

Focus on Partners: The INCO-PAPA Project

The INCO (International Scientific Cooperation) Project *Exploitation of the genetic biodiversity of wild relatives for breeding potatoes with sustainable resistance to late blight (Phytophthora infestans)*¹, November 1, 1998 to October 30, 2001, has generated some important outputs. Scientists from Europe (Germany and Spain) and Latin America (Bolivia, Colombia, Costa Rica and Ecuador took part. The six participating institutions and principal collaborators are found in Table 1. Lieselotte Schilde from the University of Tuebingen, Germany, coordinated the project.

A large number of wild species with valuable traits — especially resistance to *Phytophthora infestans* — were incorporated into breeding materials, thus strengthening the

Table 1. Institutions and principle collaborators in the INCO-PAPA Project.

Lieselotte Schilde Helga Ninnemann University of Tuebingen Institute for Plantbiochemistry Tuebingen, Germany	Enrique Ritter Esther Ceballos Neiker – Instituto Vasco de Investigación y Desarrollo Agrario S. A. Vitoria, Spain
Julio Gabriel E.N. Fernandez-Northcote Giovanna Plata Fundación para la Promoción e Investigación de Productos Andinos (PROINPA) Cochabamba, Bolivia	Nelson Estrada Carlos Ñustez Universidad Nacional de Colombia Facultad de Agronomía Santa Fe de Bogota, Colombia
Roberto Valverde Arturo Brenes Universidad de Costa Rica Departamento de Fisiología de Cultivos y el Centro de Investigaciones Agronómicas San Pedro – Montes de Oca, Costa Rica	Pedro Oyarzun N. Hidalgo Instituto Nacional de Investigaciones Agropecuarias (INIA) Quito, Ecuador

different breeding programs of the partners. The different species and the method of hybridization (sexual or somatic fusion) are found in Table 2. Somatic hybridization was used when crossing was difficult.

Somatic hybrids and some progenies were distributed as in vitro plants to all partners, making possible the comparison of resistance of these materials in the different locations. There were similarities in the level of resistance of these genotypes with respect to the wild species involved. Most resistant materials from somatic hybrids had *S.bulbocastanum* as an ancestor, followed by *S.circaeifolium*, and, occasionally, *S.okadae*, whilst materials with *S.commersonii* and *S.berthaultii* were resistant in only some locations. In addition, materials with the accession of *S. chiquidenum* used for somatic hybridization showed a very high level of resistance. Of the wild species utilized for sexual hybridization, *S.hondelmannii*, *S.jamesii*, *S.polyadenium*, *S.avilesii*, and *S.canasense* gave the highest number of resistant progenies. Although these evaluations are preliminary and further field-testing is needed, the tendency is clear.

Table 2. Wild species incorporated into breeding materials and the method of hybridization.

Sexual hybridization		
<i>S.acaule</i>	<i>S. canasense</i>	<i>S.okadae</i>
<i>S.albicans</i>	<i>S.chomatophyllum</i>	<i>S.palustre</i>
<i>S.andreanum</i>	<i>S.hondelmannii</i>	<i>S.papita</i>
<i>S.avilesii</i>	<i>S.infundibuliforme</i>	<i>S.polyadenium</i>
<i>S.berthaultii</i>	<i>S.iopetalum</i>	<i>S.polytrichon</i>
<i>S.brachistotrichum</i>	<i>S. jamesii</i>	<i>S.raphanifolium</i>
<i>S.brachycarpum</i>	<i>S.medicans</i>	<i>S.stoloniferum</i>
<i>S.brevidens</i>	<i>S.microdontum</i>	<i>S.sucrense</i>
<i>S.bukasovii</i>	<i>S.morinasense</i>	<i>S.tarijense</i>
<i>S. bulbocastanum</i>		
Somatic hybridization		
<i>S.berthaultii</i>	<i>S.chiquidenum</i>	<i>S.commersonii</i>
<i>S.bulbocastanum</i> (2 accessions)	<i>S.circaeifolium</i> ssp. <i>capsicibaccatum</i>	<i>S.okadae</i>
<i>S.capsicibaccatum</i>	<i>S.circaeifolium</i> ssp. <i>quimense</i>	<i>S.pinnatisectum</i>

¹ European Union Program for International Cooperation (INCO), Contract number: IC18-CT-98-0320

During the project and the planning meetings, discussions and the exchange of experiences, methods and materials were ongoing. Important topics were the different evaluation methods, the identification of the type of resistance, and strategies to manage the resistance in the field for sustainability.

The impact of this project has resulted in widening the genetic background of breeding materials for the Latin American, as well as the European partners, creating a base for further cooperation and exchange of materials in the effort to produce potatoes with more sustainable resistance to *Phytophthora infestans* in the future.

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INCO-PAPA partners at Planning Meeting, Cochabamba, Bolivia, 4–7 June 2001. From left: back, J. Gabriel, R. Valverde, E Ritter, P Oyarzun, C. Ñustez, A Brenes, front, N Hidalgo, L Schilde, G Plata, E N Fernandez-Northcote, N Estrada.

R-gene Differentials for Late Blight Studies

Stuart Carnegie of the Scottish Agricultural Science Agency (SASA) will provide to anyone interested the R-gene differentials held by his institute.

Despite the development of numerous molecular marker systems for 'fingerprinting' isolates, there is still a strong desire to 'phenotype' the races to which isolates belong. To do this requires access to the R-gene differential series against which isolates are tested to determine which R-genes they can overcome. This series comprises two parts as follows:

1. Eleven genotypes, each expressing one of the eleven known (there are probably many others yet undiscovered) R-gene resistances from *S. demissum*, i.e. R1, R2, R3 or R11. Including the universal susceptible (or R0) gives twelve genotypes which are commonly referred to as the 'short' R-gene set; this set is essentially all that is required to type an isolate's race. Many 'short' sets around the world lack the R6 and/or R9 differentials, but these are included in this offer.

2. William Black also bred an additional series of differentials in which he combined the R1, R2, R3 and R4 resistances in all possible combinations. Thus there are six combinations expressing two resistances: R1.R2; R1.R3; R1.R4; R2.R3; R2.R4 and R3.R4; four combinations expressing three resistances: R1.R2.R3; R1.R2.R4; R1.R3.R4 and R2.R3.R4; and one combination with all four R1.R2.R3.R4. These additional genotypes in combination with the 'short' set make up the 'full' set of differentials.

All the differentials exist as pathogen-tested microplants at SASA and Stuart is willing to supply them as such around the world. SASA is the official body providing scientific support and services to government in Scotland, largely relating to agriculture. These responsibilities include plant health and SASA is home to the UK Potato Quarantine Unit. SASA is also responsible for the production and maintenance of seed

potato nuclear stock (initial micropropagated planting material for seed production).

The best option for testing isolates for subsequent use in variety screening is the short set plus the genotype containing R1.2.3.4 genes. This gives confidence that an isolate is capable of overcoming all 4 genes in combination if the reaction on a single R-gene differential was somewhat weak. Stuart is willing to supply five 'microprops' of each of the 12 genotypes in the 'short' set for £75 (Sterling) plus UK service tax of 17.5% (a total £88). Post and packaging are extra. This cost is the estimated actual cost to Stuart of generating new micropropagated plants with no margin whatsoever! Stuart recognizes that many of the parties requesting the set will have very little money, hence this exceptionally low charge.

A charge will also be made for the cost of transportation. Although more expensive, material will normally be sent by express carrier to minimize the risk of loss of plants in transit. However, the microprops are neither bulky nor heavy so the cost should not be large.

Additional R-gene differentials from the 'full' set can be ordered, also at a small charge; in this case probably ~ £ 8 (plus tax) per genotype. This price reflects our view that the major demand will be for the short set with only occasional requests for the others.

If you are interested, here is Stuart's contact information:

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If you have any problems reaching Stuart, you can contact Jim Duncan and he will contact Stuart for you.

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Teaching IPM-Late Blight to Resource-poor Farmers

Through the IFAD (International Fund for Agricultural Development) funded project *Integrated Management of Potato Late Blight Disease – Refining and Implementing Local Strategies through Farmers’ Field Schools* (see GILB Newsletter No. 10, April 2000) a total of 228 cycles of Farmers’ Field Schools with a strong Participatory Research component (FFS-PR) have been run in Bolivia, Bangladesh, China, Ethiopia, Peru and Uganda during 1999–2002. In the initial part of the project, extension workers or researchers facilitated all FFS-PR, but during the third year of the project (2001–2002 cropping season) about 40% of the FFS-PR have been led by farmers, who received additional training in technical and methodological terms.

The FFS-PR Methodology

The FFS-PR approach for integrated management of late blight is, in essence, an adult education method with a strong participatory research component. It involves the formation of a group of about 25 farmers with a facilitator, who is in charge of running the activities of the school. The main function of the facilitator is to design the curriculum using appropriate learning activities and to facilitate the experiments to test late blight control practices. Farmers meet with the facilitator in learning sessions every two weeks (or more frequently if they so decide). The learning activities are the central part of this method and involve different hands-on activities, so that farmers can observe results and reach conclusions about concepts and principles by themselves. For example, by putting late blight infected potato leaves in a plastic bag together with healthy leaves, they can observe the process of disease dissemination and the contagiousness aspect of late blight and start concluding that there is “something alive” involved. This process changes their belief that late blight is caused by rain or humidity and creates the germ concept in their minds.

The use of resistant potato varieties or clones and the optimization of fungicide use were the most important control components tested within the FFS-PR. Each farmer group managed and evaluated a field trial, which became the main aid for the learning activities. In these trials, farmers tested new clones, the relationship between resistance and fungicide use; frequencies, types and doses of fungicides; and other practices that they considered important for their potato farming systems. The farmer groups were divided into sub-groups, which made observations and registered data of a specific treatment. During each training session, sub-groups observed each specific treatment to determine the presence of pests and symptoms, weather and soil

conditions, etc. and based on their observations, they could exchange ideas about what they could do to control late blight. These sub-groups registered data from planting to harvesting, so they could understand disease progression and factors that influence it. They could also estimate production costs, particularly control costs, and make a comparative analysis across treatments, so that they could assess treatments not only based on control effects, but also in terms of cost-effectiveness. The purpose was to give farmers a sense of ownership of the research and learning process so they do not see it as something that belongs to the outside promoters.

Participatory evaluation of potato genotypes with resistance to late blight was conducted in each country (except in Bangladesh, where no resistant materials were available). Participating farmers in all countries affirmed the contribution of resistance to late blight control. However, farmers do not select only for late blight resistance, but for an appropriate combination of yield, culinary quality, marketability and late blight resistance.

FFS-PR led to rapid diffusion of resistant cultivars.

Farmers began multiplying promising late blight resistant varieties or clones in Bolivia, China, Ethiopia, Peru and Uganda. For example, during the first year of the project (1999–2000 cropping season) 50 new resistant clones were introduced in 13 FFS-PR in Peru and farmers selected the ten best. A recent survey indicated that about 4% of the fields of participants in FFS-PR is now planted to these resistant cultivars. Within three cropping seasons in Bolivia, there was a significant increase in the area planted to three of the varieties introduced through the FFS-PR. In China farmers have planted 62 acres with selected FFS-PR clones after three cropping seasons.

In Uganda, proper fungicide use (correct product, correct dose, and spraying after observing the field and weather conditions) introduced in the FFS-PR was adopted by 80% of the participating farmers, and in Ethiopia, most participants adopted diffused light stores, planting in furrows, hilling, sorting at harvest and planting in the rainy season. Farmers consider that some of these practices have a controlling effect against late blight, especially the use of resistant varieties, sorted seed, planting in furrows and hilling. Other practices are important to potato management, in general, and point out how a FFS-PR should not focus on one constraint because the added value of the different practices could make the effect of improved technologies more visible for farmers.

Economic Benefits

As the first step of a larger evaluation to determine if FFS can contribute to poverty alleviation, an economic evaluation based on consecutive survey data collected during 1999–2002 was made of the FFS-PR in Cajamarca, Peru. Farmers who participated in FFS-PR increased their yields between 1.2 and 4.3/tons/ha. An increase of 2 tons/ha



FFS-PR in Karubanda, Uganda, 2002.

represented an additional benefit of USA\$ 160/ha at potato prices in 2002. However, the average plot size of FFS-PR participating farmers was < 0.25–0.3 ha and the current low market price did not provide sufficient incentive for farmers to produce more potatoes. In locations where potatoes are grown in a more commercial manner on larger areas and with a higher market price, the benefits should increase accordingly. The reduction in the application of fungicides was statistically significant in only one of the four years surveyed, representing an average benefit of \$3.00/farmer for a reduction of 0.8 applications. However, one must keep in mind that late blight control is site-specific. In comparisons made in FFS-PR during the 2001–2002 cropping season in Uganda, the practice of weekly sprays cost 68% more than the FFS-PR method of optimal fungicide use.

The integrated management of late blight in developing countries requires that farmers have access to information about the biophysical principles involved in the control of this disease. However, having access is not enough if there are not appropriate methods available to facilitate the interpretation and understanding of this information. The PR-FFS methodology, which is effective in promoting learning and combining training with research to adapt and refine IPM to local conditions, represents an alternative for institutions that are working with farmers and aim at promoting IPM in general. However, scaling up this kind of method to reach millions of farmers is still a challenge.

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Late Blight Abstracts

Socioeconomic impact of two potato varieties (Cipira and Tubira) released in Cameroon

Deffo V, Njualem D, Koi J and Demo P. 2003. *American Journal of Potato Research* 80:151–158.

In 1988, the IRA-CIP potato project was created in Bambui, Cameroon, with the major objective of improving potato

production in the country. In 1992, two potato cultivars, Cipira and Tubira, were released by the project. In 1998, a socioeconomic impact study of Cipira and Tubira was carried out in the main potato-producing region of Cameroon to determine the reaction of the farmers, the effect of the new potato cultivars on the farmers' standard of living, and the level of achievement of the project's objectives.

Data were collected on-farm using questionnaires and direct observations. An impact survey was carried out in the region with a sample of 297 farmers selected among the potato farmers using stratified random sampling. The survey indicated that 98.6% of the potato farmers were aware of the new cultivars. Their main source of information was other farmers (51.5% of farmers informed). Seventy-eight percent of the farmers were still using Cipira and 62% had adopted it as part of their production system. These farmers (62.6%) reported that the resistance of Cipira to late blight was higher than that of local and European cultivars used in their production system. More than 44% of the farmers believed that their standard of living had improved due to Cipira and Tubira, since they had generated more revenue to improve their family education and nutrition, build more houses, buy more farms, purchase more farm inputs, and open new businesses. In addition, the farmers' average yearly potato production increased from 1.6 to 3.1 tons during the period when these varieties were being adopted.

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Leaf position prevails over plant age and leaf age in reflecting resistance to late blight in potato

Visker M H P W, Keizer L C P, Budding D J, Van Loon L C, Colon L T and Struik P C. 2003. *Phytophthora* 93:666–674.

The effects of plant age, leaf age, and leaf position on race-nonspecific resistance against *Phytophthora infestans* were investigated in a series of field and controlled environment experiments with five different potato (*Solanum tuberosum*) cultivars. Leaf position proved to be the most significant factor; apical leaves were far more resistant to late blight than basal leaves. Plant age and leaf age had only minor effects; therefore, the resistance of a specific leaf remained about the same during its entire lifetime. The gradual increase in late blight resistance from basal leaves to apical leaves appeared to be a general effect, irrespective of cultivar, growing conditions, or resistance test. Therefore, it is important to consider leaf position in tests for late blight resistance, because contrasts in resistance may be ascribed erroneously to differences between genotypes or treatments, whereas they are actually caused by differences in leaf position.

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Resistance to late blight and soft rot in six potato progenies and glycoalkaloid contents in the tubers

Andrivon D, Corbiere R, Lucas J M, Pasco C, Gravoueuille J M, Pelle R, Dantec J P and Ellisseche D. 2003. *American Journal of Potato Research* 80:125–134.

Glycoalkaloids are anti-nutritional compounds commonly found in wild *Solanum* species used as resistance sources to major potato pathogens. It is therefore important for breeding purposes to know whether selecting for resistance using such species necessarily selects also for high glycoalkaloid contents in the tubers. To test this hypothesis, we used six partial progenies from crosses between *Solanum tuberosum* and accessions of *S. andigena*, *S. berthaultii*, *S. phureja*, and *S. vernei* to investigate the possible correlation between resistance to *Phytophthora infestans* and/or to *Erwinia carotovora* subsp. *atroseptica* and the concentration of glycoalkaloids in tubers. Concentrations of α -solanine and α -chaconine in the tubers segregated in each progeny, as did resistance to each pathogen. Some, but not all, clones from each progeny showed hypersensitive reactions to the isolate of *P. infestans* used. Furthermore, clones within each progeny also differed for components of partial resistance to *P. infestans*, suggesting that all four wild species could be used as sources of both race-specific and partial resistance to late blight. With the exception of low, but statistically significant, correlations between concentration of α -solanine and two late blight resistance components (incubation period and spore production per unit lesion area) in progenies derived

from *S. vernei*, and despite a trend towards higher glycoalkaloid concentrations in the tubers of the clones most resistant to soft rot within progenies derived from *S. berthaultii* and *S. vernei*, no consistent relationship between resistance to either disease and concentrations of α -solanine and/or α -chaconine was observed. These results indicate that neither race-specific nor partial resistance to late blight and soft rot in the accessions used as progenitors of resistance depend on high solanine or chaconine concentrations. These resistance sources could thus prove useful in breeding programs for improved behavior against *P. infestans* and/or *E. carotovora*.

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Identification of late blight, colorado potato beetle, and blackleg resistance in three Mexican and two South American wild 2x (1EBN) *Solanum* species

Chen Q, Kawchuk L M, Lynch D R, Goettel M S and Fujimoto D K. 2003. *American Journal of Potato Research* 80:9–19.

Wild potatoes are important sources of genes for resistance to disease and insect pests. A collection of wild Mexican and South American *Solanum* species from the US potato Genebank was evaluated under laboratory and/or field conditions for their reaction to late blight (*Phytophthora infestans*), Colorado potato beetle (CPB, *Leptinotarsa*

Congratulations 2003 – 2004 JANE Award Winners¹

A total of 24 proposals was submitted for consideration for funding under the JANE Award Fund for 2003–2004. The Award Selection Committee and the APS Foundation had a difficult task in evaluating all the proposals received by the established deadline. The APS Foundation is pleased to announce that the following proposals were selected for funding at a level of \$5,000 each. "Diversity of *Phytophthora infestans* in Potato Seed Production Areas in Mexico," **Gerardo Alvarado** and **Edith Garay Serrano**, Michoacan, Mexico, and "Development of Late Blight Management Strategies for Resistant Potato Cultivars in Ecuador" (second year), **A. Taibe**, **X. Cuesta** and **G. Forbes**, Quito, Ecuador.

¹ Phytopathology News, May 2003, Volume 37, Number 5, reprinted with permission

5th World Potato Congress and Trade & Technology Show

We have been in touch with the Host Committee in China. The Host Committee is preparing to request from their Governments the last week of March 2004 to hold the Congress. They have been waiting for the SARS situation to improve (which it has) before requesting this approval. As soon as the date is confirmed, we will be notifying all of the delegates and others.

If you have any questions, please let us know. Thank you for your continued support.

Lloyd Palmer, President
Email: info@potatocongress.org

decemlineata Say), and blackleg (*Erwinia carotovora* subsp. *atroseptica* (van Hall) Dye) in order to identify individual genotypes with multiple resistance genes. Late blight inoculations using aggressive isolates (US-8/A2 and US-11/A1 mating types) of *P. infestans* revealed a wide range of variation for resistance between and within the accessions of the wild species tested. For late blight, susceptible as well as moderately to highly resistant genotypes were observed in all the species tested. However, at least one accession from the three Mexican and one South American wild diploid species tested showed a relatively uniform high level of resistance to *P. infestans*. These included *S. bulbocastanum*, *S. pinnatisectum*, *S. cardiophyllum*, and *S. circaefolium*. Two accessions from South American species *S. commersonii* were highly susceptible to late blight. For the Colorado potato beetle test, only one species, *S. pinnatisectum* appeared uniformly resistant to CPB under field conditions. Results of screening for blackleg resistance showed that there were major differences between genotypes in the wild species. Accessions of *S. circaefolium* P1498119 and *S. bulbocastanum* P1 243504 were identified as having significantly higher blackleg resistance than cultivated potato and the other wild species tested. However, genotypes from these two accessions were more susceptible to late blight and CPB. Characterization of the *P. infestans* isolate P1801C.16 used for late blight evaluation and multilocus isolate tests using US-8/A2 and US-11/A1 races revealed that the resistance in *S. pinnatisectum* genotypes tested corresponded to a race-non-specific genetic system, which was different from any existing R genes. *Solanum pinnatisectum* genotypes with both high levels of late blight and CPB resistance as well as blackleg resistance genotypes identified in the present study represent a diverse gene pool that may be useful for development of new potato cultivars with multiple disease and insect resistance. The potential utilization of these valuable sources for improvement of cultivated potato is discussed.

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Expression of a fungal glucose oxidase gene in three potato cultivars with different susceptibility to late blight (*Phytophthora infestans* Mont. de Bary)

Felcher K J, Douches D S, Kirk W W, Hammerschmidt R and Li W. 2003. *Journal of the American Society for Horticultural Science* 128:238–245.

Research was done to determine if enhanced resistance to potato (*Solanum tuberosum* L.) late blight could be obtained by combining host plant resistance and engineered resistance. Late blight susceptible cultivars, Atlantic, and Spunta and the partially resistant cultivar Libertas were transformed with a fungal glucose oxidase gene, resulting in lines which ranged in transgene copy number from 1 to 8. Glucose oxidase

enzyme activity ranged from 0.00 to 96.74 10^{-5} units/mg plant tissue. There was no correlation between copy number and level of transgene mRNA, level of transgene mRNA and enzyme activity, or between level of enzyme activity and disease resistance. Field and growth chamber evaluation of late blight response demonstrated little to no effect of the glucose oxidase transgene in either late blight susceptible or partially late blight resistant cultivars. However, enzyme activity levels were much lower than levels reported in previous research, which may account for the lack of effect of glucose oxidase against *Phytophthora infestans*. Twenty-one percent of the transgenic lines were phenotypically off-type compared to nontransgenic controls. Most of the off-type transgenic lines (four out of seven) were derived from 'Libertas'. Because several off-type lines did not express the glucose oxidase protein, this phenomenon could not be attributed solely to the glucose oxidase transgene. Based on these results, transgenic lines produced for this study do not increase resistance to *P. infestans* even in combination with moderate host plant resistance. However, production of greater numbers of transgenic lines with the current construct or, production of transgenic lines in which a different constitutive promoter drives the expression of the glucose oxidase gene might result in greater disease resistance. However, the usefulness of any small increase in resistance would need to be evaluated against the time and cost required for development of transgenic potato cultivars and the potential for off-type tubers and plants.

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Thermal properties of overwintered piles of cull potatoes

Kirk W W. 2003. *American Journal of Potato Research* 80:145–149.

Annual epidemics of late blight of potato have lead to debate as to the relative importance of overwintering sources of inoculum. Host availability is a key factor for overwinter survival of *Phytophthora infestans* and the initiation of epidemics of potato late blight. Temperature within discarded piles of cull potatoes may influence tuber tissue temperature and therefore affect survival of meristematic tissue. Consequently the risk of initiation of an epidemic of late blight from cull piles is closely related to the thermal experience of overwintered potato culls. Temperature monitoring of cull piles over two years indicated that temperature was stable in the interior of the piles regardless of cull pile size (1-15 ton) or year. The possible use of ambient temperature information gathered during winter months in potato-growing regions may not help estimate the risk of an epidemic of late blight initiated from cull piles as, although highly correlated with the surface temperature of cull piles, ambient temperature was not correlated with the temperature

within the cull piles. The presence of cull piles in excess of 1 ton may enhance the survival of the host and thus the development of *P. infestans* from infected tubers.

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Relative performance of five forecasting schemes for potato late blight (*Phytophthora infestans*). I: Accuracy of infection warnings and reduction of unnecessary, theoretical, fungicide applications

Taylor M C, Hardwick N V, Bradshaw N J and Hall A M. 2003. Crop Protection 22:275–283. © Elsevier Science Ltd 2002.

The Smith Period, Negative Prognosis, Blitecast, Sparks and NegFry forecasting schemes for potato late blight were evaluated over a 6-year period at five locations representing a range of blight risk situations. Frequent measurements were made by in-field meteorological stations and untreated, blight susceptible, potatoes in small plots were regularly assessed for symptoms of the disease. Although the Smith Period was the most reliable scheme (warnings rarely in error) it often gave too long an advanced warning of an eventual disease outbreak; NegFry was the most accurate scheme assuming an ideal warning of 10 days was required by growers.

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Potato Meetings

The Joint Meeting of EAPR: Section Breeding and varietal assessment and EUCARPIA: Potato Section will be held 26–30 July 2003 at Oulu, Finland. For more information contact

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The 87th Annual Meeting of The Potato Association of America, PAA 2003 *Back to Tradition* will be held 10–14 August 2003 in Spokane, Washington. More information can be found at www.paa2003.wsu.edu/index.htm or wsuconf@wsu.edu

The XXI Congress of the Latin American Potato Association (ALAP, Asociación Latinoamericana de la Papa), V Latin American Seminar on Potato: Use and Commercialization (V Seminario Latinoamericano de la Papa: Uso y Comercialización), X Meeting of the Chilean Potato Association (Asociación Chilena de la Papa, ACHIPA) and II Spanish American Congress on Research and Development of the Potato (II Congreso Iberoamericano sobre Investigación y Desarrollo en Patata) will be held 7–12 March 2004 in Valdivia, Chile. More information can be found at <http://uach.cl/alap2004> or contact Andrés Contreras, ALAP President, Email acontr@uach.cl

The Sixth Triennial Congress of the African Potato Association *Research Development Innovation for Income Generation and Food Security* will be held 5–10 April 2004 in Agadir, Morocco. More information can be found at <http://www.iavcha.ac.ma/APA/congress.html> or contact A. Hanafi, APA President, Email: hanafi@iavcha.ac.ma

Global Potato News now reaches industry people in 103 potato-producing countries. Among its features are a Site Update Alert (a monthly or bi-weekly e-mail site update newsletter), the Potato Research Newsletter (a quarterly e-mail newsletter of the latest potato research information) and Potato Trends (references to important trends in the international potato industry). More information at www.potatonews.com



INTERNATIONAL POTATO CENTER (CIP)

The GILB Newsletter is supported in part by the International Potato Center and through the coordinator and secretariat of GILB.

The **GILB Newsletter** is distributed in print and electronic formats to selected members in the scientific community, including GILB collaborators, researchers and donors. Past and current issues of the Newsletter are also available on the GILB homepage of the International Potato Center (CIP) website at www.cipotato.org/gilb/

The objective of the newsletter is to facilitate and increase communication and cooperation among persons and organizations working to combat *Phytophthora infestans*, the causal agent of potato late blight disease.

Please consider sharing a brief write-up on your current work related to late blight with other GILB Newsletter readers. Short articles (250 words or less) are particularly welcome, as are news items, notices of coming events, and summaries of research underway.

Direct submissions or comments to GILB Editorial Committee members: Edward French, Charlotte Lizarraga or Greg Forbes through the general GILB newsletter E-mail address (GILB@cgiar.org).

Potato Web Links

Agriculture Network Information Center
www.agnic.org

Agronomic Links Across the Globe
www.agry.purdue.edu/links

American Phytopathological Society
www.apsnet.org

APSnet, Plant Pathology On-Line
www.apsnet.org/online/feature/lateblit/

CRP-Gabriel Lippmann CREBS, Luxembourg
<http://www.crp.gl.lu/fr/index.php3>

Cornell-Eastern Europe Mexico Potato Late Blight Project (CEEM)
www.cals.cornell.edu/dept/plantbreed/CEEM

EUCABLIGHT (Potato Late Blight Network for Europe)
<http://www.eucabligh.org/EucaBlight.asp>

European Association of Plant Breeders (EUCARPIA)
www.eurcarpia.org

European Association for Potato Research (EAPR)
www.agro.wau.nl/eapr

Global Potato Focus
www.potatofocus.com

Global Potato News
www.potatonews.com

Idaho Plant Disease Reporter/Late Blight
www.uidaho.edu/ag/plantdisease/lbhome.htm

Integrated Management of Late Blight on Potatoes
www.gov.mb.ca/agriculture/crops/diseases/lateblight/index.html

Integrated Management of Late Blight on Potatoes (PMRA, Canada)
www.hc-sc.gc.ca/pmraralala/english/pdf/spm/spm_s9602-e.pdf

International Center for Genetic Engineering & Biotechnology (ICGEB)

www.icgeb.trieste.it/biosafety

International Potato Center (CIP)
www.cipotato.org

Maine Potato Board
www.maine potatoes.com

Malheur Experiment Station. Potato Late Blight
<http://www.cropinfo.net/PotatoBlight.htm>

Michigan State University
<http://www.lateblight.org/>

Minnesota Certified Seed Potato Growers Association
<http://www.mnseedpotato.org/>

Monsanto
www.monsanto.com

National Potato Council
www.npcspud.com

New Agriculturist
www.new-agri.co.uk

North American Potato Late Blight On-line Workshop
www.apsnet.org/online/lateblite/

North Dakota Pesticide Quarterly
www.ext.nodak.edu/extnews/pestqtrly

Oregon State University
<http://plant-disease.oregonstate.edu/index.htm>

PICTIPAPA
<http://ppathw3.cals.cornell.edu/Fry/pictipap.htm>

Plant Pathology Internet Guide Book
www.ifgb.uni-hannover.de/extern/ppigb/

Potato Association of America
www.ume.maine.edu/PAA

Potato Engine
www.potatoengine.com/thinkpotato.html

Potato Information Exchange
www.css.orst.edu/potatoes/main.htm

Potato Research Online
<http://www.potatonews.com/potatoresearch.asp>

Red Electrónica de la Papa Redepapa)
<http://redepapa.org>

Plant Research International
www.plant.wageningen-ur.nl

Resource Center, Cornell University
<http://www.nysipm.cornell.edu/>

Scottish Agricultural College (SAC)
www.sac.ac.uk

Scottish Crop Research Institute (SCRI)
www.scri.sari.ac.uk/trial/

Universidad Agraria La Molina, Peru
www.lamolina.edu.pe/investigacion/programa/papa

University of Idaho
www.uidaho.edu/ag/plantdisease/plbstem.htm

University of Florida. Late Blight On Potatoes And Tomatoes.
http://edis.ifas.ufl.edu/scripts/htmlgen.exe?DOCUMENT_VH008

University of Wisconsin
www.hort.wisc.edu/usdavcru/

Wageningen University
www.wau.nl

World Potato Congress
www.potatocongress.org/

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