia lactucae* or is restricted to some cultivars.

## Samenvatting

### *Overgevoeligheid van slabladeren geïnoculeerd met Bremia lactucae*

De waardplantreacties bij één compatibele en drie incompatibele combinaties van valse meeldauw en sla werden onderzocht. De verschillende interacties kunnen gekarakteriseerd worden door de intensiteit van de myceliumontwikkeling en de omvang van de weefselnecrose in de waardplant (Tabel 1.). Een overgevoeligheidsreactie werd zowel in compatibele als in incompatibele combinaties gevonden.

## Acknowledgment

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## References

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## Book review

M. Stahl and H. Umgelter, 1976: Pflanzenschutz im Zierpflanzenbau. Handbuch des Erwerbsgärtners, Band 5, 2nd Edition. Verlag Eugen Ulmer, Stuttgart. 495 pp with 267 illustrations, 9 pp. references; cloth bound, price DM. 88.

This second edition of the German manual on 'Crop protection in the cultivation of ornamentals' has been completely revised. Since the first edition in 1959 much new information has become available, the use of pesticides is continuously changing and increasing, and the number of ornamental species is constantly growing.

A short introductory chapter (12 pp.) briefly describes the nature of the various disease incitants, pests and non-infectious harmful factors. It gives some general information on the damage and on control. A more extensive chapter (84 pp.) deals with diseases, pests and damages of general importance. Biological pest control is discussed in four pages only.

The major part of the book (359 pp.) concerns the diseases and pests of the ornamental plant species grown in Germany, which are arranged alphabetically according to the Latin name. The disorders are concisely, but clearly described and some information is given on their incitants to assist macroscopic identification. This is followed by data on their control. The text seems up to date and is well illustrated with numerous photographs. The rather limited list of references may help those interested in further scientific detail. The choice of the references indicates that the authors are also acquainted with pertinent research in neighbouring countries and that the book has more than local value. This is also because various pathological problems of ornamentals grown in greenhouses are international.

The book has been written mainly for commercial growers ('Erwerbsgärtner'). Thus, much emphasis is laid on practical control, but it will also be of help to teachers and students and all others involved in practical control and able to read German.

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