

Threshold systems for integrated control of foliar leaf spot diseases in sugar beet – the German 'summarische Bekämpfungsschwelle' DI 5/15/45 %

Introduction

Infestation with foliar diseases, such as *Cercospora beticola* (C.b.), *Erysiphe betae* (E.b.) and *Ramularia beticola* (R.b.) is generally increasing. In Germany and Austria C.b. has the highest importance (Fig. 1). The regulation of foliar diseases is done by fungicide application. Threshold systems can decrease the

amount of active ingredients applied. Therefore, the integrated plant protection model (IPM Sugar Beet Model) was introduced in the mid of the 90's. Because of a lack in efficient control different threshold systems were tested from 2001 to 2003 (series 1). A specific application procedure was verified in 2004 and 2005 (series 2). Both series were carried out in field trials in Germany and Austria.



Fig. 1: Leaf damage caused by *Cercospora beticola*

Material and Methods

Determination of threshold systems (series 1)

Three threshold systems were tested compared to an untreated control (Fig. 2). The disease incidence (DI: number of infected leaves, minimum 1 spot) and the disease severity (DS: percentage of infected area per leaf) concerning each foliar

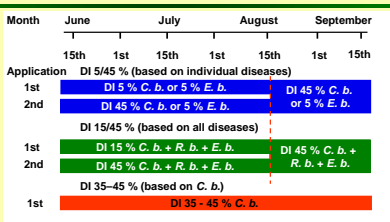


Fig. 2: Threshold systems for fungicide application in sugar beet to control *Cercospora beticola* (C.b.), *Erysiphe betae* (E.b.) and *Ramularia beticola* (R.b.), Germany and Austria, 2001-2003; DI: disease incidence of infested leaves (minimum 1 spot)

disease were assessed on 100 leaves, yield and quality were determined.

Verification of the summary threshold system (series 2)

Fungicides were applied when 5 % DI (C.b., E.b. or R.b.) were reached till the end of July, 15 % DI from August 1st and 45 % DI from mid August (Fig. 4).

Results

Determination of threshold systems (series 1)

White sugar yield (WSY) of the untreated control decreased significantly with increasing infestation levels. No significant differences were

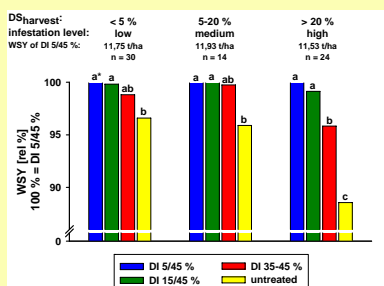


Fig. 3: Relative white sugar yield (WSY) influenced by different threshold systems for fungicide application in sugar beet under different disease severity at harvest (DS_{harvest}), Germany and Austria 2001-2003

*different letters mark significant differences between control strategies at the probability level of $p = 0,05$
DI: disease incidence definition see Fig 1

found between DI 5/45 % and DI 15/45 % whereas DI 35-45 % mostly showed a significant decrease in WSY (Fig. 3). The development of DI at the beginning of August (Fig. 4) indicated a risk of yield loss. Consequently, a three step system was initiated, the summary threshold system DI 5/15/45 %.

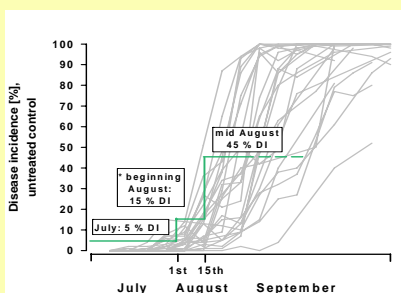


Fig. 4: Summarisches Bekämpfungsschwellsensystem ("summary threshold system") for fungicide application in sugar beet to control *Cercospora beticola*, *Erysiphe betae* and *Ramularia beticola*, 23 sites in Germany and Austria, 2002; * regional specification
DI: summary disease incidence of *Cercospora beticola*, *Erysiphe betae* and *Ramularia beticola*

Verification of the summary threshold system (series 2)

This summary threshold system for fungicide application in sugar beet clearly demonstrated that loss of WSY can be avoided even under low infestation level (Fig. 5)

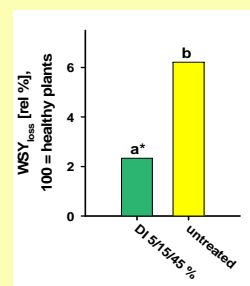


Fig. 5: Loss of white sugar yield (WSY_{loss}) influenced by summary threshold system (DI 5/15/45 %) related to healthy crops, 21 sites in Germany and Austria, 2004 and 2005, *different letters mark significant differences between control strategies at the probability level of $p = 0,05$
DI: disease incidence definition see Fig 4

Summary

Increasing infestation level increases the risk of loss of WSY by foliar diseases, especially *Cercospora beticola*. Integrated control requires fungicide application according to threshold sys-

tems. In 2004 the summary threshold system DI 5/15/45 % was initiated in Germany for fungicide application. Consequently, loss of WSY can be minimized and fungicide application re-

duced expressing environmental and economical friendly production. The adaptation of the summary threshold system to resistant and tolerant cultivars presently is under research.

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