

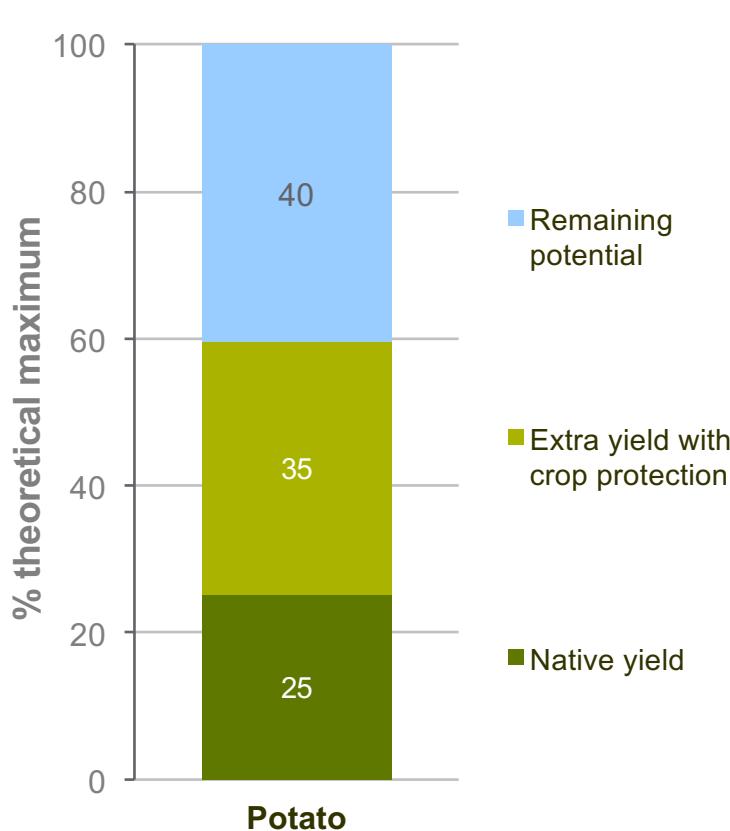


Fungizide zur Kraut und Knollenbekämpfung

Helge Sierotzki, Joel Meier, Stefano Torriani
Syngenta Crop Protection



Kartoffelernteertrag



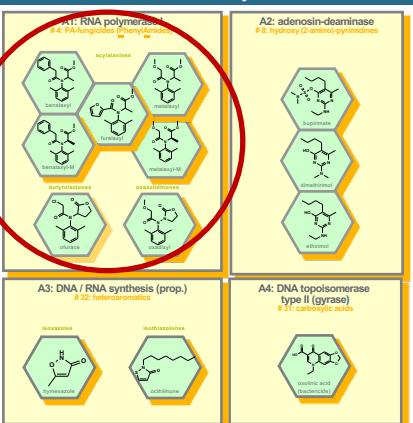
- Ertrag variiert zwischen 12 und 47 t/ha in Europa
- Weltdurschnitt bei etwa 19 t/ha
- (China: 15 t/ha, bei 100 mio t/y; 360 mio t/y Welt gesamt)

Source: Crop Losses to Pests; E-C Oerke, Journal of Agricultural Science (2006), 144, 31-43

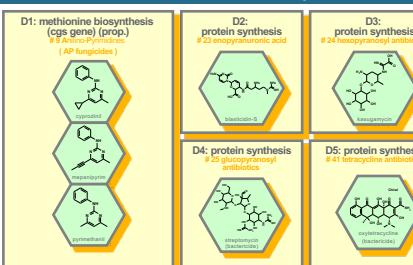
Mode of Action of Fungicides

FRAC classification on mode of action 2016 (www.frac.info)

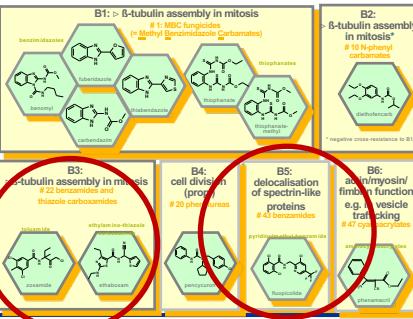
A: Nucleic Acid Synthesis



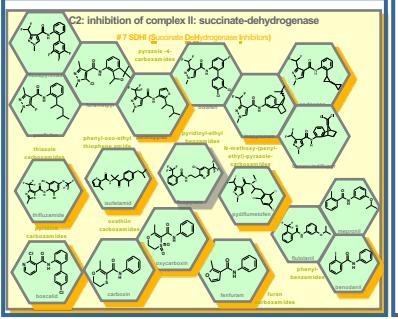
D: Amino Acid and Protein Synthesis



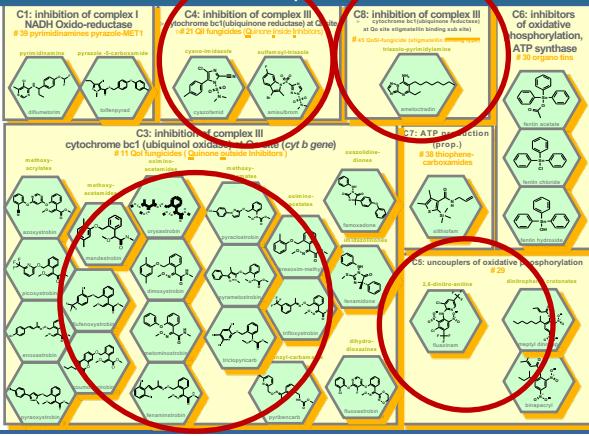
B: Cytoskeleton and motor proteins



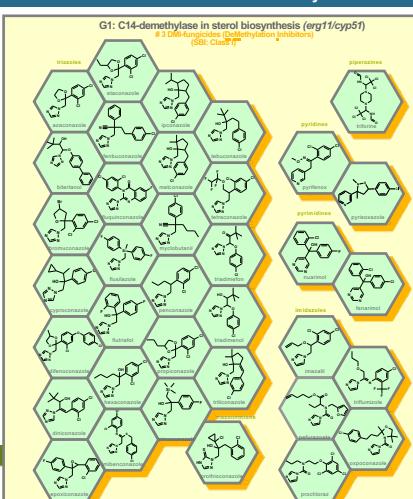
C: Respiration



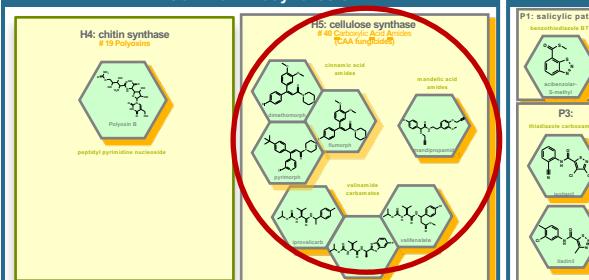
C: Respiration



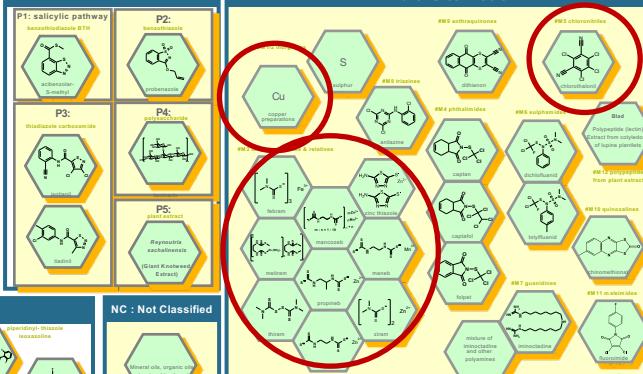
G: Sterol Biosynthesis in membranes



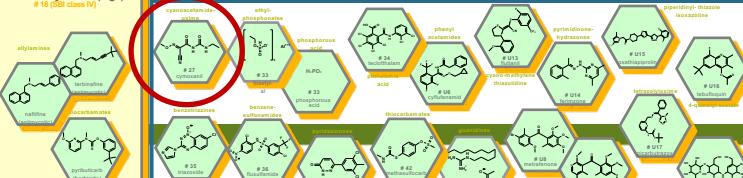
H:Cell Wall Biosynthesis



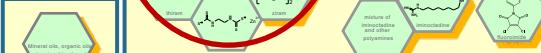
P: Host Plant Defence Induction



Unknown Mode of Action



NC : Not Classified



C: Respiration
C2: inhibition
▷ succinate
7 SDHI (Succinate dehydrogenase inhibitor)

Legend:

- FRAC**: mode of action group
- sub-group**
- Inhibition of complex II:** insecticide-detoxifiers
- [B]: botanical** (botanical inhibitors)
- FRAC code no. (F)** and group name
- local level (group)**
- multiple accessiones**

FRAC

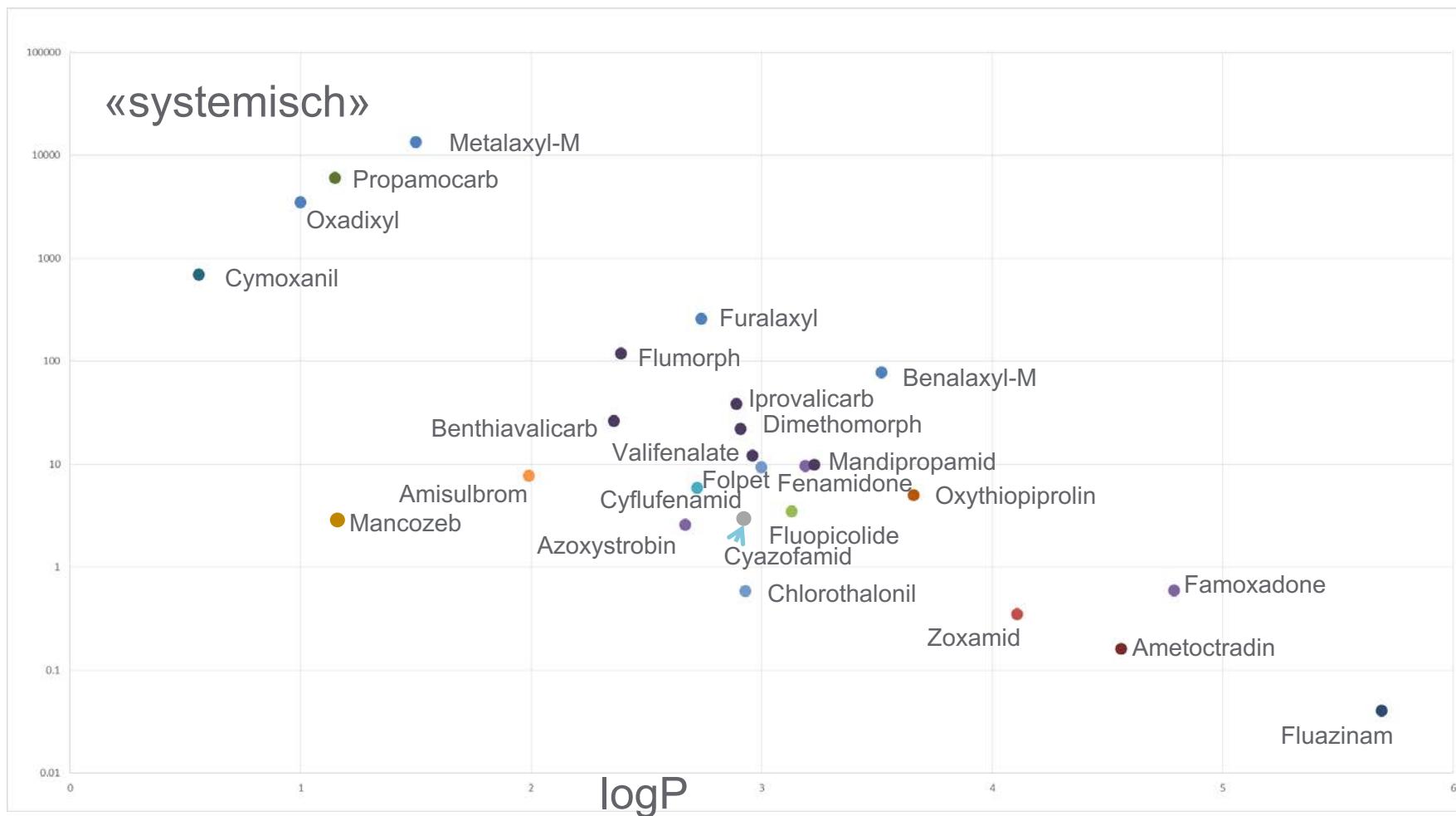
FUNGICIDE RESISTANCE ACTION COMMITTEE

syngenta

CropLife International

Physikalisch-Chemische Eigenschaften von Phytophthora-Fungiziden

Löslichkeit



- Die physikalisch-chemischen Eigenschaften bestimmen die Wirkweise der Fungizide
- Formulierung moduliert diese Eigenschaften

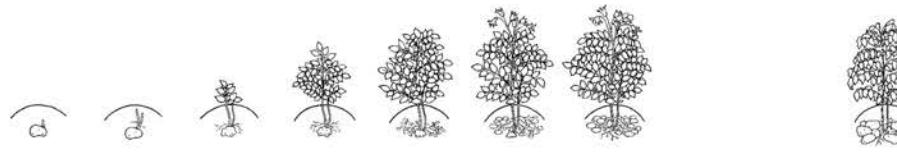
euroblight.net Liste der Fungizide

Product (Dose rate (litre or kg/ha))	Leaf blight	Tuber blight	New growth	Stem blight	Protectant	Curative	Antisporulant	Rainfastness	Mobility	Year
copper				●	●●	0	0	●	C	1900
dithiocarbamates (2.0) ¹	2.0	0.0		●	●●	0	0	●●	C	1961
chlorothalonil				●	●●	0	0	●●●	C	1964
cyazofamid (0.5)	3.8	3.8	●●	●	●●●	0	0	●●●	C	2001
fluazinam (0.4)	2.9			●	●●●	0	0	●●●	C	1992
zoxamide + mancozeb (1.8)	2.8			● ⁵	●●●	0	0	●●●	C + C	2001
amisulbrom + mancozeb (0.5+2.0)	4.5	3.7		●	●●●	0	?	●●●	C + C	2007
azmetotradin + mancozeb (2.5)	3.7		?	?	●●●	0	0	●●●	C + C	2011
famoxadone + cymoxanil				●●	●●	●●	●	●●●	C + T	1996
mandipropamid (0.6)	4.0		●●	●●	●●●	● ⁴	●●	●●●	C/T	2005
mandipropamid + difenoconazole (0.6)	4.0		●●	●●	●●●	● ⁴	●●	●●●	C/T + C	2005
benthiavalicarb + mancozeb (2.0)	3.7		● ³	●●●	●●	●	●	●●●	T + C	2003
cymoxanil + mancozeb				●●	●●	●●	●	●●	T + C	1976
cymoxanil + metiram				●●	●●	●●	●	●●	T + C	1976
cymoxanil + copper				●●	●●	●●	●	●●	T + C	1976
dimethomorph + mancozeb (2.4)	3.0			●●	●●●	●	●●	●●●	T + C	1988
dimethomorph + fluazinam (1.0)	3.7	3.3	●●	●	●●●	●	●●	●●●	T + C	2012
fenamidone + mancozeb (1.5)	2.6		● ² ⁵	●●●	0	● ² ⁵	●●●	●●●	T + C	1998
(zoxamide + cymoxanil) + fluazinam (0.45+0.4)	4.3								C/T + C	2013
(zoxamide + dimethomorph) + fluazinam (1.0+0.4)	4.6 ²								C/T + C	2015
mandipropamid + cymoxanil (0.6)	4.4		●●	●●	●●●	●●	●●	●●●	C/T + T	2013
benalaxyl-M + mancozeb ²	3.0		●●	●●	●●●	●●●	●●●	●●●	S + C	1981
metalaxyll-M + mancozeb ²			●●	●●	●●●	●●●	●●●	●●●	S + C	1977
metalaxyll-M + fluazinam ³			●●	●●	●●●	●●●	●●●	●●●	S + C	
propamocarb + cymoxanil + cyazofamid ((2.0)+0.5)			4.6 ⁴						S + T + C	2012
propamocarb + cymoxanil (2.0)					●●	●●● ⁴	●●●		S + T	2011
propamocarb-HCl + fenamidone (2.0)	2.5		●●	●●	●●●	●●	●●	●●●	S + T	1998
propamocarb-HCl + fluopicolide (1.6)	3.8	3.9	●●	●●	●●●	●●	●●●	●●●	S + T	2006

¹ Includes manebl, mancozeb, propineb and metiram. ² See proceedings for comments on phenylamide resistance. ³ Based on EuroBlight field test in 2006-2012. ⁴ Based on EuroBlight field trials 2009-2012. ⁵ Based on limited data. ⁶ In some trials there were indications that the rating was 1+2. ⁷ A provisional rating based on 5 EuroBlight experiments.

Mögliche Behandlungsprogramme

Kartoffeln



Krankheitskontrolle

Rhizoctonia, Silberschorf

Maxim 100 FS

Krautfäule, Alternaria

Ridomil Gold
2,5 kg/ha

Krautfäule, Alternaria

Revus MZ oder **Revus** 0,6 l/ha
2,5 kg/ha + Slick 0,5 l/ha

Krautfäule, Alternaria

Revus Top
0,6 l/ha

Krautfäule

Amphore Flex
0,6 kg/ha

NEU

Krautfäule, Alternaria

Mapro 0,4 l/ha
oder **Bravo** 500 3 l/ha

Alternaria (stark anfällige Sorten).
Als Zusatz zu Ridomil Gold, Revus MZ,
Amphore Flex, Mapro oder Bravo 500.

+ Slick
0,5 l/ha

Gebitztes Saatgut verwenden oder Beizung auf Pflanzmaschine. Dosierungssangaben siehe Text.

Systemisch, 1-2 Behandlungen.

Max. die Hälfte aller Behandlungen mit **Revus MZ**. Wartefrist **Revus MZ**: 2 Wochen (Frühkartoffeln: 1 Woche).

Ab Befallsrisiko Behandlungen im Abstand von 7-10 Tagen. Wartefrist: 2 Wochen (Frühkartoffeln: 1 Woche).

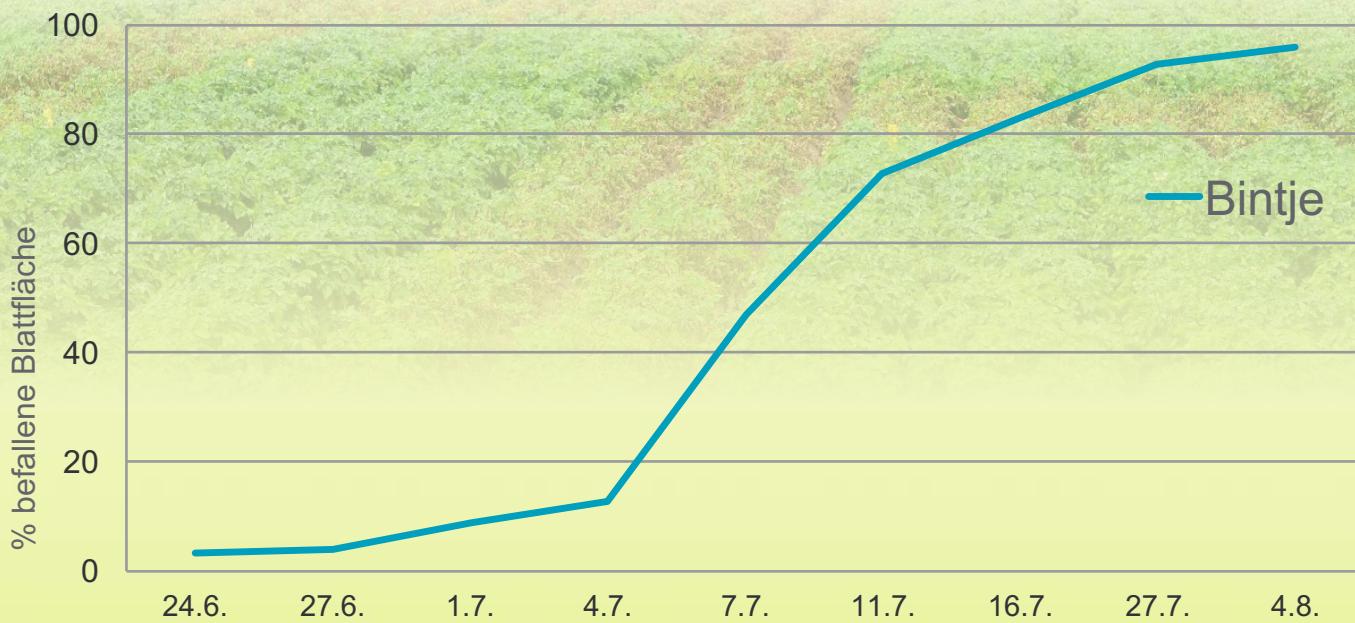
Ab Befallsrisiko Behandlungen im Abstand von 7-10 Tagen. Wartefrist: 2 Wochen (Frühkartoffeln: 1 Woche).

Abschlussbehandlungen. Wartefrist: 2 Wochen (Frühkartoffeln: Mapro 1 Woche; Bravo 500 2 Wochen).

Anstelle von Slick kann auch **Amistar** 0,75 l/ha eingesetzt werden. Wartefrist: 3 Wochen (Frühkartoffeln: 1 Woche).

- Metalaxyl-M, Mancozeb, Mandipropamid, Cymoxanil, Chlorothalonil, Fluazinam

Krautfäule-Krankheitsverlauf 2016



Parzellenversuch Dielsdorf ZH, Sorte Bintje,





Situation 2016

SRF

Heute

NEWS SPORT METEO KULTUR DOK

SCHWEIZ ABSTIMMUNGEN REGIONAL INTERNATIONAL WIRTSCHAFT PANORAMA MEHR

SENDUNGEN A-Z JB

Schon wieder eine schlechte Kartoffelernte

Aktualisiert am Samstag, 6. August 2016, 17:35 Uhr

1 1 1 2

4 Kommentare

Nach dem zu heissen und zu trockenen letzten Jahr erwarten die Schweizer Kartoffelproduzenten 2016 erneut bis zu 30 Prozent weniger Erträge. Der nasskalte Frühling hat den Knollen zugesetzt. Die schlechte Qualität erschwert zudem die Verarbeitung.

Primär Inokulum:

- Outgrade piles; tas de dechets
- Infiziert Knollen
- Oosporen
- Durchwuchs

Zürich 4°

Suche Anmelden

Blick

Home News Sport People Ratgeber Life Gesundheit Virtual Reality Auto Star des Tages Services

SIE SIND HIER: HOME > NEWS > WIRTSCHAFT > ZWEIFEL GREIFT ZUR IMPORTKNOLLE: KARTOFFELKRISE IN DER CHIPSTÜTE

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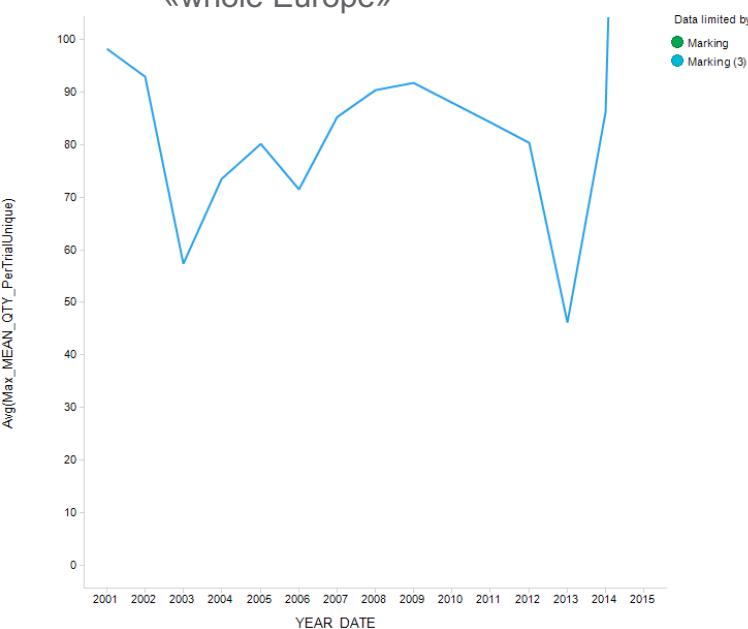
Zweifel greift zur Importknolle

Kartoffelkrise in der Chipstüte

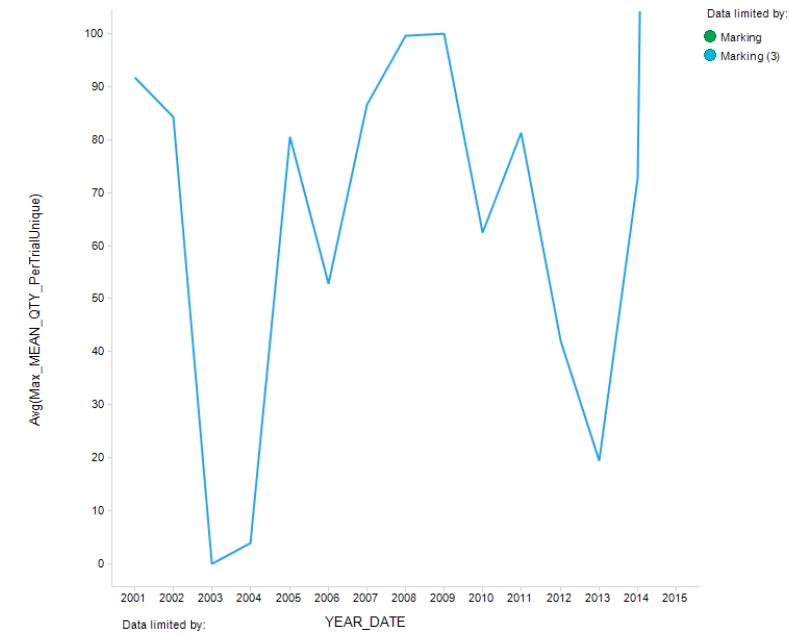
In der Schweiz werden die Kartoffeln knapp. Chips-Hersteller wie Zweifel müssen deshalb jetzt auf Importware aus der EU zurückgreifen. Billiger werden die Knabber-Snacks deshalb aber nicht.

Krankheitsverlauf für Phytophthora infestans in vergangen Jahren

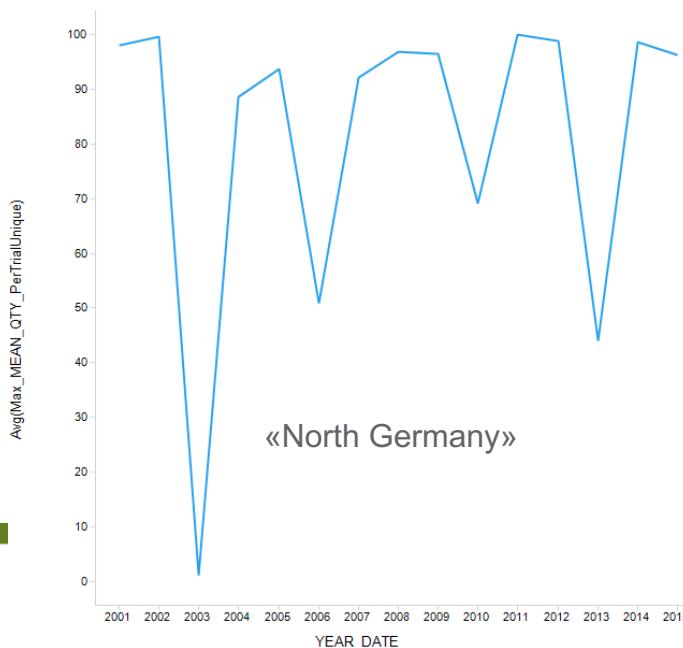
«whole Europe»



«South Germany + North Switzerland»



«North Germany»



Data from Syngenta trials
Average max severity in control plots

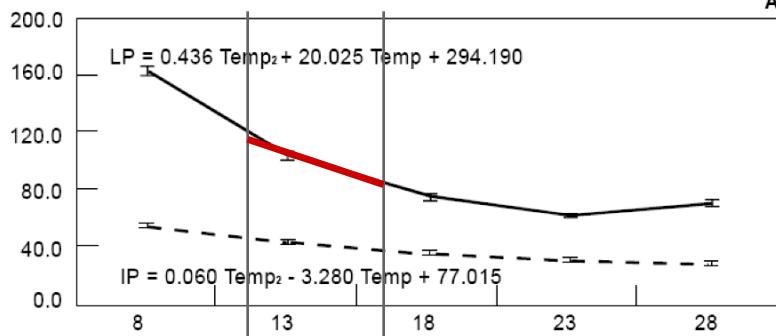
Examples for altered geographical distribution of plant pathogens

TABLE 1 - Examples of studies on the spatial distribution of plant disease, including the application of plant disease models and projections from global climate models, scope, and principal conclusions of the impacts of climate change

Crop	Pathogen/disease	Area	Impact of climate change	Reference
Banana (<i>Musa</i> spp.)	<i>Mycosphaerella fijiensis</i> Morelet / black Sigatoka	Global	Areas favorable for the disease will decrease.	Jesus Junior et al. (2008); Ghini et al. (2007)
Coffee (<i>Coffea arabica</i> L.)	<i>Hemileia vastatrix</i> Berk & Br. / coffee leaf rust	Brazil	Reduced incubation period.	Ghini et al. (2011)
Coffee (<i>Coffea arabica</i>)	<i>Meloidogyne incognita</i> (Kofoid & White) Chitwood	Brazil	Increased number of generations of the nematodes.	Ghini et al. (2008)
Eucalypts (<i>Eucalyptus camaldulensis</i> Dehnh.)	<i>Cylindrocladium quinqueseptatum</i> Boedijn & Reitsma / leaf blight	Global	Indication of new high-risk areas.	Booth et al. (2000)
Forest species	Forest-pathogenic fungi	France	Predicted warming would be favorable to most of the studied species, especially those for which winter survival is a limiting factor linked to low temperature.	Desprez-Loustau et al. (2007)
Grapevine (<i>Vitis vinifera</i> L.)	<i>Plasmopara viticola</i> (Berk. & Curt.) Berl & de Toni / downy mildew	North-west of Italy.	More severe epidemics and increased number of fungicide sprays to control the disease.	Salinari et al. (2006)
Maize (<i>Zea mays</i> L.)	<i>Puccinia polysora</i> Underw. / rust	Brazil	Reduction of the most favorable period.	Moraes et al. (2011)
Oak (<i>Quercus</i> spp.)	<i>Phytophthora cinnamomi</i> / root disease	Euro-Mediterranean region	Spread to new areas, increased favorable period for inoculum production and infection, increased pathogen survival on soil and roots and plant predisposition.	Brasier & Scott (1994); Brasier (1996)
Oak (<i>Quercus</i> spp.)	<i>Phytophthora cinnamomi</i> Rands / soil-borne pathogen	France	Increased annual rates of pathogen survival and spread to new areas from the Atlantic coast.	Bergot et al. (2004)
Oilseed rape (<i>Brassica</i> spp.)	<i>Leptosphaeria maculans</i> / phoma steam canker	Scotland and England	Despite high complexity interaction, the disease will increase in severity and spread.	Butterworth et al. (2010); Evans et al. (2008)
Potato (<i>Solanum tuberosum</i> L.)	<i>Phytophthora infestans</i> / late blight	Finland	Disease occurrence increased in all regions.	Carter et al. (1996)
Potato (<i>Solanum tuberosum</i>)	<i>Phytophthora infestans</i> / late blight	Global	Strong differences between potato production zones.	Hijmans et al. (2000)
Rice (<i>Oryza sativa</i> L.)	<i>Magnaporthe grisea</i> / rice leaf blast	Asia	Effects varied between different agroecological zones.	Luo et al. (1995)
Several crops	<i>Xiphinema</i> , <i>Longidorus</i> spp., <i>Globodera rostochiensis</i> (Wollenweber), <i>Meloidogyne</i> sp.	Great Britain and Europe	Increased nematode population and spread to Northern Europe.	Boag et al. (1991); Carter et al. (1996)
Several crops	Several pathogens	Sweden	Dramatic change in crop health.	Roos et al. (2011)

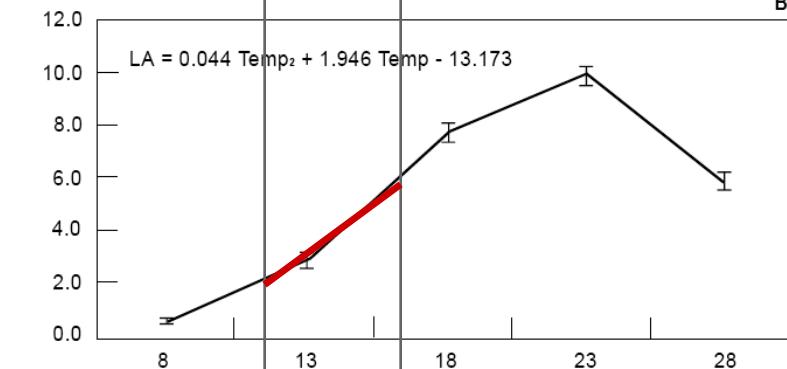
Parasitic Fitness and Temperature Response of new lineages of *Phytophthora infestans* from Peru (Andrade et al., 1997/98, CIP Program Report, pp. 77-82)

Incubation and latent period (h)



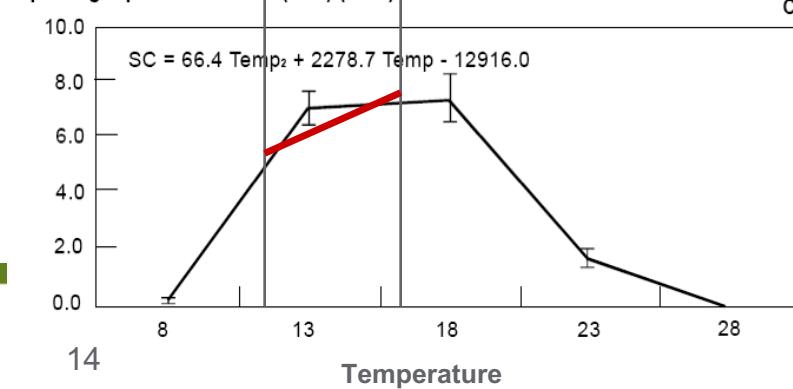
A

Lesion area (cm²)



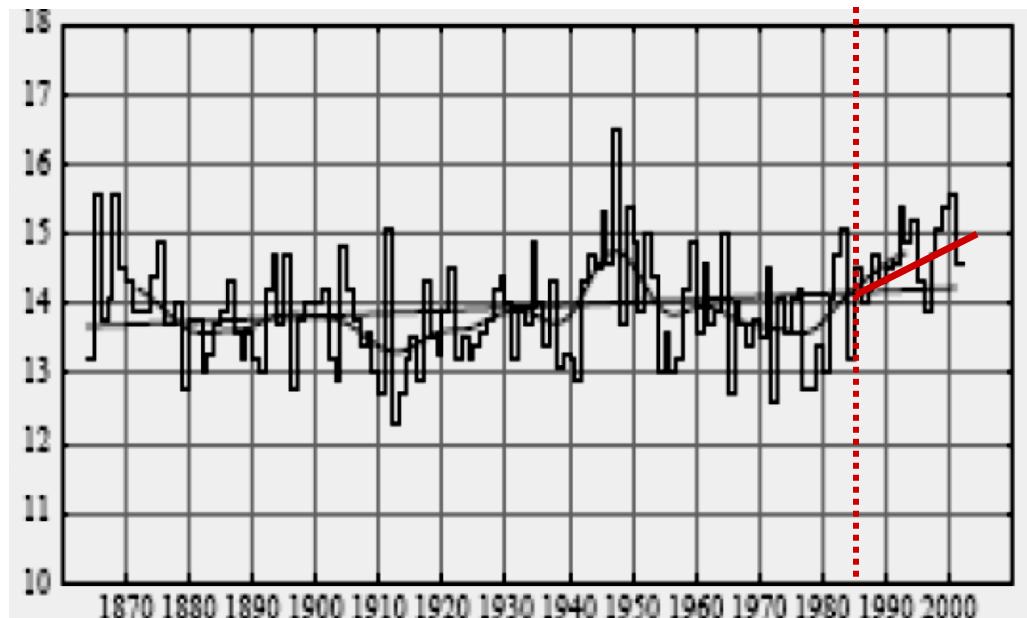
B

Sporangia per lesion area (cm²) (x10⁴)



C

Entwicklung der mittleren Sommertemperatur in Zürich



Zunahme der mittleren Sommer-Temperatur um ca. 1 °C pro 20 Jahre (1985 - 2005)

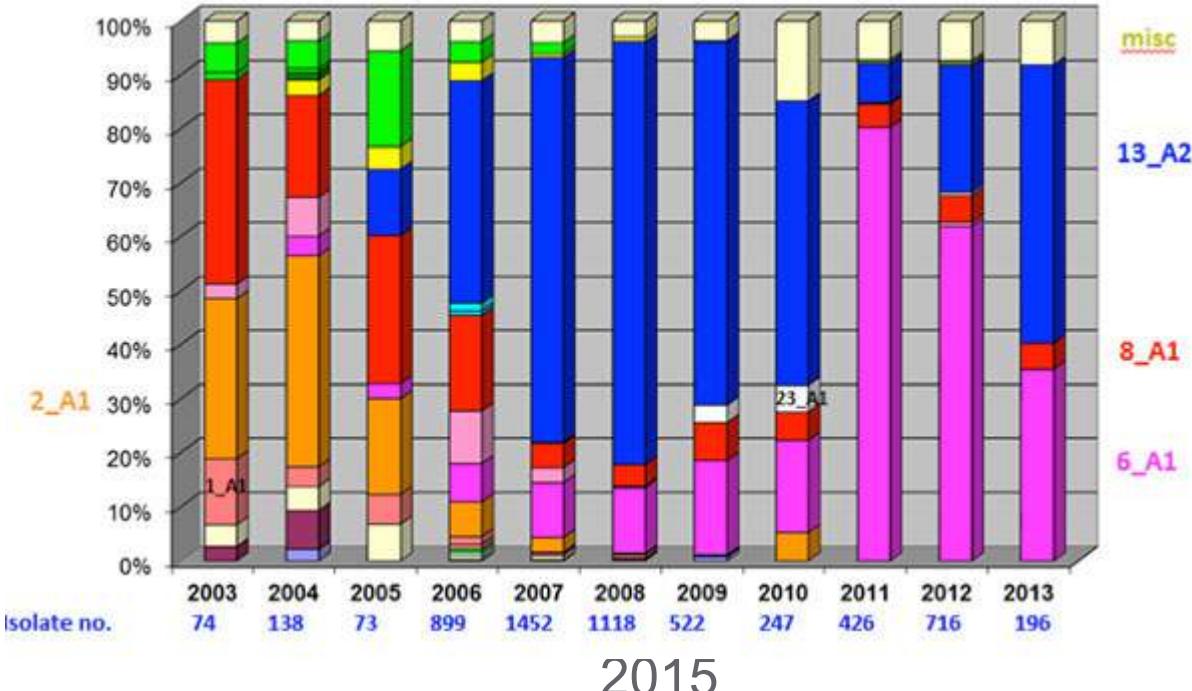
Population Dynamik

Others: hauptsächlich PA sensitiv

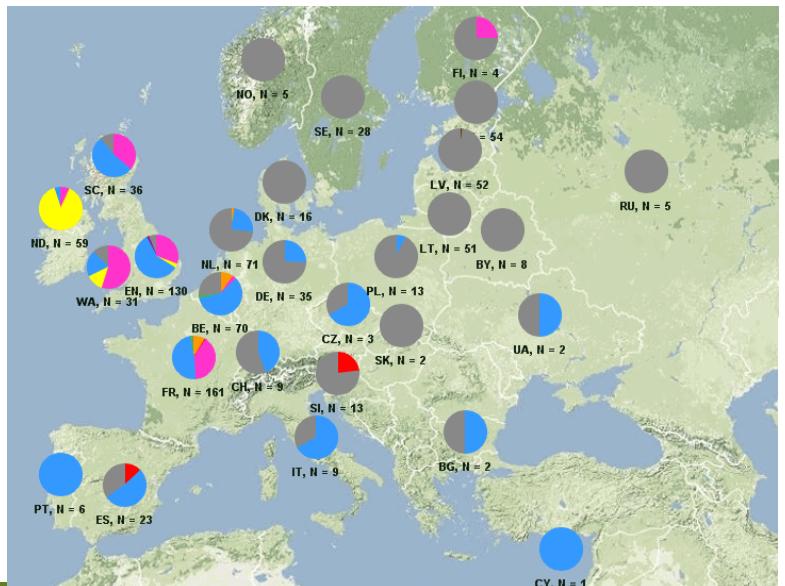
EU_13_A2: hauptsächlich PAresistant

EU_33_A2: Fluazinam resistant

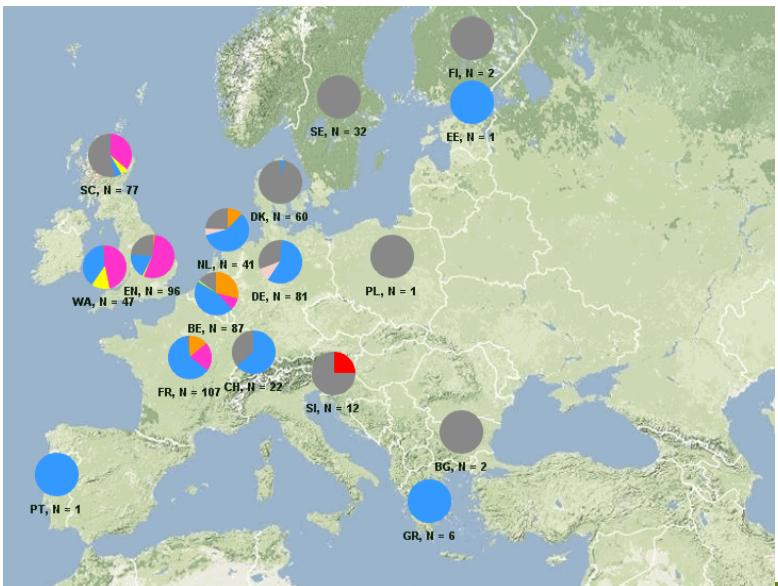
EU_6_A1: PA sensitiv



2013

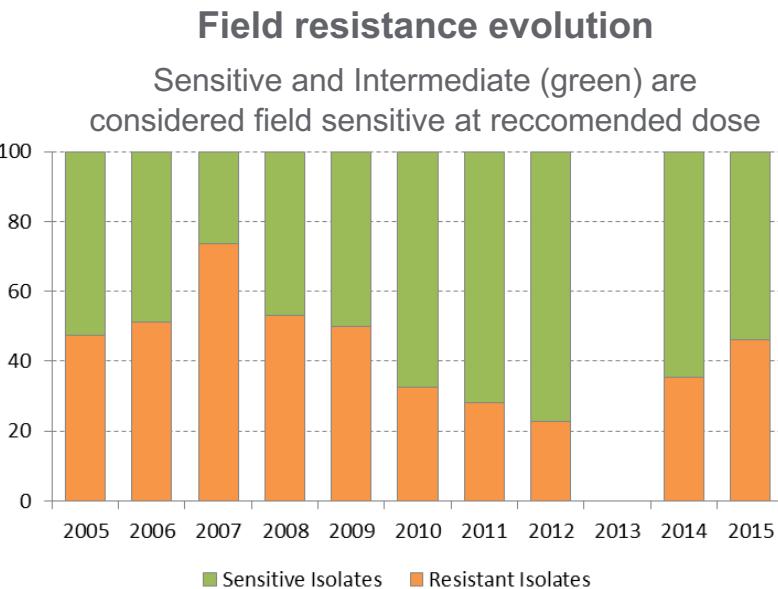
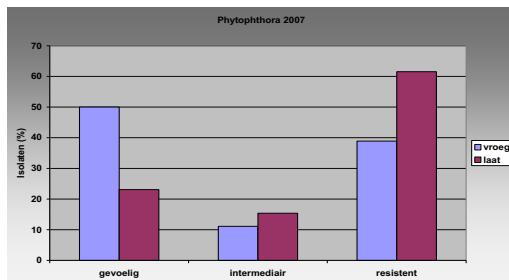


2015

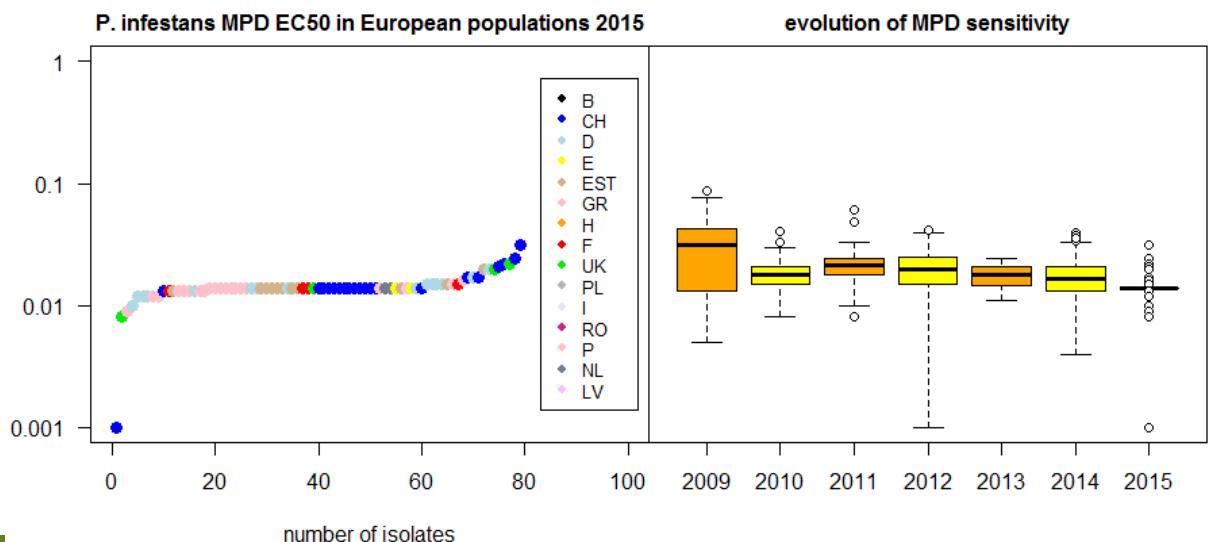


Fungizidresistenz-Evolution

- Mefenoxam:



- Uncouplers: Fluazinam (zeitlich und örtlicher eingeschränkte Resistenz beobachtet)
- Mandipropamid:
- Qo1
- Qo1 Cyazofamid
- Cymoxanil
- Zoxamid
- Qo1S



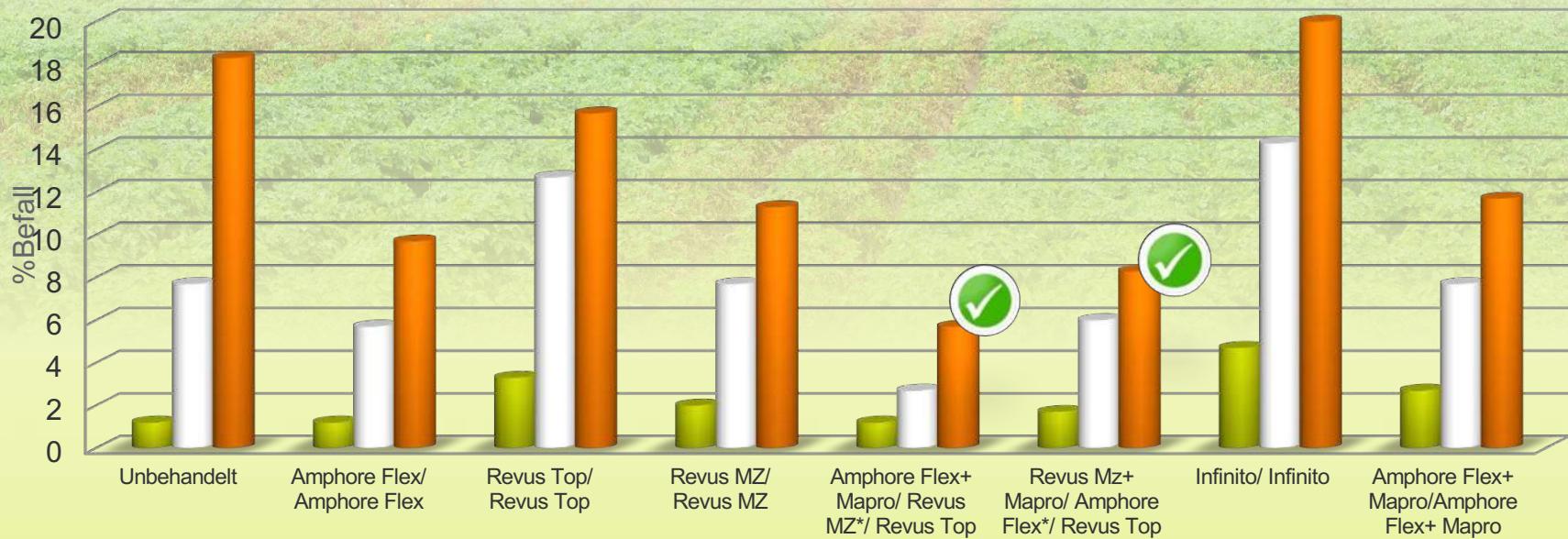
Krautfäule-Krankheitsverlauf



Parzellenversuch Dielsdorf ZH, Sorte Bintje,

Krautfäule "abstoppen"

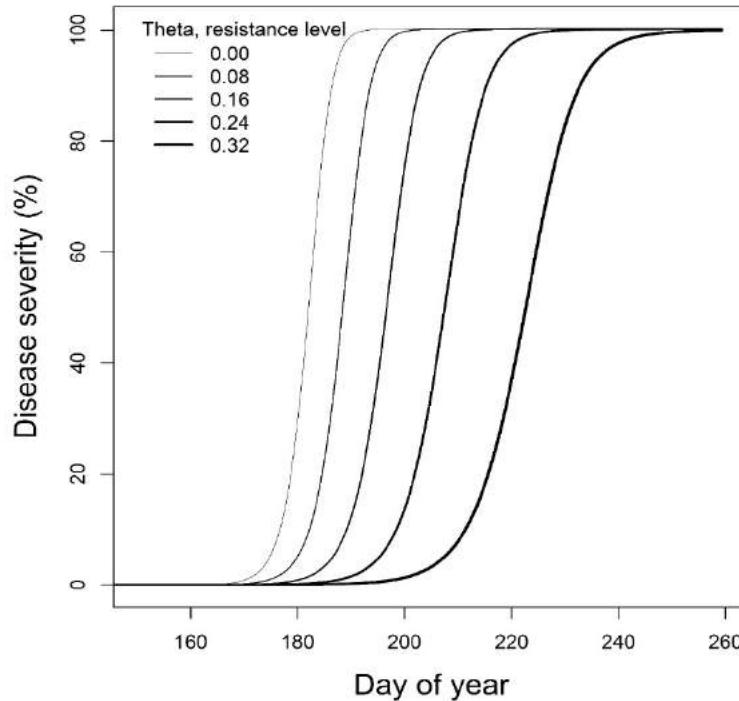
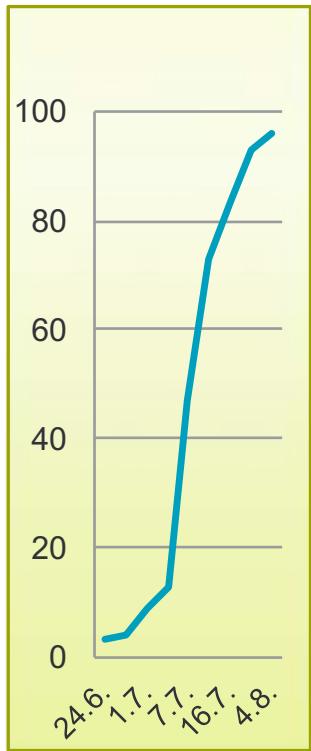
■ 22.6. ■ 27.6. ■ 1.7.



Versuch Dielsdorf, Behandlungen: 22.6./*24.6./28.6.

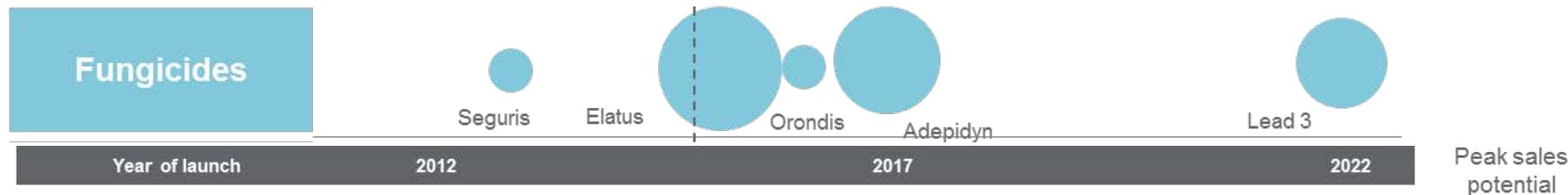
Auswertungen: 22.6./27.6./1.7.

Interaktion von Fungizid und Sortentoleranz

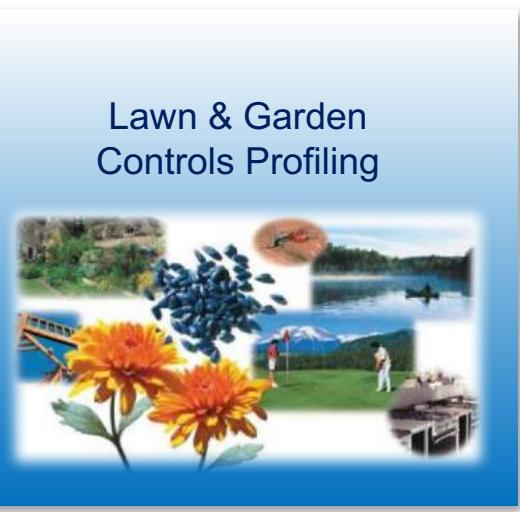
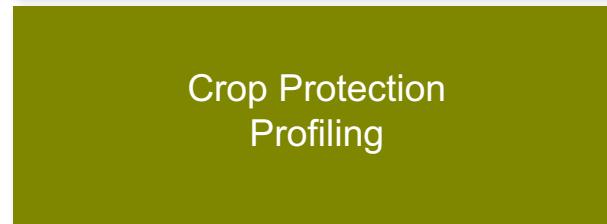
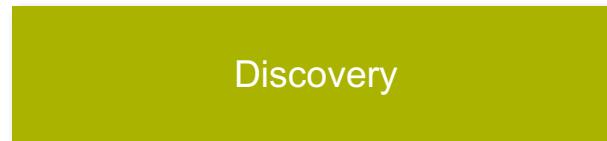
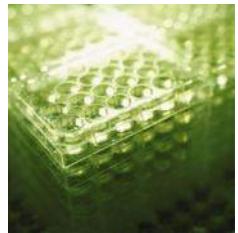


- Verzögert Epidemie
- Funigizidterminierung besser; gesamhaft besser Schutz
- Führt zu verlangsamter Fungizideresistenz und Durchbruch der Wirtsresistenz

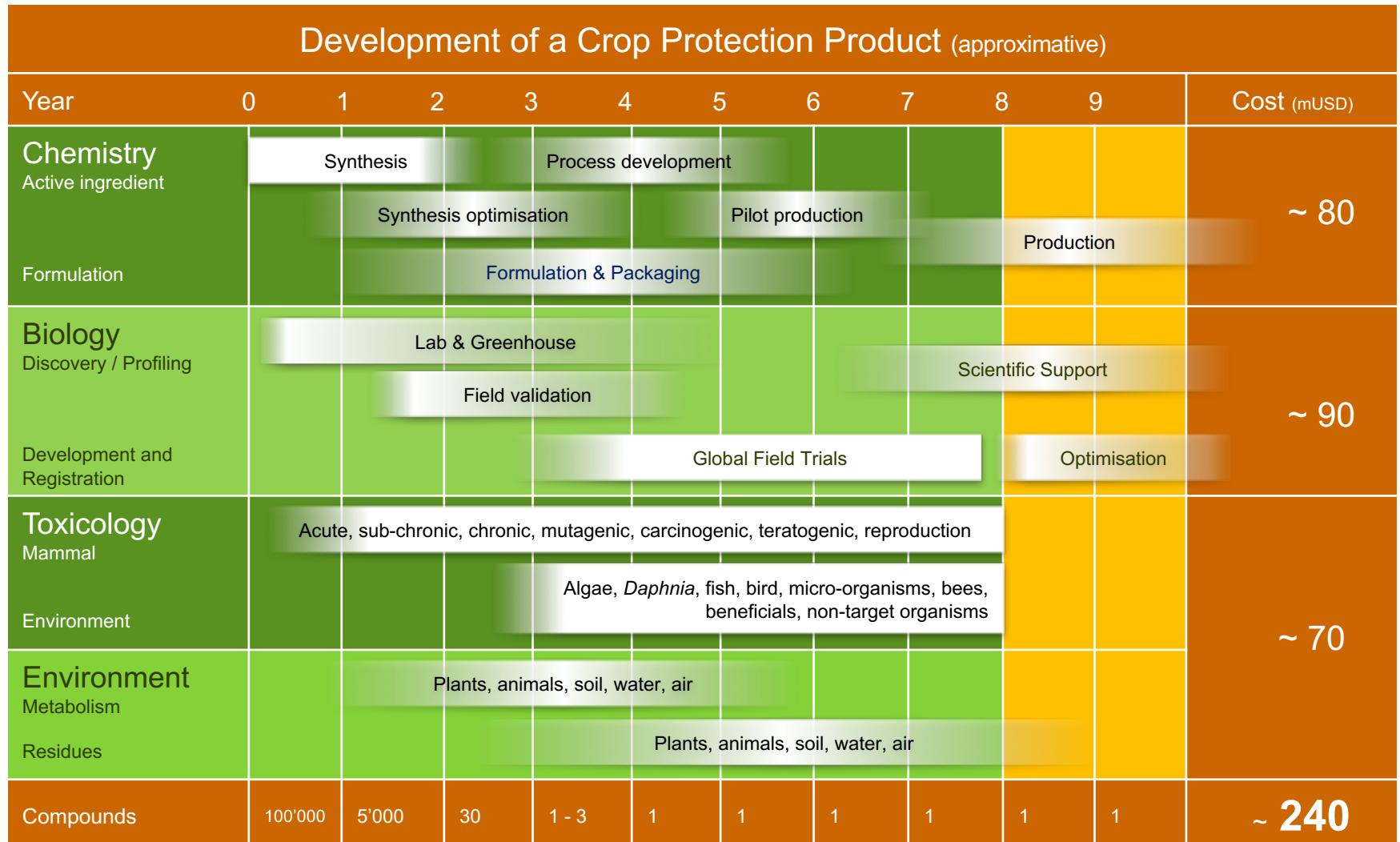
Innovationsüberblick



Forschungsprozess

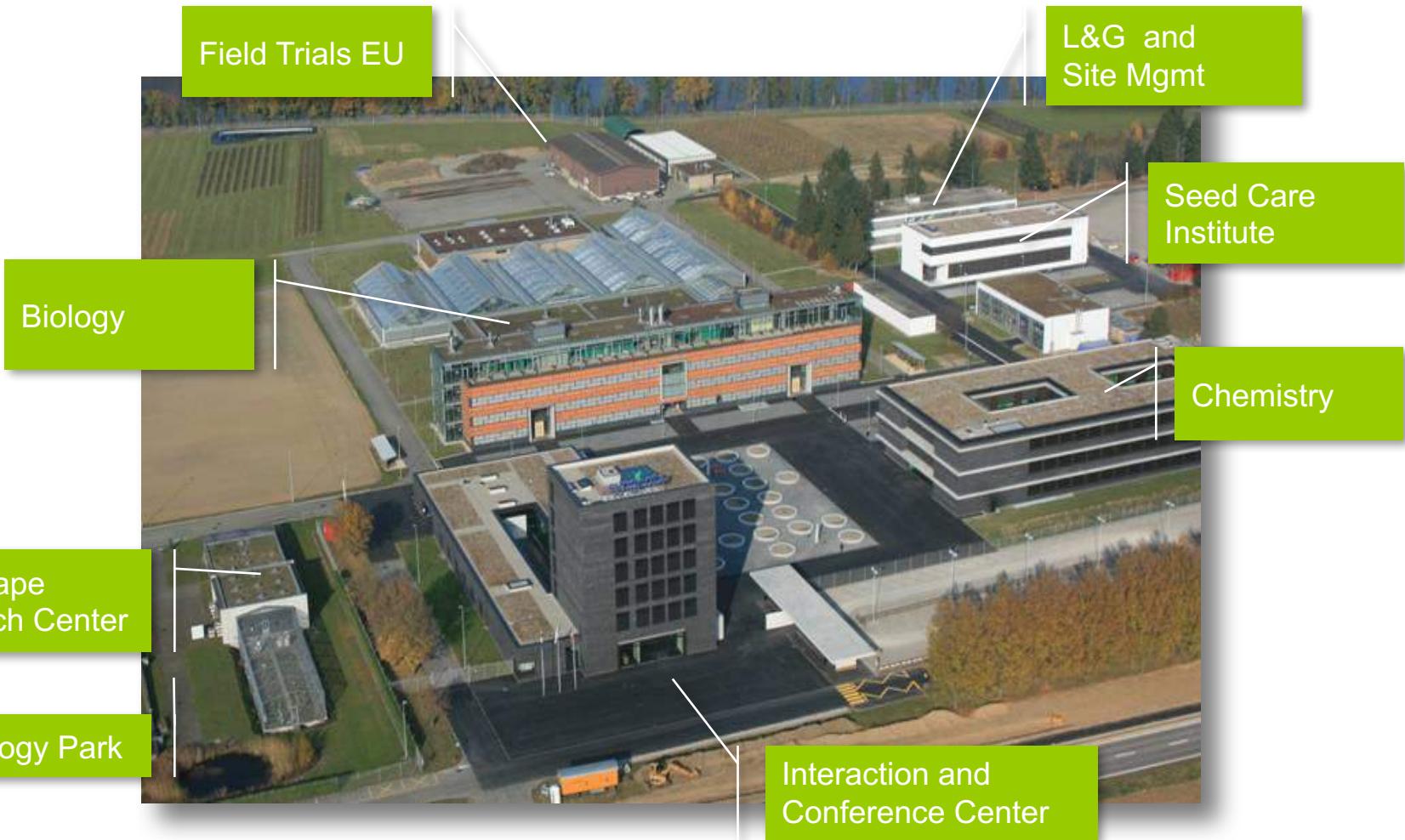


Der lange Weg von einer Substanz zu einem Produkt



Source: CropLife International, adapted

Forschungscampus Stein



Was kommt als nächstes

- Erhalten der bekannten Fungizide
- OXTP: neuer Wirkmechanismus (Syngenta: Orondis)
- und weitere «Oomycetide»
- Sortentoleranz
- Diagnostik und Modelle zur frühzeitigen Eingreifen in Phytophtora Jahren
- Vorhersagen zur integrierten Verwendung von Sortentoleranz und Fungiziden
- Integration von biologischen Wirkmitteln und neuen Technologien



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