A sustainable approach to control downy mildew (*Bremia lactucae*) in greenhouse-grown lettuce

N. Van Hese[1,4], A. Bogaert[2], I. Leenknegt [3], N. Vergote[2], P. Bleyaert[4], M. Höfte[1]

[1]*Laboratorium voor Fytopathologie, Vakgroep Gewasbescherming, Universiteit Gent*
[2]*Provinciaal Proefcentrum voor de Groenteteelt, Kruishoutem*
[3]*Proefstation voor de Groenteteelt, Sint Katelijne Waver*
[4]*Inagro, Rumbeke-Beitem*

Abstract

Bremia lactucae, the causal agent of downy mildew in lettuce (*Lactuca sativa*), causes high yield losses. The pathogen is usually controlled by fungicides in combination with resistant varieties. However, new races of Bremia develop very rapidly and the pathogen easily develops resistance to chemicals. The aim of this work is to develop a more sustainable control strategy, based on the epidemiology of the pathogen. This work focuses on the possible sources of primary inoculum, the climatological conditions the pathogen needs to survive and infect plants, and the translation of this knowledge into practical advice for breeders.

In Flanders, the presence of oospores was demonstrated in severely diseased crops from field and greenhouse trials, indicating that they may form a possible source of primary inoculum. Since *B. lactucae* is considered as a heterothallic oomycete, the presence of the two mating types B1 and B2 is needed for the production of oospores. Mating types analyses indicated that isolates of both mating types occur in Flanders, although B2 was detected only once up till now. The impact of oospores in the disease epidemiology will be further investigated.

Greenhouse trials revealed that the key components for climate adaptation are relative humidity and temperature. A relative humidity below 90% significantly suppresses the disease incidence. The temperature is inversely related to the length of the incubation period, and a temperature above 18°C is unfavorable for the pathogen. Further analysis of the epidemiology indicated that these climatological conditions are mainly important during germination, penetration and sporulation. Once inside the plant, *B. lactucae* can survive periods with lower relative humidity and higher temperatures, during which its development is paused. Greenhouse trials

have shown that climate adaptation may be a potential control strategy, but this is not always economically and practically feasible. Consideration of chemical treatments in the sustainable protection system is thus inevitable. Registered chemicals against *B. lactucae* have been evaluated in the lab and in greenhouse experiments. Most of them work more effectively when applied preventively, which emphasizes the necessity to predict an outbreak of downy mildew. Therefore, we are currently developing a system with trap plants, which will give information about the circumstances favorable for a disease outbreak. Besides the registered chemicals, we also consider the potential use of biopesticides such as lipopeptides produced by *Bacillus subtilis*.