Breeding for Host Resistance Wrap-up

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The discussion began with comments about late blight resistant varieties. There is an enormous breeding effort and a great number of resistant materials in the pipeline, but do these materials have the characteristics to make it big time? Unless varieties have suitable agronomic and quality characteristics [i.e. high yielding ability, acceptable cooking and frying quality, desirable taste, tuber shape, color of skin, shallow eyes, etc) they will not be grown and there will be no effect on the late blight problem. For that reason, some of the participants felt that, eventually, GMOs would be the answer — the incorporation of resistance genes into already accepted varieties. At present, public acceptance is a challenge and proof that GMOs are safe must be provided. One way to overcome public distrust could be to isolate and transfer potato resistance genes with potato promoters and to use a procedure that does not apply possibly harmful selection marker genes like bacterial antibiotic resistance genes. A poster in the Breeding for Host Resistance section entitled "Cloning of a R gene from *Solanum bulbocastanum* conferring complete resistance to *Phytophthora infestans"* demonstrated the feasibility of resistance gene transfer to and gene expression in a susceptible potato cultivar. Another comment was that with proper prebreeding the problem of combining maturity and resistance could be solved. However, combining agronomic qualities and resistance could take much longer.

There was a lively discussion about R-genes. One theory states that R genes, even if defeated (i e. plants become infected with isolates of *P. infestans* not carrying the specific avirluence genes corresponding to the plants' R genes), provide partial resistance to *P. infestans.* It was suggested that a great number of R genes remain unidentified and the term R gene-free plant is impossible to substantiate. In a practical sense, using breeding materials without known R genes makes it easier to select for partial resistance. Molecular tools to identify known R genes would be useful. Many breeding programs do use R genes. One participant noted that, some varieties with R genes have demonstrated durable resistance— for example Bzura has lasted 17 years in Poland.

The comment was made that molecular breeders could help practical breeders to know if different mechanisms of resistance were present. For example, Stirling is a long lasting resistant variety of which two resistance loci have been mapped, which will be useful for breeders.

At present chemical control remains the mainstay of late blight management because resistance levels are not high enough to fully protect the crop. However, it was mentioned that in the ECOPAPA (Enrichment of Potato Breeding Programs in Latin America and Europe with Resistance to Late Blight, *Phytophthora infestans*) Project, involving researchers in Europe and South America, there are materials with higher levels of resistance and fungicide sprays can be reduced.

One participant noted that durability could be viewed in different ways. Highly resistant materials with R genes that break down in a few years can be used and then replaced with other highly resistant materials with other R genes, thus rotating the R genes. In that way you have durability, but the components are not durable. Another opinion is that this approach may be impractical because of the necessarily long time needed for traditional breeding working with R genes.

The session closed with the controversial suggestion that a " win – win" situation might be desirable where some of the yield is sacrificed and some disease is present, but there is less selection pressure on the pathogen, so the rate of disease could be slower.

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