Presentation

Early outbreak of potato late blight in Denmark 2011

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SUMMARY
In 2011, the weather in Denmark was relatively warm and dry in April and first half of May. From mid May the weather changed, and there were many days with precipitation in the second half of May. Potato emergence was early (already from mid May) and in many places the fields were very wet. Oospores are expected to have played a significant role as source of primary inoculum and the first infections from soil borne oospores probably took place in the second half of May. More wide spread attacks appeared in the beginning of June and the first recorded outbreaks of late blight were in South and Mid Jutland on the 15th June. From these foci there were a secondary spread to many fields. Late blight was finally controlled but with a relatively high fungicide input. Field trials with the Danish Dose Model were continued in 2011. In the dose model the fungicide input is adjusted to the actual need, and it was possible to achieve a safe and economically profitable control of late blight. However, in a season like 2011, characterised by a prolonged and high infection pressure, there was only a minor reduction in fungicide use using the general model. However, using a revised model (Dose Model 2) with even lower fungicide inputs at low disease pressure it was possible to reduce the fungicide use by 26% and still having a good control of late blight.

KEYWORDS
Potato late blight, *Phytophthora infestans*, oospore infection, early outbreak, dose model, reduction in fungicide input

INTRODUCTION
The importance of oospores as soil-borne inoculum is documented in the Nordic countries (Anderson *et al.*, 1998; Hannukkala *et al.*, 2007) as well as in many European countries (Cooke *et al.*, 2011). Danish and Finnish studies of the correlation between crop rotation and early late blight infections (Bødker *et al.*, 2006; Hannukkala *et al.*, 2007) and investigations from The Netherlands show that oospores remain viable for 3 and 4 years in clay and sandy soils (Turkensteen *et al.*, 2000). Both mating types are present in the Nordic late blight populations and the high genetic variation present indicates sexual recombination (Letinen *et al.*, 2008; Letinen *et al.*, 2009). However, in general oospores play a minor role as source of primary inoculum compared to tuber borne infections (Cooke *et al.*, 2011). In Denmark, oospores seem to play a role in connection with early disease outbreak in some years. Since 1995, in 5 out of 16 years indications of infections from oospores were found in the Danish late blight monitoring network (1995, 1997, 2001, 2003 and

2005; not published). In 2011, reports again showed cases of oospores as source of primary inoculum of significant importance.

DISEASE SITUATION 2011

In 2011, the weather in Denmark was relatively warm and dry in April and first half of May. From mid May, the weather changed and there were many days with rain in the second half of May (Fig. 1). Potato emergence was early (already from mid May) and in many places the fields were very wet. The first unnoticed oospore infections took place mid May in some of these fields.

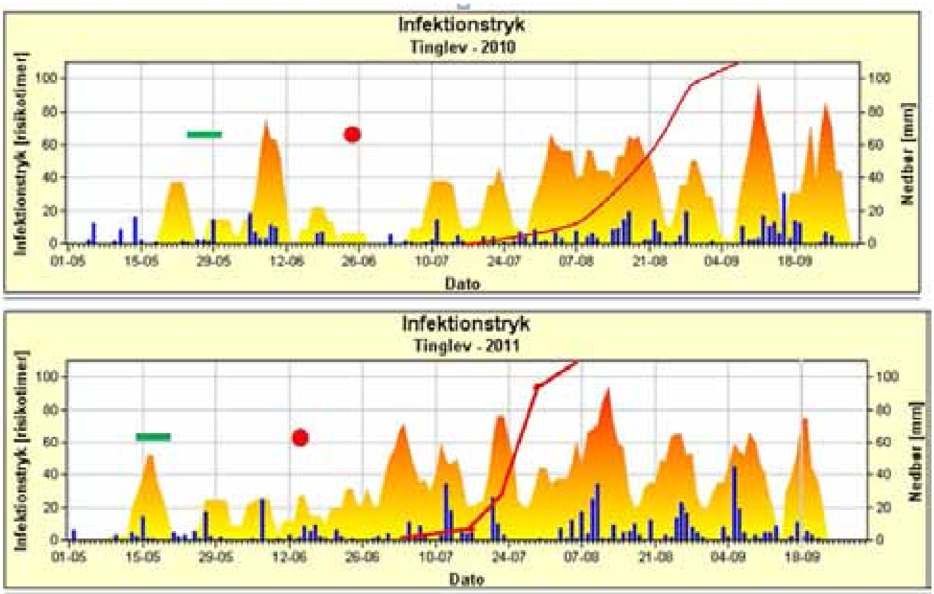

Fig. 1. Infection pressure for potato late blight (left axis) and precipitation (mm, right axis) at Tinglev (Southern Jutland) in 2010 and 2011. Green bar (mid May) indicates potato emergence, red dot indicates the first recorded outbreak of late blight and the red curves show development of late blight in untreated field plots at Jyndevad Field Station (10 km from Tinglev). Data on infection pressure from www.euroblight.net.

The first recorded outbreak of late blight in 2011 was seen in South and Mid Jutland 15 June (Fig. 1). From these fields, there was a secondary spread of late blight to neighbouring fields and since the weather condition was favourable for infections from late June blight developed in many fields. Figure 1 shows the important difference between the seasons 2010 and 2011. In 2011, the weather was characterised by a high and continous infection pressure from Mid-late June until harvest. In 2011, the fungicide applications were in general 1-2 weeks too late in many fields and often the applications were performed on established infections. However, later in the season, blight was finally controlled but with a relatively high fungicide input (30%-50% more applications and in some fields up til 100% more applications). In many fields, one application of metalaxyl (Ridomil Gold) effectively stopped further development of the disease.

In 2011, the tuber yield was on average with a high variation. Despite the high incidence of fields with late blight, the frequency of fields and tubers with tuber blight were very low.

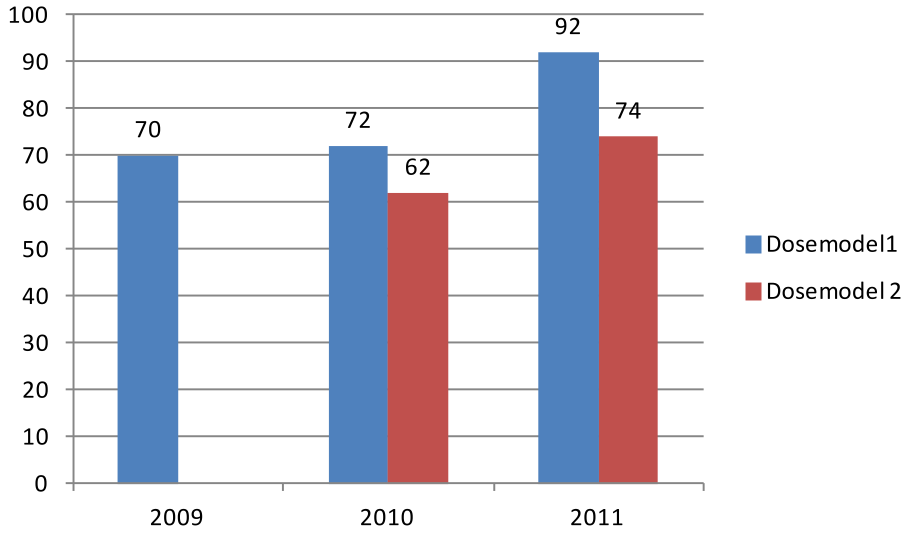

Fig. 2. Fungicide use in dose models relative to standard, full dose (fungicide use measured as relative treatment frequency index where standard full dose is 100, approximately 12-13 sprayings). Trials in starch and ware potatoes 2009 (6 trials), 2010 (9 trials) and 2011(3 trials). Dose Model 1: dose x interval depends on presence of late blight in the area, infection pressure and variety (Nielsen et al., 2010). Recommend lower dose especially in beginning of season. Dose Model 2: In principle same as Dose Model 1 but reduces doses further and possibilities for longer intervals early season. Dose models gave same control of late blight as standard full dose and same economy as standard Dithane NT.

REDUCED FUNGICIDE INPUT MODELS

In the Danish experimental Risk Dependent Dose Model, the fungicide input is adjusted according to the actual need. Prior to periods with a high risk of infection, the dose model uses full dosage of the most efficient fungicides. By contrast, in periods with a low risk, the dose model recommends reduced dosage or no sprayings. All sprays are carried out at weekly intervals. By optimising the spray applications according to need, there is thus a possibility of cheaper disease control in potatoes while still having an effective control (Nielsen, 2004; Nielsen *et al.*, 2010). In the dose model, the potential risk for infection (infection pressure) and dose depend on variety resistance and how close to the potato field late blight has been observed (www.euroblight.net).

Potato late blight occurred relatively late in the trials 2009-2010 and did not develop until the end of July. Under these conditions, the trials with reduced doses show that it is possible to reduce the application of effective fungicides (Revus and Ranman) by up to 30% (treatment index, Fig. 2). In 2011, late blight developed earlier in the trials but it was only 1-3 weeks earlier than in 2009-2010. The important factor was widely the continuous and high infection pressure throughout the season from late June to September (Fig. 1). Under these circumstances, it was only possible to use reduced dosages in the beginning of the season. Use of the general model (Dose Model 1 as in 2009 and 2010) gave in 2011 a good control of late blight but the reduction in fungicide use was only 8% compared with routine spraying (Fig. 2). However, using a model with lower fungicide inputs at low disease pressure (Dose Model 2) it was possible in 2011 to reduce the fungicide use by 26% and still having good control of potato late blight (Fig 2).

CONCLUSION

In 2011, potato emergence was early and oospores played a significant role as source of primary inoculum for infections events in the second half of May. The first outbreaks of late blight were recorded in South and Mid Jutland on 15 June and from these fields there were a secondary spread of late blight. Later in the season, blight was kept under control by a relatively high level of fungicide input. In many fields, one application of metalaxyl (Ridomil Gold) effectively stoppede further spread of the disease.

Using a dose model where fungicide input is adjusted to the actual need, it is possible to achieve a safe and economically profitable control of potato late blight. The fungicide reduction potential depends on the weather conditions and duration of periods with high infection pressure. Field trials in 2011 using the dose model showed only a minor reduction in fungicide use in a season with a prolonged and high infection pressure. However, using an experimental model with lower fungicide inputs at low disease pressure it was possible to reduce the fungicide use by 26% and still having good control of potato late blight. In the seasons 2009-2010, where the epidemics started later and where the disease pressure was lower, the general dose model used 30% les fungicide than standard routine spraying and with good control of late blight.

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