



ENDURE

European Network for Durable Exploitation of crop protection strategies

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List of relevant ongoing national/European research programmes/projects promoting sustainable alternatives to pesticides

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Glossary

Non-chemical plant protection

Non-chemical plant protection covers all measures carried out in order to prevent or control pathogens, pests and weeds. It does not include measures used to introduce low-risk pesticides, reduce the input of pesticides (fungicides, insecticides, herbicides etc.) or improve the effect of these, nor decision support systems to this end.

Preventive measures

Preventive measures are measures carried out to prevent or lessen the impact of pathogens, pests and weeds such as crop rotation, healthy seed material, avoiding infection, using resistant varieties etc.

Direct control measures

Direct control measures are measures carried out to achieve control of the pathogens, pests or weeds in the field, such as mechanical weed control, application of non-pesticide compounds, biological control etc.

Potato

Potato (*Solanum tuberosum*)

Summary

Data on ongoing projects in non-chemical plant protection in potatoes has been collected from the ENDURE partners. Seven countries have supplied data, although one country found it difficult, bordering on impossible, due to the fragmented structure of the research in that country.

Information collected shows that in total 42 projects on non-chemical plant protection in potato have been reported, 33 of which are on preventive methods and nine of which are on direct management. In addition, five projects on related research in potato and 13 projects on related research in other crops have been reported.

1 De-fragmentation of available data

In Activity IA 4.1a, the aim is to defragment available data to improve the accessibility of the existing nationally based knowledge about non-chemical plant protection. It was agreed to proceed with collecting knowledge only on non-chemical plant protection in potato as an example.

In order to carry out this task, requests were sent to the ENDURE partners involved directly in IA 4.1a (AU, BBA, PRI, RRES), to all the other partners in IA 4 (IT, SSUP, IHAR) and to the scientific representatives of every ENDURE partner. The request asked for information on ongoing projects, finished projects and institutions (government, academic and private), all of which have focus on or carry out research concerning non-chemical plant protection in potato. This deliverable is only concerned with the ongoing projects.

1.1 Timescale

The original deadline for this deliverable was M6 (30 June 2007). However, due to the late start of the project and the involvement of most partners in many activities in the project, the deadline was delayed until M9 (30 September 2007). In order to meet this deadline, it was requested that the answers from the partners be supplied no later than 10 August 2007. The main part of the answers was received by 26 September 2007.

1.2 Answers to request

All seven partners in IA4 (BBA, IT, AU, SSUP, PPO, RRES, IHAR) supplied input concerning ongoing projects, and in addition two other partners replied (without input) (CNR, DAAS). The two partners from Italy (SSUP and CNR) replied that it was not possible to answer due to the fragmented structure of research in their country.

2 Ongoing projects concerning non-chemical plant protection for potato.

Below is listed all projects reported from the ENDURE partners. In total 42 projects on non-chemical plant protection in potato have been reported, 33 of which are on preventive methods and nine of which are on direct management. In addition, five projects on related research in potato and 13 projects on related research in other crops have been reported. As they do not all have titles or summaries in English, they will not all actually be accessible for all partners.

2.1 Preventive measures

2.1.1 Preventive measures in general

There are eight projects being carried out concerning preventive measures in general. They are listed in Table 1. Three run out in 2007, one in 2008, two in 2009, one in 2010 and one in 2011.

Table 1. Ongoing projects on preventive measures in general in potatoes

Title (original)	Title (English)	Country	Period	Summary in English
Risikominderung der Verbreitung von Quarantäneschadorganismen durch hygienisierende Maßnahmen	Reducing risk of dispersal of quarantine pests through hygienic measures	DE	2004 – 2007	no
Bewertung von Sekundärrohstoffdüngern und Abfällen (z. B. aus der Kartoffelverarbeitung) hinsichtlich möglicher Risiken für die Pflanzengesundheit	Assessment of secondary raw material fertilisers and debris (e.g. from potato processing) concerning possible risks for plant health	DE	2001 - 2007	no
Latente infectie van aardappelknollen door <i>Phytophthora infestans</i> ; van latent zieke poter tot primair zieke plant	Latent tuber infections: the route from a latently infected tuber to a source of primary inoculum	NL	2007 – 2009	(yes)
Preventie van <i>Phytophthora infestans</i> in aardappel door UV belichting	UV illumination of potato crops to prevent infection by <i>P. infestans</i>	NL	2007 – 2009	no
Bodemgezondheid binnen bedrijfssystemen	Managing soil health in crop rotations with potato	NL	2005 – 2008	yes
Multitrophic interactions in the rhizosphere		UK	2007 – 2011	?
Kartoffelproduktion, forebyggelse af kartoffelsygdomme og forbedring af dyrkningssikkerhed	Potato production, prevention of diseases and increasing production security	DK	2007 - 2010	no
Forebyggelse af rodiltsvamp i kartoffelmarker	Prevention of rhizoctonia in potato fields	DK	2007	no

2.1.2 Choice of cultivar

There is one project being carried out concerning choice of potato cultivar as a preventive measure. The project ends in 2007.

Table 2. Ongoing projects on choice of cultivar as a preventive measure in potatoes

Title (original)	Title (English)	Country	Period	Summary in English
Wertprüfungen für den ökologischen Landbau 03OE671	Variety trials for organic farming	DE	2004 – 2007	no

2.1.3 Decision support systems

There is one project being carried out concerning decision support systems for non-chemical plant protection in potatoes. The project ends in 2007. The project is listed in table 3.

Table 3. Ongoing projects on decision support systems for non-chemical plant protection in potatoes

Title (original)	Title (English)	Country	Period	Summary in English
Entwicklung, Überprüfung und Praxiseinführung des Prognosemodells ÖKO-SIMPHYT zur gezielten Bekämpfung der Kraut- und Knollenfäule (p. infestans) im ökologischen Kartoffelanbau mit dem Ziel, den Einsatz kupferhaltige Fungizide auf ein Minimum zu reduzieren 03OE553	Development, testing and implementation of the predictive model ÖKO-SIMPHYT for targeted protection against P. infestans in organic farming in order to reduce use of copper fungicides to a minimum	DE	2004 - 2007	no

2.1.4 Resistance

With a total of 21 projects going on concerning resistance in potatoes, three against bacterial diseases, 13 against fungal diseases, one against aphids and four with combined resistance against several problems (listed in tables 4-7), this is the most active area of research on preventive non-chemical plant protection in potatoes. There is not information about the ending date of all projects, but of those that there is such information, six run out in 2007, four in 2008, two in 2009, one in 2010 and one is permanent.

Table 4. Ongoing projects on resistance against bacterial diseases (soft rot) in potatoes

Title (original)	Title (English)	Country	Period	Summary in English
Etablierung von Basiszuchtmaterial mit Resistenz gegen die Bakterielle Ringfäule der Kartoffel	Establishment of basic breeding material with resistance against bacterial ring rot of potato	DE	2004 – 2007	no
Proteom-Analyse an transgenen Kartoffeln (<i>Solanum tuberosum</i> L.) mit verbesserter Nassfäuleresistenz	Proteome analysis using transgenic potatoes (<i>Solanum tuberosum</i> L.) with improved soft rot resistance	DE	2004 – 2007	yes
Auswirkungen der endogenen Pektatlyase (PL) 1 auf die Aktivierung von pflanzlichen Resistenzmechanismen in transgenen Kartoffeln (<i>Solanum tuberosum</i> L.)	Effects of the endogenous pectate lyase (PL) 1 on the induction of plant defence mechanisms in transgenic potatoes (<i>Solanum tuberosum</i> L.)	DE	2004-2008	yes

Table 5. Ongoing projects on resistance against fungal diseases (mainly blight) in potatoes

Title (original)	Title (English)	Country	Period	Summary in English
Entwicklung von Keimplasma mit Phytophthora-Resistenz (Kraut- und Braunfäule) auf breiter genetischer Basis (Solanum-Arten) und züchterischer Anpassung an Langtagbedingungen	Development of prebreeding material with durable resistance to late blight (foliage and tubers) and adaptation to long-day conditions	DE	2001 – (perma- nent)	yes
Untersuchung genetischer Ressourcen der Kartoffel der IPK-Genbank - Außenstelle Nord - auf Resistenz gegen Phytophthora infestans an Blättern und Knollen	Assessment of genetic resources of the IPK Potato Genebank for foliage and tuber resistance to Phytophthora infestans	DE	2001 – 2007	yes
Functionele karakterisering van R genen m.b.v. effectors: nieuwe resistentiebronnen	Functional Characterization of R-genes by effectors to find new sources for resistance	NL		no
Phytophthoraresistentie knol	Tuber late blight resistance	NL		no
Nonhost resistentie tegen Phytophthora	Non- host resistance against Phytophthora	NL		no
Introgressieveredeling phytophthoraresistentie	Introgression breeding of potato	NL		(yes)
Resistentiemechanismen against Phytophthora	Mechanisms of resistance against Phytophthora	NL		no
Identificatie van virulentietargets in de Phytophthora infestans-aardappel interactie	Identification of virulence targets in the Phytophthora infestans-potato interaction	NL		no
Udvikling af kartoffelplanter med øget sygdomsresistens ved brug af bioteknologi inspireret fra traditionel Andes Mashua dyrkning	Development of potato plants with increased disease resistance by using biotechnology inspired by traditional Andes Mashua cultivation	DK	2005 – 2007	?
Monitoring van virulentieontwikkeling, fungicideresistentie en collectiebeheer	Monitoring of virulence shifts and collection of P. infestans strains	NL	2007 – 2009	(yes)
Effect van fysiologische leeftijd van pootgoed op oogstzekerheid en het verloop van resistentie tegen Phytophthora in biologische aardappelteeltsystemen	Effect of physiological aging of seed potatoes on yield and Phytophthora resistance in organic potato crops	NL	2005 – 2008	no
IVT - provision of comprehensive independent disease ratings for the potato industry		UK	2004-2007	?
Exploitation of natural plant biodiversity for the pesticide-free production of food – BIOEXPLOIT		EU FP6	2005-2010	yes

Table 6. Ongoing projects on resistance against insects (aphids) in potatoes

Title (original)	Title (English)	Country	Period	Summary in English
Luisresistentie in Aardappel	Aphid resistance in potato	NL		(yes)

Table 7. Ongoing projects on combined resistance against several problems in potatoes

Title (original)	Title (English)	Country	Period	Summary in English
Technologieentwicklung und Anwendung innovativer Selektionsverfahren für eine wettbewerbsfähige Kartoffelzüchtung. Teilprojekt: Krautfäuleresistenz	Development of the technology and application of an innovative selection technique for competitive potato breeding. Project: Resistance to foliage blight	DE	2007-2009	yes
Einsatz molekularer Markertechniken zur Identifikation und Charakterisierung somatischer Hybriden der Gattung Solanum (Teilaufgabe zum BAZ-Projekt 3128)	Using molecular marker techniques for the identification and characterisation of somatic hybrids of the genus Solanum	DE	2005 – 2008	yes
Erzeugung und Selektion von Kartoffelgenotypen mit kombinierter Virus- und Phytophthora-Resistenz unter Einsatz biotechnologischer Verfahren	Production and selection of potato genotypes with combined resistances to virus and Phytophthora by use of biotechnological methods	DE	1997 – 2008	yes
Developing a physical and functional map of the potato: Creating new sources for molecular markers to breed cultivars with multiple resistances and quality traits – APOPHYS		EU FP6	2003-2007	yes

2.1.5 Effects on biodiversity

Two projects are concerned with the effects of non-chemical plant protection measures, mainly use of transgenic cultivars, on biodiversity, see table 8. Both projects end in 2008.

Table 8. Ongoing projects on effects on biodiversity of non-chemical plant protection in potatoes

Title (original)	Title (English)	Country	Period	Summary in English
Einfluss des Anbaus transgener Kartoffeln auf die strukturelle und funktionelle Diversität von Rhizospäre-, Endorhiza- und Geocaulosphäre-assoziierten Bakterien und Pilzen	Influence of cultivation of transgenic potatoes on the structural and functional diversity of rhizosphere-, endorhiza- and geocaulosphere-associated bacteria and fungi	DE	2005 – 2008	no
Entwicklung einer Methode zur Detektion des Einflusses transgener Pflanzen auf Ökosysteme auf der Basis von Veränderungen des Genoms responsiver Viren sowohl in Pflanzenmaterial als auch ihren Vektoren	Development of a method for detection of the influence of transgenic plants on ecosystems based on the investigation of changes in the genome of responsive viruses in plant material as well as in their vectors	DE	2005 – 2008	yes

2.2 Direct measures

2.2.1 Direct management of pests

Six projects, shown in table 9, are concerned with the direct management of pests. One ends in 2008, one in 2009, while the other four are permanent.

Table 9. Ongoing projects on direct management of pests (insects incl. larvae & nematodes).

Title (original)	Title (English)	Country	Period	Summary in English
Regulierungskonzepte zur Reduktion von Drahtwurmschäden (06OE272)	Management concepts for reducing damage due to wireworms	DE	2007 – 2009	no
Weiterentwicklung der Methoden zur Anwendung und Risikobewertung von Bakterien gegen Schadinsekten (z. B. Bacillus thuringiensis gegen Kartoffelkäfer und gegen Maiszünsler)	Further development of methods for application and risk evaluation of bacteria to noxious insects (e.g. Bacillus thuringiensis against the Colorado potato beetle)	DE	2001 – (perma- nent)	(yes)
Erarbeitung eines nationalen Programms zur integrierten Bekämpfung der Kartoffelzystennematoden	Investigations on integrated management options for PCN control and integration of measures in existing production systems in collaboration with plant protection services of the Bundesländer	DE	2001 – (perma- nent)	no
The diversity, biology and dynamics of microbial agents that regulate nematode populations in the rhizosphere		UK	2005 (perma- nent)	?
Molecular genetics of interactions between plants and sedentary nematodes		UK	2005 (perma- nent)	?
Managing potato cyst nematode through maximising natural decline and population suppression		UK	2005 – 2008	?

2.2.2 Direct management of pathogens

Three projects, shown in table 10, are concerned with the direct management of pathogens (fungal diseases). Two end in 2007, one in 2009.

Table 10. Ongoing projects on direct management of pathogens (fungal diseases).

Title (original)	Title (English)	Country	Period	Summary in English
Beheersmaatregelen voor de reductie van zilverschurft (<i>Helminthosporium solani</i>) bij aardappelen	Control measures for the reduction of silver scurf disease (<i>Helminthosporium solani</i>) on (seed) potatoes	NL	2005-2007	yes
Integration of precision irrigation and non-water based measures to suppress common scab of potato		UK	2006-2009	?
Black dot - developing effective integrated control		UK	2003-2007	?

3 Related research

3.1 Potatoes

3.1.1 Fungicides

Four projects are concerned with fungicides, either reducing their use or finding low-risk fungicides. The projects are shown in table 11. One project ends in 2007, two projects end in 2009 and one in 2010.

Table 11. Ongoing projects on fungicides.

Title (original)	Title (English)	Country	Period	Summary in English
Optimalisatie van Low Risk Profile Middelen tegen <i>Phytophthora infestans</i>	Optimization of low risk profile substances against <i>Phytophthora</i>	NL	2007 – 2009	yes
Opstellen van een geactualiseerde jaarrond strategie	Formulate an up-to-date control strategy for late blight	NL	2007 – 2009	yes
Exploring the potential for cost savings through matching blight fungicide inputs to cultivar resistance		UK	2007-2010	?
Disease diagnostics - improving decision making using real-time predictive diagnostics		UK	2004-2007	?

3.1.2 Volunteer potatoes

One project is concerned with volunteer potatoes. The project is shown in table 12. The project ends in 2009.

Table 12. Ongoing projects on volunteer potatoes.

Title (original)	Title (English)	Country	Period	Summary in English
Plaatsspecifiek verwijderen aardappelopslag	Site specific removal of volunteer potatoes	NL	2007 – 2009	yes

3.2 Related projects not on potatoes

3.2.1 Projects on organic or low-input farming which include plant protection

There are three projects going on on organic or low-input farming which to some extent include research on plant protection. The projects are shown in table 13.

Table 13. Ongoing projects on organic or low-input farming which include plant protection.

Title (original)	Crops or pathogens studied	Country	Period	Summary in English
SIMBIO-VEG	weeds, insects, fungi, arable and vegetable crops	IT	?	?
FOMB	weeds, insects, fungi, arable and vegetable crops	IT	?	?
QualityLowInputFood – QLIF	wheat, tomato, brassica, onion, lettuce, apple, Fusarium, Didymella, Xanthomonas, Clavibacter, cabbage root fly, brassica aphids, weed management, downy mildew, Septoria, rusts, powdery mildew	EU FP6	?	yes

3.2.2 Projects on biological control including allelopathy

There are five projects going on in biological control, including allelopathy, in different crops. While three of the projects end within a few years, two of the projects are planned to continue until 2025. The projects are shown in table 14.

Table 14. Ongoing projects on biological control and allelopathy.

Title (English)	Country	Period	Summary in English
Using fungi pathogens and entomophaga in biological control of western flowers thrips <i>Frankliniella occidentalis</i> (Pergande) in greenhouse vegetable production.	PL	2006-2025	no
Increasing of baculoviruses efficacy in control of agriculture and greenhouses crop pests – elaboration of strategy	PL	2003-2025	no
Elaboration of biological and technological basis for use of entomopathogenic nematodes in biological and integrated control of selected sawflies (Hymenoptera: Symphyta) – important pests of orchard and urban trees	PL	2004-2007	no
The use of allelopathic compounds present in plants and antagonistic microorganisms in the control of <i>Verticillium</i> wilt of the pepper	PL	2005-2008	no
Biological control of vegetables with the use of mixtures in biocontrol agents	PL	2006-2009	no

3.2.3 Projects on pesticides and pollution by them

There are two projects going on concerning new pesticides and reducing the pollution by pesticides. The projects are shown in table 15.

Table 15. Ongoing projects on pesticides and pollution by them.

Title (English)	Country	Period	Summary in English
The biological evaluation of new fungicides and methods used for control of diseases on vegetable plants. a) in the field, b) in the greenhouse	PL	1986-2007	no
Reducing pesticide-related water pollution by improving crop protection practices: the use of embedded ICT technologies	FR, IT, ES	?	?

3.2.4 Other projects

There are three other projects going on, two with specific pests in specific crops, one with a very broad scope. The projects are shown in table 16.

Table 16. Other relevant ongoing projects.

Title (original)	Crops or pathogens studied	Country	Period	Summary in English
New cyst nematode threats to cereals in the UK	cyst nematodes, cereals	UK	2006 – 2009	?
Development of a Forecasting Framework and Scenarios to Support the EU Sustainable Development Strategy – FORESCENE	?	EU FP6	?	yes
Harmonise the strategies for fighting <i>Diabrotica virgifera virgifera</i> - DIABR-ACT	Maize, Diabrotica	EU FP6	2006 - 2008	yes

4 Conclusion

4.1 Ongoing research

Although quite a lot of research is presently going on concerning non-chemical plant protection in the ENDURE partner countries, there are also some areas where there is little or no research, and in addition, more than a third of the research is only funded until the end of 2007, about a fourth to 2008, less than a fifth to 2009 and only seven projects are running longer than that or permanent.

Most of the research going on concerns preventive methods, while only few projects are concerned with direct management. No projects are concerned with direct weed management.

5 Critical reflections

5.1 Availability of data

It has proven difficult to receive data on ongoing projects on non-chemical plant protection in potatoes from some the ENDURE partners. There could be several reasons for this. One could be, as the Italian partners describe, that the research is very fragmented and difficult to obtain information about.

5.2 Accessibility of data

The data from all the ongoing projects are usually not reported in international journals until the time when the projects end – and sometimes not even then. Although knowledge that research on a subject is going on in another country can be relevant to a researcher, in order to make a direct contact, the results from research can usually not be utilized unless they are available either published or on the internet in English.

6 Future plans

6.1 Acquiring additional data

The results from this deliverable will be posted on the ENDURE workspace incl. relevant links to find access to the projects. The ENDURE partners who have not already supplied data will be encouraged to do so.