

The development and control of Late Blight (*Phytophthora infestans*) in Europe in 2010 and 2011

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INTRODUCTION

The EuroBlight late blight country profile was launched in 2007 to keep track of the development of late blight and its control in Europe in individual countries and over years. This paper reports the development and control of late blight in Europe, 2010 and 2011.

One important motivation for sharing data is that the results are analysed in a pan-European context. When data are available over several years it will be possible to analyse the data over years and across countries. This is especially interesting now that all countries in Europe have to adapt to the new EU pesticide package to be implemented by the end of 2013. Using the data we collect before and after 2013 might be used for impact assessment of this EU regulation. We will also use the data to stimulate to collaboration, harmonisation and coordination between institutions and across countries.

METHODS

The country profiles have the following structure and content:

Summary

- Write a short summary (max 200 words) about late blight development, fungicide use and control of late blight in the country and year selected. This section will be used to generate a summary report covering all countries. Additionally, this will be the starting point for the summary report about late blight, fungicide use and effectiveness of control measures, published after each EuroBlight workshop.

Early outbreaks of potato late blight

- Select the date of first observation of late blight in covered or very early planted potatoes

- Disease source for these attacks (options: Seed, Cull pile, Volunteer plants, Covered crop, Waste pile, Oospores, Indications of Oospores, Other, Not known)
- Select the date when first infections were reported in more than 5 conventional, normally planted potato fields. This is the date when late blight is recorded in more than a few fields for the first time. After this event – and if the weather is continuously blight favourable - there will be a risk of epidemic developments in non-treated (and especially in susceptible) cultivars.
- Disease source for these attacks (options: Seed, Cull pile, Volunteer plants, Covered crop, Waste pile, Oospores, Indications of Oospores, Other, Not known)
- Write a short text (max 100 words) about early attacks. The report generator will include dates and disease sources in texts. Enter additional information in the text window.

Weather conditions and late blight development

- Weather based risk of late blight. Select whether the weather-based risk for late blight development was low, medium or high for the months May to September. Or, select 'Not known'.
- Write a short text (max 100 words) about the weather conditions related to late blight development. Mention if the information about weather conditions is general for the country, related to a specific region and if the risk is qualitative or based on calculations with a model or a DSS.

Use of fungicides and control strategies

- Enter the number of fungicide applications used in ware potatoes. What do the majority of conventional farmers do to control late blight in ware potatoes?
- Enter the number of fungicide applications used in all potatoes. Sometimes quantitative information is available as a mean of all types of potatoes e.g. in DK as calculated Treatment Frequency Index based on amounts of fungicide sold (normal dosage) and related to the total area of conventional grown potatoes
- Write a short text (max 100 words) about fungicide use and control of late blight.

Organic potatoes

- Select when outbreaks were recorded in fields with organic potatoes (Options: early, medium, late or not known compared to normal)
- Select the level of attack (Options: low, medium, high or not known compared to normal).
- Select the mean yield level in organic potato fields (Options: <20 t/ha, 20-30 t/ha, 30-40 t/ha, >40 t/ha or not known)
- Write a short text (max 100 words) about the situation in organic potatoes.

Tuber blight

- Select the level of tuber blight attacks (Options: low, medium, high or not known compared to normal).
- Write a short text (max 100 words) about tuber blight.

Alternaria spp.

- Select when outbreaks were recorded (Options: early, medium, late or not known compared to normal).
- Select the level of attack (Options: low, medium, high or not known compared to normal).
- Write a short text (max 100 words) about *Alternaria*.

Characteristics of *Phytophthora infestans*

- Write a short text (max 100 words) about pathogen characteristics. In the country reports graphs for mating type distribution and virulence pathotypes are automatically included based on available

data from the Eucablight database.

Use of cultivars

- Write a short text (max 100 words) about use of cultivars.

Use of DSS

- Write a short text (max 100 words) about use of DSS in the country.

The reports per country published below are the abstracts of the country reports taken directly from the database with only slight editing.

THE DEVELOPMENT AND CONTROL OF *PHYTOPHTHORA INFESTANS* IN EUROPE IN 2010 AND 2011

The abstracts of the country reports are provided by country in alphabetic order. General trends and observations on weather conditions, disease development etc. are discussed in the section of summary information. Information regarding “Date of first observation of late blight in covered or very early planted potatoes” and “Date when first infections were reported in more than five conventional, normally planted potato fields” for 2010 and 2011 is shown for all European countries on maps in Fig. 1-4. The same data are combined into marker plots per year in Fig. 5 and 6. The weather based risk at selected stations in Europe is shown in Fig. 7. The level of tuber blight attack is given in Fig. 8 and problems with tuber blight is shown in Fig. 9.

Belgium 2011

The spring months of March and April were very dry, and although late blight lesions had already been found early in the season on a dump pile (April 15), there was little or no risk for spread of the disease. This was also the case during a sunny, dry month of May, and disease pressure remained very low during the critical phase of emergence and rapid leaf growth of the ware potatoes. Late blight could develop somewhat during several consecutive infection periods in June, but it was not until the second half of July that weather conditions became very favourable for the disease. Late blight attacks in fields were observed from the last week of July, and continued to increase until the end of the growing season, as the weather conditions remained unfavourable.

Belgium 2010

A significant number of frost days during the winter of 2009/2010 most probably led to the destruction of a large proportion of the remaining (volunteer) potato tubers in the field. Average planting date for ware potatoes (mostly cv. Bintje) was around 20 April. Early development of the late blight disease was hampered by spells of dry, sunny weather in May. Very few early attacks were observed or reported. A dry, hot and sunny month of June further reduced disease pressure to a very low level. Wide spraying intervals, even in susceptible varieties, were applied. The return of rainy weather conditions in the second half of July quickly led to an increase in the disease pressure; short application intervals were necessary throughout the rest of the season, which remained excessively wet. Some late blight attacks were observed from the beginning of August, with a strong expansion towards the end of this month. Wet harvest conditions caused a lot of problems with bacterial rot and meant a difficult start of the storage season.

Czech Republic 2011

In 2011, the weather conditions were very favourable for the development of potato late blight.

Rainfall in May, June and August was near the normal in the main production region; however, in July it reached 160 – 180 % of the normal. The spread of foliage blight was intensive and the level of tuber infection was also severe. The first more important outbreaks in the potato production region were observed in the second decade of July; however, epidemic late blight spreading was very rapid and non-treated crops were completely destroyed in 2 – 4 weeks, based on locality and varietal susceptibility. The first important infection period was between the 18th and 26th June. In July very favourable conditions were recorded for late spreading between the 10th and 21st July and then between the 26th and 30th July. Infection period in August lasted for the whole first half of the month. Intensive rainfall and continuously wet soil supported tuber infection as well. Intensive infection pressure thoroughly verified efficacy of applied fungicides. The highest efficacy was recorded for fungicides Infinito (fluopicolide, propamocarb hydrochloride), Revus (mandipropamid), Ranman (cyazofamid), Altima (fluazinam), Consento (fenamidone, propamocarb hydrochloride) and Acrobat WG (dimethomorph, mancozeb). In the efficacy of systemic fungicides based on phenylamides pathogen resistance was highly expressed. However, potato late blight mostly did not cause important yield loss, since almost ideal conditions for crop growth and development resulted in obtaining of high yields prior to epidemic onset. Problems in ware potatoes were caused by tuber infection in most cases and consequences are expected in stores, especially in crops when haulm was not killed in time. Most of the early potatoes were harvested before epidemics occurred in the region.

Czech Republic 2010

The year 2010 was characterized by the intensive disease infection pressure, severe tuber infection and specific development due to very variable weather course. The situation was also complicated by diverse age of crops in the main potato production region, as the planting period was prolonged until the beginning of June due to unfavourable weather. Rainy weather in May and the first half of June initiated first outbreaks of potato late blight. However, further disease development was completely stopped due to warm and dry weather conditions from mid-June to mid-July. The drought period was followed by rainy weather that lasted until the end of the growing season. Late blight epidemics highly affected potato crops during August. Due to high rainfall tubers were directly infected from the onset of disease epidemics and a considerable amount of these decayed in the soil prior to harvest. Lower number of infected tubers was loaded into stores and storage loss was lower than initially expected. In the early potato production region epidemics developed prior to harvest, i.e. beginning June level of infections were extraordinary high for this region and tubers were also attacked. Considering fungicides the highest efficacy was found for Ranman (cyazofamid), Casoar (chlorothalonil, propamocarb hydrochloride), Altima (fluazinam), Infinito (fluopicolide, propamocarb hydrochloride) and Revus (mandipropamid). A gradual increase in fungicide resistance was observed for phenylamide-containing fungicides.

Denmark 2011

The date of crop emergence was relatively early, 12-20 May. Exactly during this period and especially in the South and Central Denmark, weather was wet and blight favourable and this resulted in early attacks from oospores in many fields – more than the in any of the previous 16 years. This was only recognized 3-4 weeks later when heavy attacks in many fields were reported in the Danish late blight surveillance network. Subsequently, weather conditions were blight favourable throughout the season. Despite the widespread early attacks, a survey on 900 ha in the South of Denmark showed that about 80 % of this area was without any blight symptoms and only 2 % had severe attacks (Pedersen unpublished). Most popular fungicides were Dithane, Ranman, Revus and Ridomil. The yield in 2011 was medium and the level of tuber blight was low. This might be due to widespread use of Ranman during the late season controlling tuber blight. The Blue 13 pathotype was found

in Denmark in 2011, but Ridomil generally was effective in 2011. Usage of the Danish DSS dose model in 2011 resulted only in a minor reduction in fungicide use in a season characterised by long periods with high infection pressure. The field test of a revised model with even lower fungicide inputs used at low disease pressure showed that it was possible in 2011 to reduce the fungicide use by 26% and still having a good control of potato late blight. Attacks of *Alternaria* was late and at low levels in 2011.

Denmark 2010

Crop emergence was normal 20-25 May. Indications of oospores were only found on a trial site and in a few other fields with narrow crop rotation. First attacks were recorded on 8 June. Attacks in more than five fields were reported on 7 July. June was unfavourable for late blight and July and August had several dry spells making blight control with fungicides relatively easy. Even Dithane is used widespread because it is cheap the use of Ranman/Revus control strategies is increasingly used in Denmark. Ridomil obtained a good effect. Yield was relatively high and tuber blight was only a problem in few fields due to a rainy period and blight favourable conditions in September. *Alternaria* was observed early in the season and caused some problems. Attacks of *Alternaria* seems to be an increasing problem in Denmark.

England & Wales 2011

Planting progress was generally good in England and Wales in 2011. Weather conditions conducive to late blight development were reported from mid-June and throughout July and August. There were 36 incidents of late blight reported on Potato Council-funded late blight maps in GB in England and Wales until mid-September. Most reported outbreaks were in crops, with one infection reported on a volunteer and one on an outgrade pile. Fourteen incidents were reported in July, 14 in August and 8 in September and, overall, control of late blight was good. Control of late blight in England and Wales was good in 2011, with no incidents until mid-July and weather conditions did not affect timing of fungicide applications. According to the UK pesticide usage survey report 235, the active ingredients used on the largest areas were fluazinam, mancozeb/cymoxanil, cyazofamid, mandipropamid and fluopicolide/propanocarb-hydrochloride.

England & Wales 2010

Planting was delayed in March due to heavy rain and snow across much of England and Wales, however, most of the crop was in by the last week of May. Weather conditions conducive to late blight development were reported mid-June, and throughout most of July and August. There were 67 confirmed incidents of late blight in England and Wales in 2010. Most reported outbreaks were in crops with the occasional infection reported on outgrade piles and volunteers. Only 1% of incidents were reported in June, with 80% reported across July and August and the remainder in September. Growers used a range of fungicides which were often applied as tank mixes. Control of late blight was good overall. Conditions during harvest were variable, with rain interrupting lifting and in some instances lifting was delayed due to poor conditions earlier in the season that delayed the cereal harvest. Most fungicides were applied at seven day intervals unless risk was considered to be low for extended periods. *Alternaria* is not considered to be a major disease of potatoes in England and Wales, although occasional outbreaks are reported, particularly on susceptible varieties such as cv. Markies. First symptoms in reported cases were reported mid- to late July in 2010.

Estonia 2011

Due to late spring there was only short time difference between planting, development and late blight infection of early and maincrop potatoes. After the very low incidence of late blight in previous 2010 year, the late blight established very late in 2011. The dry weather in first half of the growing season

did not favour the development of late blight. The weather conditions were more favourable for development of early blight than for late blight. Also leaf blotch of potato, caused by *Botrytis cinerea* caused essential damages in potato foliage. The weather changed in mid July, when intensive rains occurred in the Northern and Western parts of Estonia and favoured infection. First late blight attacks were recorded on July 14. The weather in central and southern parts of Estonia remained dry until the end of first decade of August. Rain events covering whole Estonia from mid August created very favourable conditions for late blight. Infected potato foliage was destroyed within a week in these conditions. The new network consisting of 13 iMetos stations was established in collaboration of Jõgeva PBI and farmers cooperative Talukartul for DSS in late blight control. Use of the DSS saved 1-2 fungicide applications in average.

Estonia 2010

The late blight established early in 2010. First infections were recorded at the end of May in covered field of early potatoes and at the end of June in open fields. The established infection stopped in following hot and dry weather. Late blight established again on late varieties in September just before the harvest. It was year of lowest late blight incidence since 2002. Weather conditions were more favourable for *Alternaria*, causing medium level of attacks. Leaf blotch of potato caused by *Botrytis cinerea* damaged the potato plants in the same level as did *Alternaria*. Early blight needed more fungicide input for effective control than late blight. There was low incidence of tuber blight. *Alternaria* caused more tuber infection than Phytophthora, especially in sandy soils.

Finland 2011

The potato late blight development in Finland in 2011 was highly determined by exceptionally warm weather accompanied by very local heavy thunder storms with excessive precipitation. The first blight observations were made at the first week of July, which has been very constant within past ten years. At the sites with high precipitation the progress of late blight epidemics was faster than ever recorded earlier during the 2000s. At sites with low precipitation no blight at all was detected. The use of fungicides as well was dependent on the blight risk induced by the local thunders. Tuber blight at the sites with high precipitation and failure in leaf blight control seems to be more devastating than normally in Finland. In 2011, probably due to warm but relatively rainy summer, *Alternaria* at some sites and cultivars was very common and also injured some crops very seriously. Also in the late blight control the intensive use of mancozeb-products has been replaced by more modern products with no or low efficacy against *Alternaria*.

Finland 2010

In 2010 there was practically no potato late blight in Finland. Due to the dry and warm weather conditions farmers normally sprayed 3 – 5 times.

France 2011

In Brittany (along the Channel coast), early crops (plastic covered and under tunnels) were planted by the end of January and most of the crops remained covered until end of March. The first outbreak of late blight occurred in a tunnel in the last days of March, followed by an outbreak in an open field in the first days of April. These very early crops were ready for harvest and tuber damage was not recorded at harvest. In the seed production areas, planting of the crops was almost completed by mid April (2-3 weeks earlier than usual) with unexpected dry and mild conditions. Climatic conditions of April and May were mild to warm and unusually dry, not conducive at all for large late blight development however sporadic outbreaks occurred on volunteers and cull piles late May. Few rains early June contributed to the first outbreaks in conventional fields which had no further favourable spreading conditions, afterwards. After a continuous low risk period from April to end

of June, the climatic situation completely changed, turning into rain and mild to cold temperatures. Crops were close to haulm killing but spraying program had to be adjusted following high risk periods. Late maturing crops had to be protected thoroughly in order to maintain high quality tubers at harvest. For the ware potatoes in the north of France, planting was earlier than usual, and late blight appeared in April during warm and humid conditions. The spring 2011 was marked by a particularly dry climate. During June, the lack of water and the high temperatures stressed the maturation of tubers and reduced the tuberisation from 10 to 30 % according to the varieties and the sectors. The return of rains in mid July strongly favoured the establishment of late blight. Weather was continuously conducive for blight development and tuber quality was affected. The incidence of *Alternaria* was severe in the Picardie region and disease appeared as early as end of June.

France 2010

Very early potato planting occurred mid February in Brittany, along the Channel coasts, mostly under plastic covers and tunnels. From March until end of May, the climatic conditions were not too conducive for late blight development though several late blight outbreaks were recorded for covered crops. In seed potato growing areas (Brittany), climatic conditions have been fairly cold and dry after planting and the first outbreak of late blight occurred early June. A low risk period followed in July and high risk periods occurred again at the haulm killing period, in August. Good tuber quality was guaranteed by a comprehensive spraying program. In the Northern potato growing areas (ware and processing), planting occurred from mid April until mid-May, in cold and humid conditions. These climatic conditions have limited late blight outbreaks though volunteers were growing with no protection against late blight as well as waste piles. Due to heavy rain falls from mid June, the first blight outbreaks occurred on waste piles (Picardie region) and gardens (Nord Pas de Calais region). Blight pressure was very low during July and, with the use of the DSS, some sprayings have been saved. A high risk period persisted in August when further disease dispersal has affected some commercial crops later by the end July. Overall harvested crops were blight free with very few exceptions.

Germany 2011

Planting of potatoes in Germany took place during end of March and mid of April. It is a normal planting date. Very warm and dry conditions in April and May resulted in an early emergence of potato plants (beginning of May= 10-14 days earlier than normal). The first outbreak of late blight in potatoes was in the beginning of June (04. June) – very late. The weather conditions for the development of late blight was low in the North and high in the South. The number of fungicide treatments was normal in 2011. All kind of products were used. The outbreak of early blight was normal (2-4 weeks after the crop emergence). The start of the early blight epidemic depends on the cultivar, crop emergence (plant age), weather condition and inoculum. In some regions there was a very early start of the epidemic. Therefore in most regions early blight has been a destructive disease and caused yield losses due to premature defoliation. Fungicide used to control early blight: Mancozeb-containing products, Ortiva (Azoxystrobin), Signum (Boscalid + F500).

Germany 2010

Planting of potatoes in Germany took place during end of March and mid of April. It is a normal planting date. The first outbreak of late blight in potatoes was in the mid of May in the early potato growing area (11.May). In the first week of June late blight was observed in the Southern potato growing region. The weather conditions for the development of late blight was low in the North and high in the South. The number of fungicide treatments was normal in 2010. All kind of products were used. The outbreak of early blight was normal (2-4 weeks after the crop emergence). The start of the early blight epidemic depends on the cultivar, crop emergence (plant age), weather condition

and inoculum. Therefore in some regions (north, east and west) early blight has been a destructive disease and caused yield losses due to premature defoliation. Fungicide used to control early blight: Mancozeb-containing products, Ortiva (Azoxystrobin), Signum (Boscalid + F500). There are two decision support systems, Phytophthora-Model Weihenstephan and ISIP for the control of late blight running in Germany. The information of the DSS's are also on the internet (www.krautfaeule.de; www.isip.de). The majority of the potato growers are directly informed by fax or e-mail. In many regions the state advisory services inform the farmers by telephone or fax.

Republic of Ireland 2011

Favourable weather conditions during April resulted in relatively early planting of the potato crop during 2011. Although wet weather conditions prevailed during May, June and July temperatures were below normal. No early outbreaks of late blight were reported, with the first outbreak recorded on the 8th of July in Co. Kerry (South-West of the country and away from the major potato production regions). Further outbreaks were not reported until late July / early October. In general routine fungicide applications were made at seven day intervals and little problems with disease control were reported. No major outbreaks of *Alternaria* were reported. There are limited information on individual use of DSS. Country-wide forecasting provided by Met Eireann using Effective Blight Hours based upon Bourke's rules were issued through national media outlets. *Phytophthora infestans* characterisations are ongoing.

Latvia 2011

Crop emergence was completed by the end of May. Cool weather conditions (average temperature of 8-10 °C) delayed the crop growth and development of late blight, therefore the first warning of the development of late blight was received on the 26th of June when the temperature and humidity conditions were favourable for the development of the disease. Also the first warning of the development of *Alternaria solani* was received in this period. In June 95 mm of rainfall was recorded in western part of Latvia, but in the northern part - 135 mm of rainfall. The first protective application of fungicide (systemic or translaminar + contact) was made before the infectious period. Temperature and humidity conditions were favourable for the development of both diseases. The second warning of the development of late blight was received on the 3th of July. The second protective application with fungicide (systemic or translaminar + contact) was made. The first symptoms of *Phytophthora infestans* were recorded on the 8th of July on unprotected crops. In July the infection pressure on unprotected crops was very high due to frequent precipitation and optimal temperatures. In July 136 mm of rainfall was recorded in western part of Latvia with average temperature of 15 – 19 °C for the most of July. The following applications in July were made with translaminar + contact fungicides and in August - with contact fungicides, mostly with mancozeb and fluazinam. Unprotected crops and those that were the most susceptible were totally killed in two weeks in the beginning of August. *Phytophthora infestans* and *Alternaria solani* progressed also in August. 101 mm of rainfall was recorded in northern part of Latvia in August and weather conditions were favourable for the development of tuber blight. The use of fungicides resulted in excellent control in all farms when the first protective application with systemic + contact fungicide was made at the end of June/ beginning of July. Control of late blight was very good to moderate in the 2010 season.

Lithuania 2011

The spring in 2011, was warm and dry in most of Lithuania therefore resulting in good conditions for planting. The first blight report came 11-12 June from an uncovered field where early potato cultivars were planted. This is later than normal. Until mid July there were only sporadic reports of blight in Lithuania. Good conditions for late blight development on leaves were recorded on the end of August and on the beginning of September. Late blight infections on tubers did not overcome

incidence in previous years as was on the controlled level. The most farmers sprayed normally starting at the end of June or first half of July and sprayed 4 – 6 times. In Lithuania, 2011, *Alternaria spp* was very rare and infection took place only in a limited number of fields, where disease severity remained at low levels.

Lithuania 2010

April was warm enough as usual. Average air temperature was 7.3 degree which is by 1.3 degree higher compared with long-term average. Amount of rain was higher by 16.3 % compared with long-term average. Air temperature in May was a little higher than usual but this month was very rainy. Total amount of the rain amounted nearly by double compared with long-term average. Therefore the planting of potato crop was delayed by nearly 3 weeks compared with usual practice. Most of the crop was planted on the second part of May. From June till August higher than usual, average air temperature prevailed. Very hot months were July and August when average air temperature was by 4.0 and 3.1 degree higher compared with long term-average, respectively. Also, during the same period, the amount of rain was exceeded. In June and July the amount of rain was higher by 13.7 % and 91.4 %, respectively. In September, air temperature and amount of rain was very close to long-term average. Rainy weather conditions are favourable for late blight occurrence and development but during the growing period heavy rains altered with very high air temperature, therefore disease occurred quite late (at the beginning of August). Heavy rain squeezed the soil and growing of potatoes was aggravated. Soil cultivation between rows was impossible due to the dense foliage. Therefore yield of potato tubers was not high enough as it was expected.

The Netherlands 2011

Just like 2007, spring 2011 in the Netherlands was extremely dry. In the southern part of the country it stayed dry till half June. The precipitation deficit (calculation starting at April first) ranged from 150 to 210 mm. From that time the weather changed and July was a wet month with precipitation amounts ranging from 100 mm in the eastern parts of the country till 200 mm in the coastal regions. This resulted in an early average planting date (first week of April) of the potatoes. Until the first week of June there has hardly been Late Blight all over the country. In May there was a report of Blight in a field under cover in the South Eastern part of the country. The disease pressure of Blight stayed rather low during the season till the beginning of August. The weather conditions were favourable for many days in July. But, the growers were able to keep their crops free of attack by spraying regularly. Most organic crops became infected during the last decade of this month. Fungicides used in 2011 differs not very much of the use in 2010. There is a shift towards the use of Revus, Valbon, and Orvego at the expense of Curzate M and Acrobat for the first 4-6 sprays. In the middle part of the season we see a lot of growers applying Infinito. In August there was a comprehensive use of Ranman and still a considerable share for Shirlan, although this product is decreasing because of disappointing experiences in August 2010.

Northern Ireland 2011

Generally crops were planted in fairly good conditions, but subsequent growth was slow due to unusually cool, dull weather during June, July and August. Blight was first reported on 18 June and was subsequently found in some crops in all potato-growing parts of Northern Ireland, but was more frequent in the north-west with less infection found in Co. Down (south and east). Overall, there were fewer reports of blight than the average, probably because of good fungicide programmes, rather poor growing conditions and weather which was not particularly favourable to blight until August. Fungicide usage was about average (seed crops received between 4 and 15 applications, with the average being 9-10); fluazinam was the most widely used active ingredient and growers also made substantial use of fluopicolide+propamocarb, dimethomorph+mancozeb, cymoxanil+mancozeb,

cyazofamid, mandipropamid and mancozeb. Blight was generally well-controlled in foliage and there were few reports of tuber blight.

Northern Ireland 2010

Crops were planted in good conditions. The weather in April, May and June was unusually dry (c. 50% of average rainfall) and some crops showed signs of stress in June and no late blight was seen. Although July was wetter than the average, the first report of blight was not received until 19 July, the latest of any year since monitoring started in 1981. Few outbreaks were reported (only 10 sites) and overall blight was well controlled. Blight fungicide usage was also therefore less than in recent years.

Norway 2011

High soil humidity in the first part of the growing season and more late blight favourable days in June than normal caused 2-3 weeks earlier infections than normal in the main crop. Late blight was also found relative early in Nordland, but was not found further north of Norway in 2011. Infected seed tubers were probably the main cause of primary infections. During July and August there were more days favourable for late blight than normal and this also continued into September. Regular fungicide treatments kept late blight under control, but about 50 % of the fields had leaf blight in early August, but at low levels. The precipitation was very high during the whole season. Potentially there will be more tuber blight than normal. On average about one more fungicide treatment was used than normal. Typically one treatment with Ridomil or Tyfon is used early and then Ranman or Revus. More than 70 % of the treatments were carried out by these two products. In Norway the decision support system for potato late blight is available for free at www.vips-landbruk.no and consists of four parts - A map of the blight attacks found, the Negative prognosis to predict the first fungicide application and Førsund's rules and a new late blight model to predict days with high risk of blight infections. The system is used both by the advisory service and by farmers.

Norway 2010

Late blight started to develop at about the same time as normal. In the main potato growing areas there were many late blight favourable days in July and August. A lot of fields had some late blight attacks, but most farmers were able to spray their fields without getting heavy losses. The level of visible tuber blight was relatively low, but probably more latent infection than normal was present. The number of treatments was about the same as normal for the last years. Late blight was found late in the season in Nordland County but not further north in Norway in 2010.

Poland 2011

In Poland the beginning of growing season 2011 with very cold and dry weather conditions during April delayed planting of the majority of potato crops for a few days, with planting continuing in mid May. Weather conditions in May and first decade of June were also dry and unfavourable for late blight attacks. First outbreak of potato late blight was recorded at the beginning of June, on 6.06.2011. Higher rainfalls, after 10th June caused the majority of late blight attacks in observed potato fields around Poland during forthcoming two weeks. Late blight attacks in more than 5 conventional, normally planted potato fields were reported on 10th June. Weather conditions in the next days favoured the development of the disease. High precipitation in July and August extended high late blight pressure. The result of "blight year" was a high level of tuber blight in yield. Farmers applied 3-13 fungicide sprays in order to control late blight.

Poland 2010

In 2010, planting of potatoes in Poland took place mainly during April, at a normal planting

time. Unfavourable weather conditions after planting (high humidity and cold) resulted in late emergence of potato plants and were not conducive of late blight appearance (too cold for the late blight development). In southern and central parts of the country first outbreaks of late blight in potatoes were reported at the end of May and at the beginning of June in covered and early planted potato crops, at a very early growth stage of potato plants (BBCH= 24-37). Late blight attacks in more than 5 conventional, normally planted potato fields were reported on 21st June. In northern regions by 20th June only a few outbreaks of late blight were recorded in crops with foliar and stem symptoms. Following approximately two weeks of extreme disease pressure in early August, more severe outbreaks were reported in northern potato region. The development of the disease stopped in July because of very dry and warm weather. Very intensive development of late blight was reported again in August (after 10th), leading to the complete destruction of plants during 7-10 days on unprotected plots. Farmers applied 1-11 sprays to control late.

Russian Federation 2011

The most severe late blight development was registered in the Kaliningrad region. The first late blight attack was reported on June 23. The disease became widespread after July 20. To August 1, the foliage was destroyed on the unprotected potato fields. Due to heavy rains shortly before and during the harvesting, the disease became a big problem in the most of farms. A moderate development of the disease was observed in the northwestern (Leningrad, Pskov, and Novgorod), western (Bryansk), and some northern regions. Other parts of the European Russia demonstrated rather weak or even suppressed late blight development. A severe or moderate early blight attack was reported for some potato cultivars, growing on unprotected fields or fields, protected only against the late blight, of the central and southern regions of the country. The most popular fungicides were Tanos, Shirlan, Infinito, Ridomil Gold MZ, and Acrobat MZ. The average number of sprayings is about 3-4; the total number of treatments ranges between 2 and 11. The owners of allotment gardens did not use any fungicides. A small number of farms used such DSSes as Plant Plus (Dacom) or VNIIFBlight for the late blight control.

Russian Federation 2010

The severe, but late development of the potato late blight was observed in the Kaliningrad region and some districts of the Leningrad region. In the case of other regions of the European part of Russia, a long period of a hot and dry weather caused very unfavorable conditions of the *P. infestans* development. However, in spite of this fact, in the central regions (for example, in the Moscow region) we observed a strong infection of potato tubers (cv. Santé): 14% on the non-treated fields and 2% in the case of a twofold treatment with the Bravo fungicide. A strong early blight infection was registered in the Vologda region (cv. Udacha; foliar infection). Average number of fungicide applications: 3-4 (max 7-9) per season. The most popular fungicides were Tanos, Shirlan, Infinito, and Ridomil Gold MZ. The owners of allotment gardens did not use any fungicides.

Scotland 2011

One hundred and forty-five confirmed outbreaks in Scotland were reported on the Potato Council-funded blight outbreak maps up until the 16th of September. The progression of crop outbreaks (134 in number) was 0% in May, 0.8% in June, another 37.3% in July, 59.0% more in August and 3.0% more up to the 16th of September. There were five confirmed outbreaks on dumps of potatoes (7, 12 and 25 July, 10 and 18 August) and six outbreaks on volunteers (12 July and 5, 9, 17, 18 and 25 August).

Scotland 2010

Thirty-two confirmed outbreaks were reported on the Potato Council-funded blight outbreak maps

up until 20 September. The progression of crop outbreaks was 0% in May, 5.3% in June, another 15.8% in July, 57.9% more in August and a further 21.1% in September (up to the 20th). There was one confirmed outbreak on a dump of potatoes (20th of September) and one outbreak on volunteers (10 August). The most widely used fungicides in 2010, in declining order, were cymoxanil, fluazinam, cyazofamid, mandipropamid, mancozeb + cymoxanil, amisulbron, benthiovalicarb + adjuvant, fluopicolide + propamocarb, famoxadone + cymoxanil, fenamidone + propamocarb, dimethomorph + mancozeb and zoxamide + mancozeb.

Slovakia 2011

Compared to 2010, above-standard rainfalls were recorded but use of pesticides was possible and disease was adequate managed. Strong damaged vestures were not recorded. Therefore, much higher yields are expected compared to the last year. High rainfalls that support the blight development were approximately from half of June till the end of July. Locally this season started 2 weeks earlier, eventually lasted longer for other 2 weeks till the half of August. In comparison to the last year, there were rainfalls less intensive but the conditions for blight development were reached and lasted continuously about 7-11 weeks.

Slovakia 2010

With regard to a very long duration of suitable conditions for spreading of Late Blight, its occurrences were recorded relatively early, with a fast follow development. Damages of vestures were high, including economic losses. It was among other things caused by large floods and long-term impossibility to enter into vestures. Some of vestures were damaged so much, that there were no crops at all, or we were unable to harvest such a crop caused by long-term flood.

Sweden 2011

The spring was warm and dry in most of Sweden 2011 resulting in good conditions for planting. The first blight reports in 2011 came 3rd of June from a covered early potato field on the South west coast. The blight pressure was low in the beginning of the season in 2011 but switched to very high in the beginning of July. The weather in south Sweden was very favourably for blight in July and August. Many reports of late blight attacks from both organic and conventional potato fields. 2011 is according to experienced advisers the worst blight year in 30 years. In North Sweden the early season was very dry and no reports of blight attacks but August was rainy. This resulted in late blight reports in September as far north as from above latitude 65 N. 2011 can be considered as a year with big difficulties to control late blight and in addition very bad harvest conditions.

Sweden 2010

The spring was warm and dry in most of Sweden 2010 resulting in good conditions for planting. In 2010, the first blight report came 1 June from an covered early potato field on the South west. The weather was very dry in the early season, resulting in only sporadic reports of blight in south and mid Sweden. The first reports came from these areas came in late July. 2010 can be considered as a year with relatively small problems with late blight

Switzerland 2011

In 2011 late blight epidemic pressure was low. Until May it was very dry in Switzerland and during April in almost all parts of Switzerland no MISPs (main infection and sporulation period) were registered. A first late blight attack was observed early on May 9 in a covered potato field in the south-western part of Switzerland. As this is geographically an "isolated" region, this attack was not important for the other potato growing regions. On May 19 and June 14 two other late blight attacks were observed. In June some MISPs were registered, but as these were only single events (except canton TI), fungicides could be applied without problems. During July and August, weather

conditions were very favourable for the development of late blight and late blight spread over the potato growing regions, but at a low pressure. Late blight attacks which were registered in our DSS PhytoPRE were mainly from untreated monitoring plots, potatoes planted in gardens or from fields with insufficient fungicide protection. Number of announced attacks was very low (44) compared to former years (2010: 75, 2009: 95, 2008: 224).

Switzerland 2010

Winter of 2009/2010 was particularly long and cold. Last snowfall in the lowland was recorded at the end of March and many potatoes were planted only in April. Compared to former years, the first late blight attack was observed rather late on 27 May in a covered potato field (2009: 30.4.; 2008: 19.5.). During the first two weeks of May and June, the weather based infection risk was very favourable for the development of late blight. Several days with continuous main infection and sporulation periods (MISP) were registered for all weather stations. Therefore late blight could spread in all potato growing regions. However, during the second part of June until July 22nd it was hot and dry. Hence, late blight epidemic pressure was strongly reduced. With a heavy thunderstorm, this dry weather period ended and since then weather conditions were again favourable for the development of late blight. Nevertheless, late blight could only recover slowly and only a few new late blight attacks were observed. In summary, the spread of late blight started late and fast, but the hot and dry weather from June 22 until July 22 stopped the epidemic and therefore late blight epidemic was weaker than the year before. Tuber blight was found in fields with tardy late blight attacks, but in summary pressure of tuber blight was low.

EARLY ATTACKS OF LATE BLIGHT

In North-West Europe in countries like the Netherlands, Belgium, France and the UK, early attacks of late blight is often found on dump piles. In 2010 and 2011 spread from dumps was not a big problem: “As is usually the case, early inoculum was found on dump piles. The spread of the disease from these early sources however was very much hampered by the dry and sunny weather in the first half of the growing season, as was the case in the previous season 2010”.

In 2010 early attacks were found in most of Europe between 25 May and 8 June. Late blight was found very late in the Netherlands (20 July) and in Northern Ireland (19 July), Fig. 1 and Fig. 5. Attacks were found widespread in Mid June in central Europe, first half of July in North-East Europe and late July and August in Northern Ireland, Scotland and Russia (Fig. 2 and Fig. 5).

In 2011 very early attacks were found in April in France and in May in Switzerland. In most other countries late blight attacks were recorded in the first half of June (Fig. 3.). Widespread attacks in conventional fields were relatively late compared to 2010, except for Denmark where wet and blight favourable weather conditions late May and early June resulted in early attacks from oospores in many fields – more than in any of the previous 16 years in the country (Fig. 6). Early attacks from oospores were mentioned as possible source of inoculums in the reports from Denmark, Sweden, Estonia and Poland.

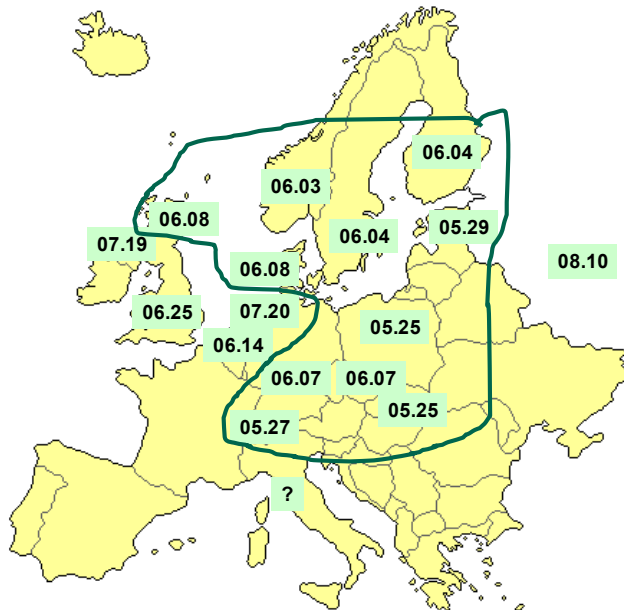


Figure 1. Date of first observation of late blight in covered or very early planted potatoes, 2010

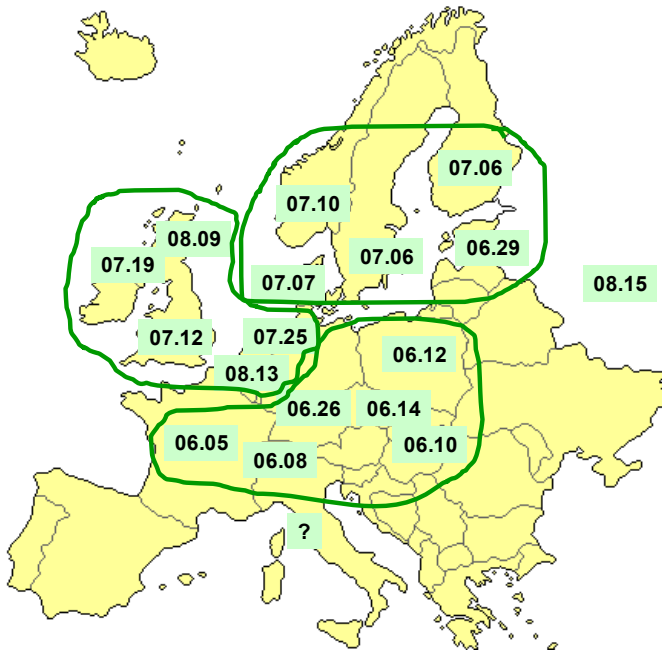


Figure 2. Date when first infections were reported in more than five conventional, normally planted potato fields, 2010.

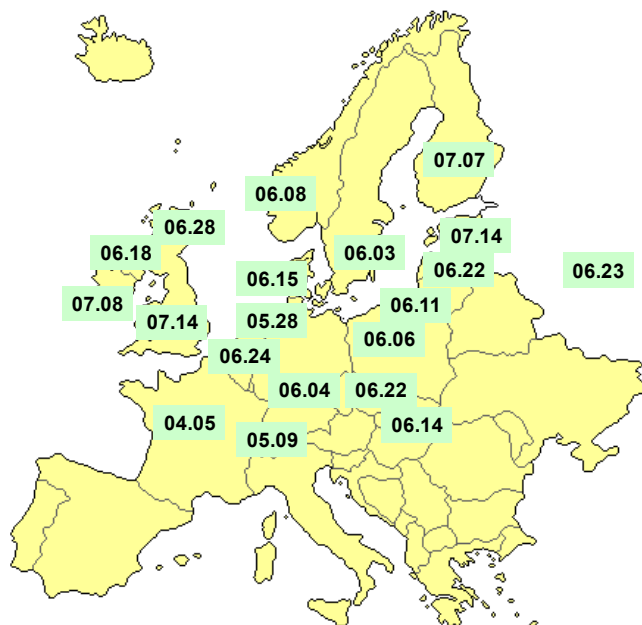
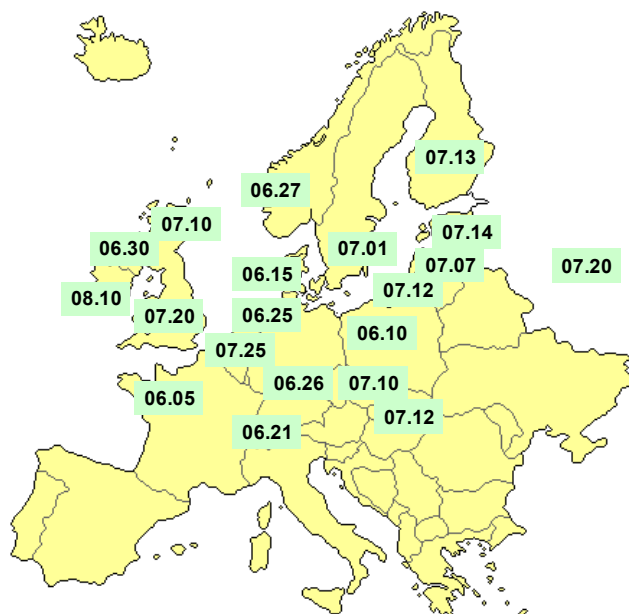


Figure 3. Date of first observation of late blight in covered or very early planted potatoes, 2011



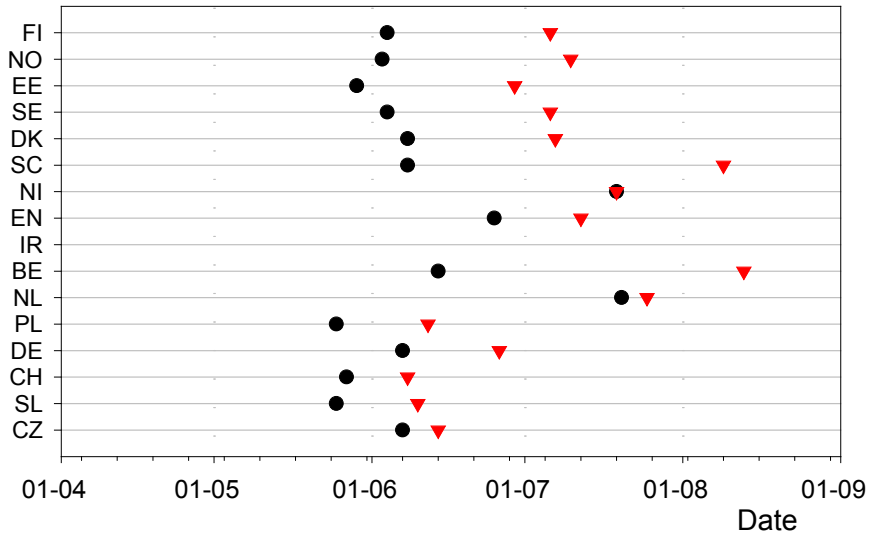


Figure 5. Date of first observation of late blight in covered or very early planted potatoes (black dots) and Date when first infections were reported in more than five conventional, normally planted potato fields (red triangles), 2010

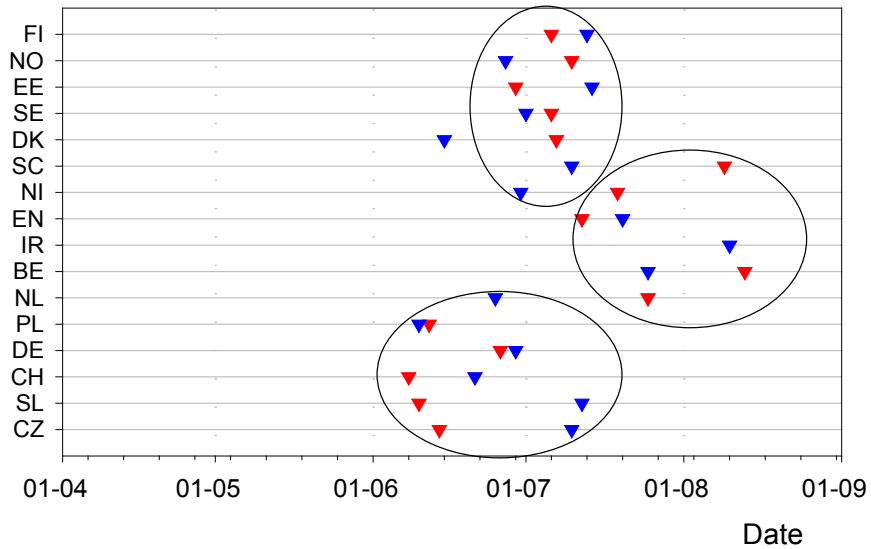


Figure 6. Date when first infections were reported in more than 5 conventional, normally planted potato fields in 2010 (red triangles) and 2011 (blue triangles) respectively.

WEATHER BASED RISK OF LATE BLIGHT DEVELOPMENT IN 2011

The weather based risk of late blight, given as infection pressure (0-20 = low; 20 – 40 = Medium and >40 = high) is given in Fig. 7. These calculations can be found on www.euroblight.net where outputs from several late blight sub-models can be compared for the period 2006-2011 across selected stations in Europe.



Figure 7. Infection pressure calculated at selected stations in Europe from 15 May-15 September, 2011

TUBER BLIGHT IN 2010 AND 2011

The level of tuber blight was low to medium in 2010, probably due to a combination of effective leaf blight control and favourable weather conditions during harvest (Fig. 8). For 2011, several countries have reported low incidence of tuber blight (not shown). The situation in 2010, reflect the situation in other countries too: “Although the weather conditions throughout the harvesting period were very wet and difficult, the level of tuber blight was less than could be expected. Fungicides with emphasis on tuber protection had been applied with (very) short intervals towards the end of the season, and the level of late blight attacks in the foliage was much lower than in previous years.”



Figure 8. The level of tuber blight attacks (low, medium or high) in 2010 compared to normal

ALTERNARIA 2010 AND 2011

The level of attack of *Alternaria Spp.* is shown for 2011 in Fig 9. A similar - but in Central and East Europe less severe situation - was the case in 2010. *Alternaria Spp* seems to be a minor problem in North/West Europe. Some countries stress that attacks of *Alternaria Spp* is an increasing problem, but severe attacks are only sporadic e.g. in Estonia, 2011, the conditions were more favourable for development of early blight than for late blight. The infection was at medium level. Also a shift in type of fungicide may change effective control i.e. in Finland "*Alternaria* has not so far been a problem. In 2010 some *Alternaria* lesions were found at the end of season. In 2011 probably due to warm but relatively rainy summer *Alternaria* at some sites and cultivars was very common and also injured some crops very seriously. Also in the late blight control the intensive use of mancozeb-products has been replaced by more modern products with no or low efficacy against *Alternaria*. In the Netherlands growers are now used to apply the *Alternaria* products (Amistar, Signum) two or three times during the months July and August.



Figure 9. Problems with *Alternaria*, 2011 in three classes compared to normal

USE OF DSSS

In Germany there are two decision support systems, PhytophthoraModel Weihenstephan (www.krautfaeule.de) and ISIP (www.isip.de). The majority of the potato growers are directly informed by fax or e-mail. In many regions the state advisory services inform the farmers by telephone or fax. In Switzerland Plot specific fungicide recommendations of PhytoPRE are used only by a small number (+/- 100) of farmers. But the PhytoPRE web pages with information on the weather based infection risk and maps with late blight attacks are visited intensively by many growers (approx. 200'000 clicks/growing season). In addition the PhytoPRE data sheet with LB-attacks is weakly published in farmer's newspapers. A lot of farmers have learned due to PhytoPRE to mind the critical facts/periods of late blight. In Estonia, a new network consisting of 13 iMetos stations was established in collaboration of Jõgeva PBI and farmers cooperative Talukartul for DSS in late blight control. A NegFry model provided through platform fieldclimate.com was used for fungicide timing. In Norway the decision support system for potato late blight is available for free at www.vips-landbruk.no and consists of four parts - A map of the blight attacks found, the Negative prognosis to predict the first fungicide application and Førsund's rules and a new late blight model to predict days with high risk of blight infections. The system is used both by the advisory service and by farmers. In England and Wales, growers can register and have free access to Blightwatch (www.blightwatch.co.uk) which gives the weather-based risk based on Smith Periods. Many growers are applying fungicides regularly, with a maximum interval of 7 days between applications, regardless of risk. DSSs providing information on a more localized scale are available to users on a subscription basis and include Forecast Extra. In Belgium, more than 2000 potato growers receive advice on late blight control from one of the two warning services, depending on the region. A network of more than 70 automatic weather stations collects the necessary meteorological data. The disease models used are historically based on the Guntz-Divoux model, but have been adapted and modified in the course of the past 20 years based on field trials and observations, new pathogen data etc. In the region of Flanders, extensions and sub models have been added, leading to a much more quantitative disease model. Additionally, the model has been integrated with GIS software and linked with a late blight attacks monitoring service. Advices are updated several times per week and communicated via internet, e-mail, fax or post. A separate advice for organic growers is available, pointing out critical days for preventative applications with copper fungicides. In the Netherlands two commercial companies supplying DSS's, Dacom and Agrovision. Many growers get information on late blight by fax, online, telephone or via a PC Programm. The use of DDS's hasn't changed a lot during the last years. In Northern Ireland, growers and advisers make use of DARD Blight-Net (http://www.ruralni.gov.uk/index/crops/potatoes/blight_net.htm), which is based on Risk Hours analagous to Smith Periods and can also sign up to receive Blight Warnings by SMS. Warnings of Infection Periods are also given on the Blightline recorded phone message and via local radio. Growers can also access Blightwatch (<http://www.blightwatch.co.uk>) based on Smith Periods. DSS e.g. Plant-Plus are mainly used by pre-packing suppliers to supermarkets to provide justification for fungicide applications. In Poland, generally, farmers start with chemical control after high amount of precipitation in the region or based on information from Main Inspectorate of Plant Health and Seed Inspection web site or based on Negative prognosis. Some farmers use the NegFry DSS (mainly in wielkopolskie voivodship). In Russia, a small number of Russian farmers used the Plant Plus (Dacom) and VNIIFBlight DSSs.