



Józefa Kapsa

**PLANT BREEDING AND ACCLIMATIZATION INSTITUTE
- NATIONAL RESEARCH INSTITUTE - RADZIKÓW
DEPARTMENT OF POTATO PROTECTION
AND SEED SCIENCE – BONIN, POLAND**

**Opportunities for
strengthening the Pest
Monitoring Systems and
Decision Support Systems**



Conference „*Sustainable use of pesticides and IPM in East-Central Europe and the Baltics*”
Radzików, 4-6 September 2011



Definition of IPM and the use of products for plant protection

The integrated pest management (**IPM**) was defined by Smith and Reynolds (1966) as:

“A pest population management system that utilizes all suitable techniques in a compatible manner to reduce pest populations and maintain them at levels below those causing economic injury.”

1. The utilization of all available control techniques,
2. The use of the economic injury level for decision of control
3. Maintenance of the pathogen/pest population density below the economic injury level.

Regulation 1107/2009

„Plant protection products should be used properly, in accordance with their authorisation, having regard to the principles of **IPM** and giving priority to non-chemical and natural alternatives wherever possible”

Directive 2009/ 128 /EC for the sustainable use of plant protection products:

„Principles of the **IPM (.....) shall apply at latest by 1 January 2014”.**



Essential elements of an integrated control strategy for late blight in potato

Stages of IPM		Activities in potato cultivation	Elements of IPM
PREVENTION	MONITORING	Previous crop and decisions before planting	soil type and crop rotation adequate cultivation techniques optimal fertilization and irrigation, weed control choice of cultivars
		Control activities during planting	seed health (certified seed) acceleration of plant sprouting in potato crops formation of ridges seed and /or soil treatments
	INTERVENTION	Control of pest during growing season	elimination of pathogen /pest sources irrigation chemical control
		Harvesting	maturity of tuber weather conditions, avoidance of wet loads avoid mechanical damages, careful handling chemical treatments (desiccation)
		Potato storage management_	curing-holding-warming

Control of agrophages during growing season

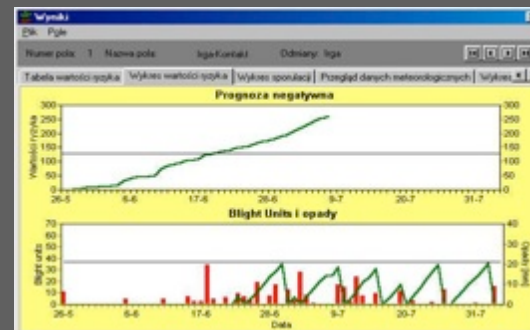
❖ elimination of pathogen / pest sources

- potato dump hygiene
- control of volunteer potatoes
- negative selection



❖ chemical control

- forecasting and monitoring
- **DSSs**
- choice of product
- haulm destruction



Input information

Output information

Permanent module
- specialist databases

Current (changing) module
- updated in the season

MODEL of PATHOGEN DEVELOPMENT
mathematic relationships
environment- plant host- pathogen

CHARACTERISTICS of PATHOGEN

CHARAKTERISTIC of PLANT HOST

PESTICIDES

WEATHER DATA

SYSTEM
data processing,
risk forecasting

decision

USER of SYSTEM

MONITORING of PRIMARY INFECTIONS

MANAGEMENT



Potato cultivars resistant to late blight (9 point scale)

02.2011 – on Polish National List **137** potato cultivars,

Table cultivars:

- ❖ Medea, Ursus (degree 6,5)
- ❖ Zeus, Sopllica (degree 6)



Starch cultivars:

- ❖ Bzura, Kuras, Ślęza (degree 8)
- ❖ Bosman, Hinga, Inwestor, Neptun, Sekwana, Sonda (degree 7)
- ❖ Umiak (degree 6,5)
- ❖ Gandawa, Jasia, Pokusa, Rudawa, Skawa (degree 6).



DSS - NegFry to control late blight

Meteo station

- Data of
- air temperature. [°C]
 - air humidity. [%]
 - precipitation [mm]
 - frequency 1 hour



Meto data



Program
NegFry



Information about a field

www.iung.pulawy.pl
www.ior.poznan.pl

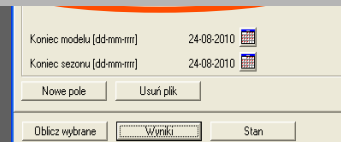
about
terms

Efficacy of LB control - validation of NegFry

Year	Level of plant destruction -%			Difference of spray number
	K	R	NF	
2003	98,5	16,5	17,5	2
2004	99,7	7,1	4,1	1
2005	99,1	18,3	14,9	0
2006	88,5	0,2	0,2	3
2007	99,5	4,7	2,3	3
2008	81,7	4,7	3,8	2
2009	98,9	29,7	25,2	2
2010	95,0	0,4	0,2	1

- K - untreated control
- R - routine, sprays each 7 days
- NF - sprays acc. DSS NegFry

Final results



Data	Dz. jedn. izyka	3kum. jedn. izyka	Opady umiulowane	opady	Blight units	Fungicyd
2010-07-13	6,0	213,7	2,4	20,0	40	
2010-07-14	15,4	229,2	0,2	0,0	0	*
2010-07-15	6,3	235,4	0,0	0,0	0	*
2010-07-16	6,2	241,6	0,0	0,0	1	
2010-07-17	4,2	245,8	1,8	1,8	2	
2010-07-18	5,6	251,4	0,0	1,8	7	
2010-07-19	7,6	259,1	0,0	1,8	13	
2010-07-20	5,0	264,1	0,0	1,8	18	
2010-07-21	5,0	269,1	4,4	6,2	18	
2010-07-22	8,0	277,1	1,4	7,6	20	
2010-07-23	39,4	316,4	14,2	21,8	27	
2010-07-24	26,4	342,8	26,4	48,2	34	
2010-07-25	4,3	347,1	16,0	0,0	0	*
2010-07-26	9,2	356,3	8,0	0,0	0	*



Validation of DSS NegFry – determination of LB appearance (Bonin, 2002-2010)

Year	NegFry prognosis of LB appearance	Date of LB appearance in locality	Difference between dates (days)	ARV*	DRV**
2002	16.06.	26.06.	10	139,2	10,3
2003	03.07.	30.07.	27	131,5	12,9
2004	23.06.	28.06.	5	147,9	8,1
2005	07.07.	25.07.	18	131,0	9,6
2006	22.06.	27.06.	5	137,8	14,9
2007	19.06.	25.06.	6	133,3	8,1
2008	30.06.	17.07.	17	140,3	7,0
2009	22.06.	20.06.	2	130,1	7,4
2010	26.06.	05.08.	40	139,5	10,6



Effectiveness of late blight control in different protection programmes

Lata	Level of plant destruction-%			Efficacy of protection- %		Number of sprays		Difference in number of applications
	K	R	NF	R	NF	R	NF	
2003	98,5	16,5	17,5	84,3	84,3	5	3	2
2004	99,7	7,1	4,1	92,9	95,9	5	4	1
2005	99,1	18,3	14,9	81,4	84,8	7	7	0
2006	88,5	0,2	0,2	99,8	99,8	9	6	3
2007	99,5	4,7	2,3	95,3	97,7	8	5	3
2008	81,7	4,7	3,8	95,0	96,0	7	5	2
2009	98,9	29,7	25,2	70,0	74,5	7	5	2
2010	95,0	0,4	0,2	99,6	99,8	6	5	1

K – untreated control

R – routine, sprays each 7 days

NF – sprays acc. DSS NegFry



Efficacy of potato protection against late blight in conventional field in 2009

Protection treatment	Number of sprays	Plant destruction on - 3.09.	Tuber yield (t/ha)	Yield increase compare to untreated control	
				t/ha	%
Untreated control	0	97,0	30,2	-	-
Intensive	11	0,3	39,7	9,5	31,3
Programe NegFry	6	0,7	44,1	13,9	46,0
LSD $\alpha=0,05$		5,4	9,1	-	-



Comparison of submodels



Home Partners Pathogens Fungicides Cultivars Potato IPM Publications

Compare submodels

Select specification

Country: Poland

Weather station: Bonin

Year: 2009

Start date: 15-05-2009

Weather data type: Temperature and precipitation

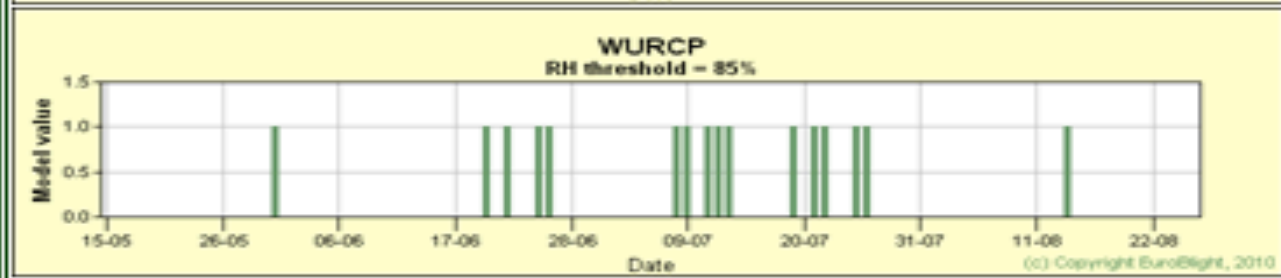
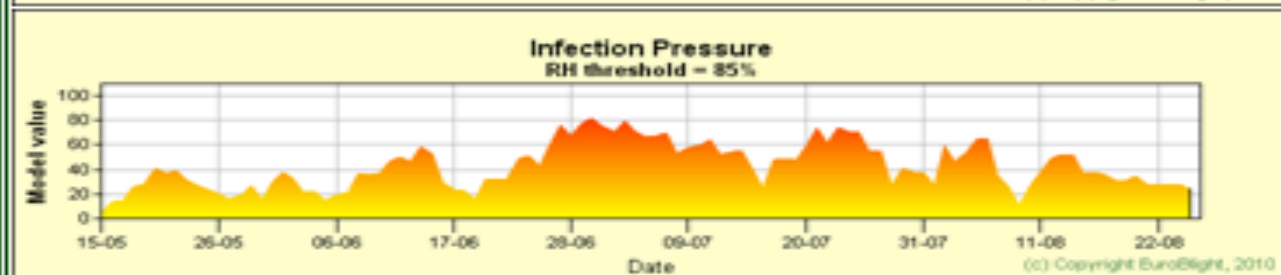
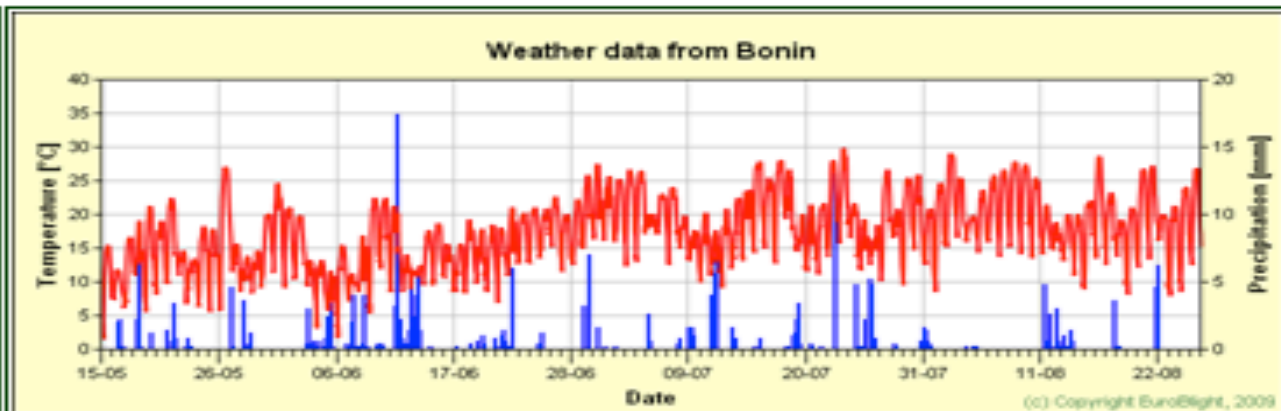
Number of models: 2

Model no. 1: Infection Pressure
RH threshold: 90% 80% 85%

Model no. 2: WURCP
RH threshold: 90% 80% 85%

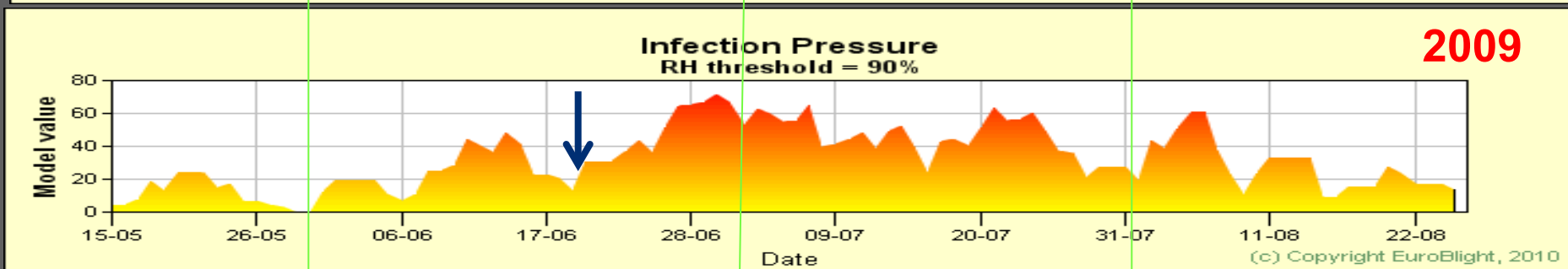
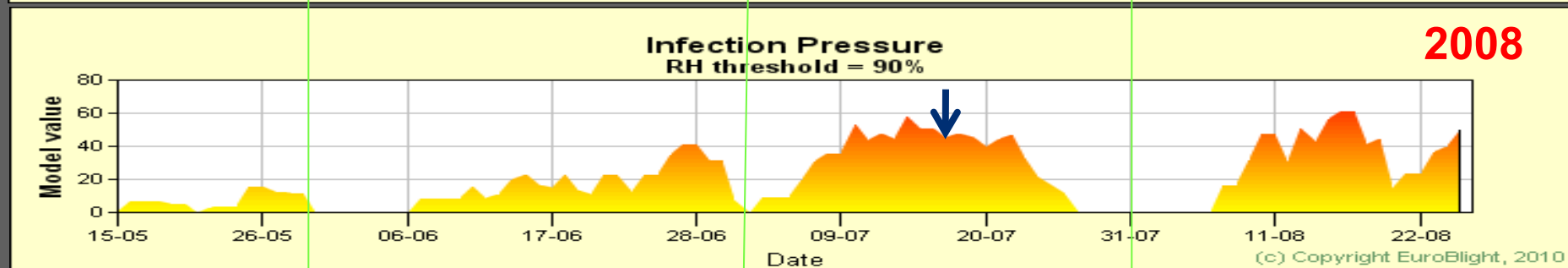
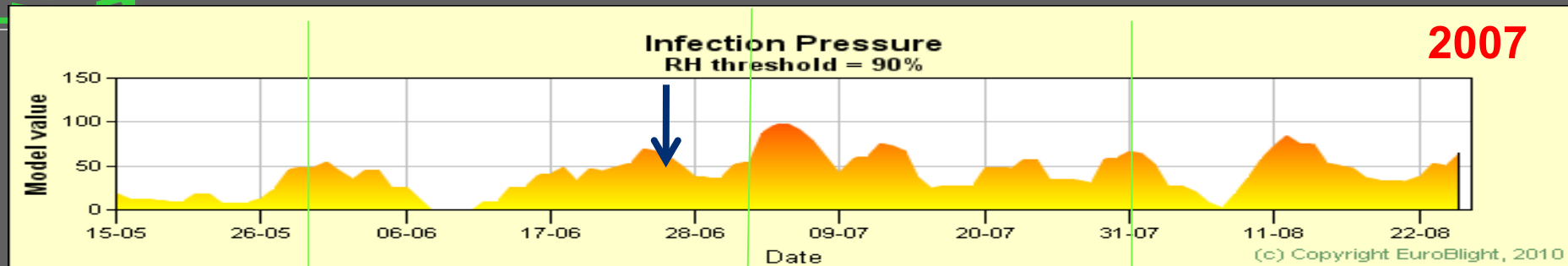
Show biological data if present

Show new data interval





Risk of LB occurrence in Bonin (years: 2007 – 2009)



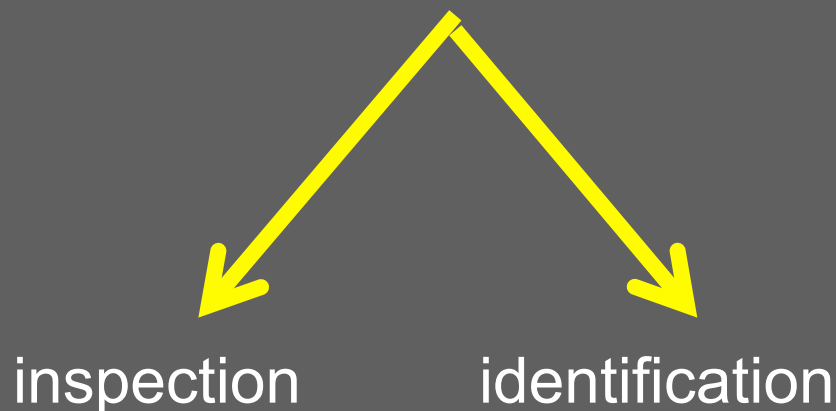
Year	May	June	July	August
2007		25.06.		
2008			17.07.	
2009		20.06.		



Monitoring – definition and its role in DSSs

Monitoring – a regular observation, is the key objective of the IPM and a very important part of DSSs.

Observation is broken into two steps:





Organizing of pest monitoring (The Pest Monitoring Network)

Reporters- monitoring



Country administrator

Country Administration

Country administrator
Name: Jens Grænbach Hansen
Email: jensg.hansen@agrsci.dk
Mail host: [outlook.agrsci.dk]
Country: DK
Server: freja.agrsci.dk
Mail user ID: []
Mail port: [25]

Reporters

Id	Name	Email	Send to
JEH	Jens Grænbach Hansen	jensg.hansen@agrsci.dk	True
PEJ	Peter Jensen	peter.jensen@agrsci.dk	True

Buttons: New, Delete, OK, Select all, Unselect all, Local reporter

Send

Edit reporter

Send

Id: JEH Name: Jens Grænbach Hansen Email: jensg.hansen@agrsci.dk

Success server: Use record server

Host: []
Directory: []
User ID: [] Password: []

Pi-Monitoring

Pi-Monitoring [Monitoring Potato Late Blight]

Reporter: []
Country: DK, In: JGH, Name: Jens G. Hansen, Email: jensg.hansen@agrsci.dk, Server: freja.agrsci.dk

Fields

Number	Name	Date	BECH Attack
1	Test field	2000-06-20	39 Attacks all over the field, severity 0.0-0.5 %
2	Test field		

Buttons: New, Delete

Observation | Field information

Date: 2000-06-20
Transfer Cancel

Observed attack:

- No attack
- One or few primary attacks in the field, largest spot < 1 m²
- One or few primary attacks in the field, largest spot 1-5 m²
- One or few primary attacks in the field, largest spot > 25 m²
- Attacks all over the field, severity 0.0-0.5 %
- Attacks all over the field, severity 0.5-1.0 %
- Attacks all over the field, severity 1.1-5.0 %
- Attacks all over the field, severity 5.1-10.0 %
- Attacks all over the field, severity 10.1-20.0 %
- Attacks all over the field, severity > 20 %
- No observation

Growth stage:

- 10 % of plants meet between rows
- 20-30 % of plants meet between rows
- 40-50 % of plants meet between rows
- 60-70 % of plants meet between rows
- 80-90 % of plants meet between rows
- No observation

Disconnected

FTP

Web-Blight



Web-Blight
Data base

Wee
by tr
crop

Diag

Cent
calcu

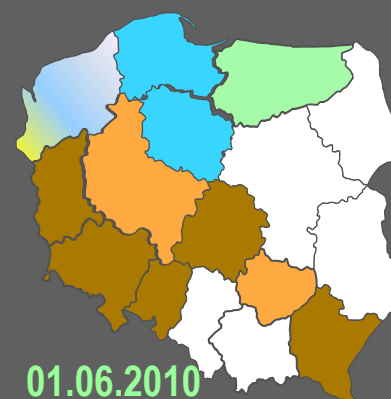
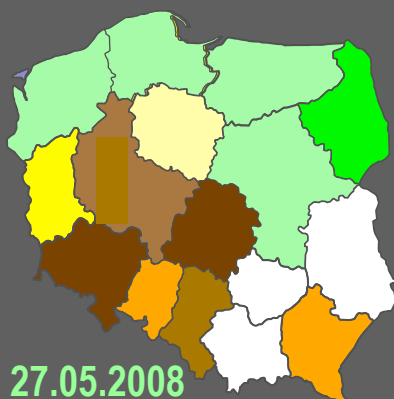
Inform

Service → the farmers

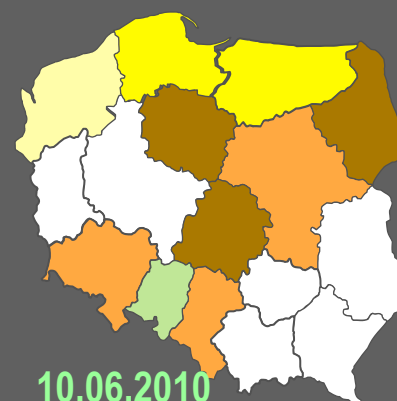
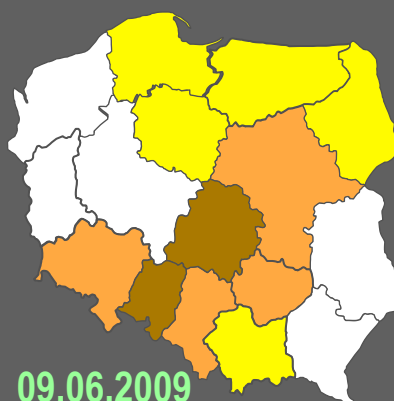
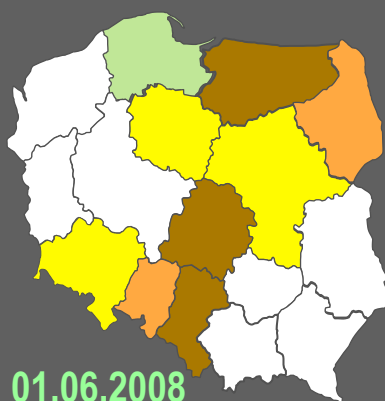


Risk assessment of LB occurrence in Poland in 2008 – 2010 based on field monitoring

a/ trained reporters



b/ questionnaire filled by inspectors of Plant Health and Seed Inspection Service



										No data	
<20	21-31	1-10	11-20	21-30	1-10	11-20	21-31	1-10	11-20		21-31
May		June			July			August			

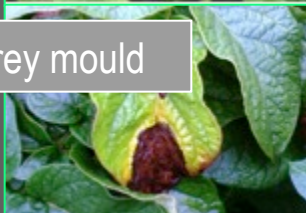


Proper diagnosis as a key component of the IPM program

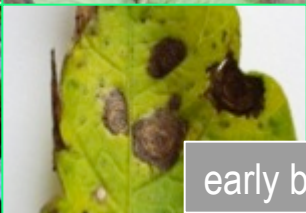
late blight?



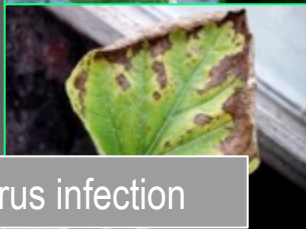
late blight



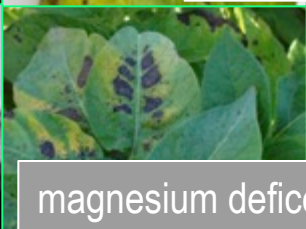
grey mould



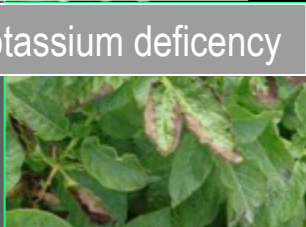
early blight



virus infection



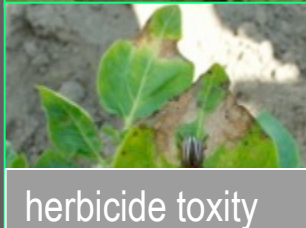
magnesium deficiency



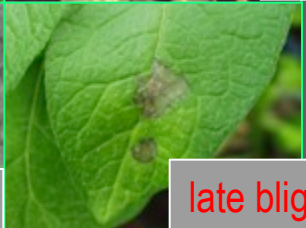
potassium deficiency



ring rot

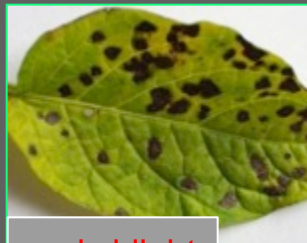


herbicide toxicity

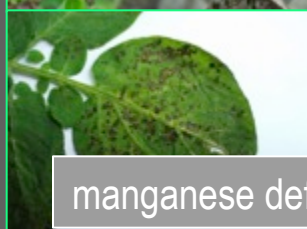
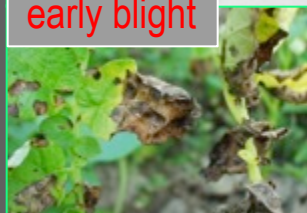


late blight

early blight?



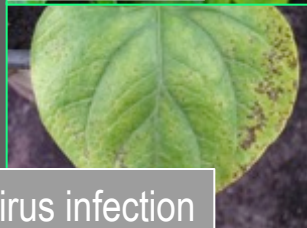
early blight



manganese deficiency



late blight



virus infection

stem late blight?



late blight



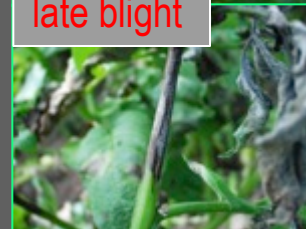
black leg



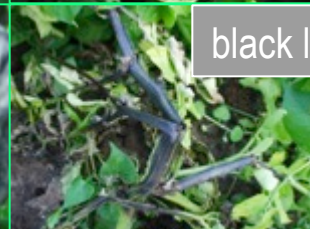
late blight



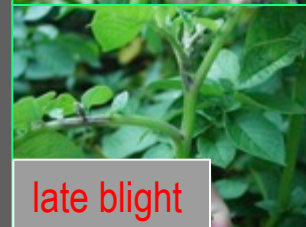
black leg



late blight



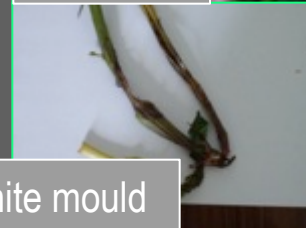
stem canker



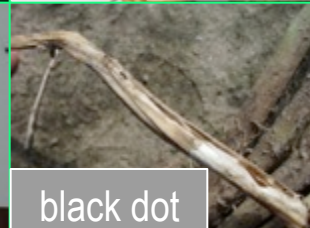
late blight



stem canker



white mould

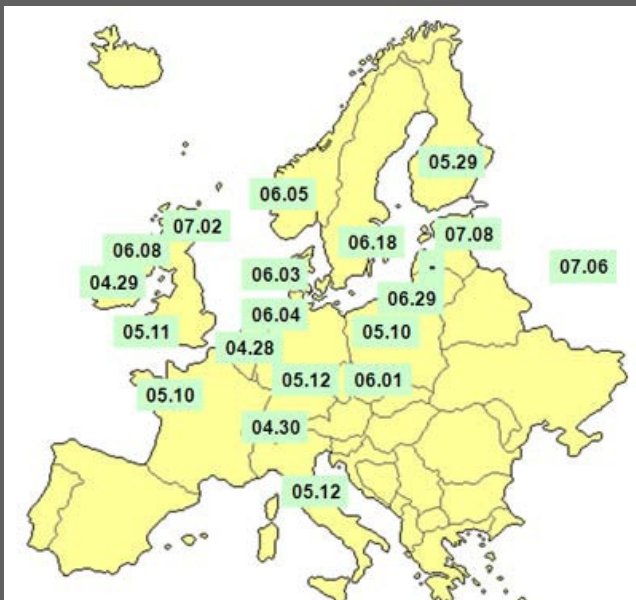


black dot

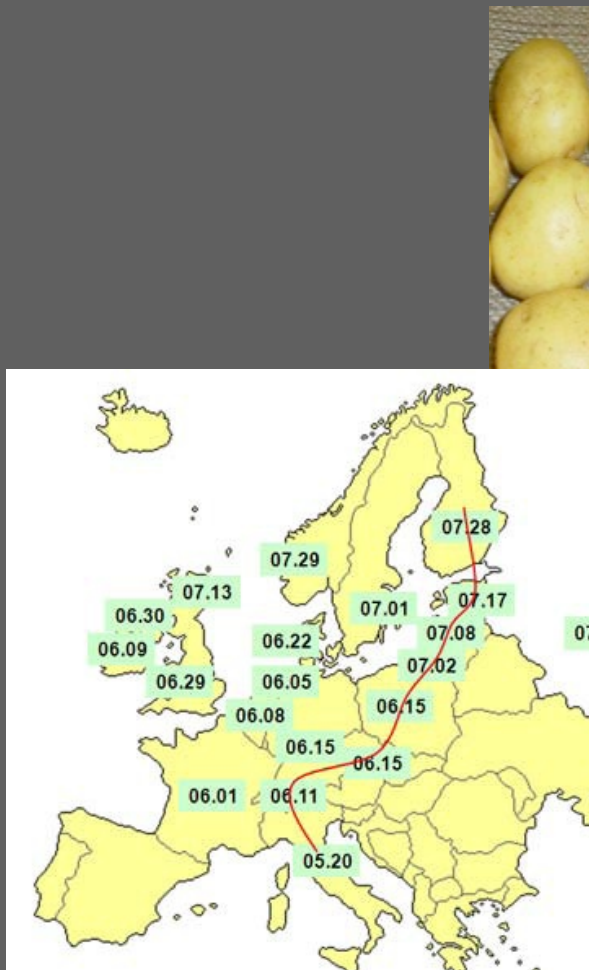


Results of observations of LB in Europe in 2009

source: Hansen *et al.* 2010)



The first observation of LB in very early potatoes or under the cover



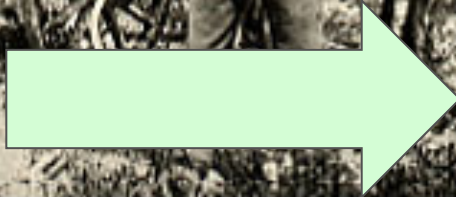
The first LB observation in more than five conventional potato fields



The level of tuber blight attacks in 2009



**Thank
you for
attention**



IPM

USUSC P0138 University Extension Service
13:01:02 May 5, 1919. First power sprayer to be used in Tooele County.
Purchased by Agent for P.V. Clegg, Tooele, Utah. This outfit sprayed
1080 apple and pear trees in five days.