POTATO BREEDING FOR RESISTANCE AT THE AGRICULTURAL INSTITUTE OF SLOVENIA

12.5.2015

Peter Dolničar
History of potato breeding at AIS

1. Potato breeding at AIS started between 1947 and 1949
2. 15 varieties had been bred, 2 still in production
3. In early eighties variety Igor dominated on Slovenian potato fields (70 % of acreage)
   – rather resistant to PVYN
After 1988 a new strain PVYN_{TN} practically eliminated Igor from production within 3 years

1. New potato breeding programme started in 1993
2. Breeding for PVY extreme resistance had first priority
3. 9 varieties breed until now
The importance of breeding programme

1. Adapted to Slovenian growth conditions
2. Resistant to local patogen strains
3. Breed for consumers needs
4. Long term self-sufficiency in seed
5. Income for local seed producers
6. Higher self-sufficiency in food supply
7. Income for local farmers and industry
Breeding programme at the Institute

- Selection of parental lines
- Crossings
- Selection for tolerance to herbicides at seedling stage
- Resistance to pests and diseases
- 8 to 10 year selection of agronomic traits on the field

- Testing for registration
- DUS testing
Selection of important traits

• Selection of genotypes resistant to PVY
• Selection of genotypes resistant to late blight
• Selection of qualitative traits (shape of tubers, colour of skin and flesh, eye deepness, stolon length, plant habit...)
• Selection quantitative inherited traits (yield, dry matter, size, number and uniformity of tubers ...)
• Tolerance to drought and heat stress (tuber malformations, cracs, internal defects ...)
• Storability
• Consumption quality (table, processing...)

Kmetijski inštitut Slovenije
Potato Virus Y

PVY strains:
• N, NTN, N-Wi
• O
• C
• other
Resistance genes to Potato Virus Y

Hypersensitivity

$Ny_{\text{chc}}, Ny_{\text{dms}}, Ry_{\text{sto}}^{n1}, Ry_{\text{sto}}^{n2}$

Extreme resistance

$Ry_{\text{sto}}, Ry_{\text{sto}}^{na}, Ry_{\text{sto}}^{rna}$

$Ry_{\text{hou}}$

$Ry_{\text{adg}}$

$Ry_{\text{chc}}$

*S. stoloniferum* – resistant also to PVA

Sante, Corine, Bzura, Brda, Bobr, Pirola, Barbara, Bison, Franzi, Mirakel, White lady, Sarpo Mira...

Resistance to infection

Tolerance
Late Blight – the major fungal disease

Population of *P. infestans* is heterogeneous.
Present both A1 and A2 mating types (ratio of type A2 found in Slovenia 20.3 %).
Possibility of primary infections with oospores.
Types of fungus resistant to metalaxyl.
New more aggressive patotypes of fungus (more infection, shorter latent period, quicker sporulation).
Resistance to late blight

Resistance to late blight on leaves:
- **Horizontal - poligenical, vertical – R genes**
- *S. demissum, S. verucossum, S. stoloniferum, S. microdontum, S. brevidens*
- *S. bulbocastanum,*
- Resistance of **Sarpo varieties** (Hungary)
- Other from wild species

Resistance to late blight on tubers:
- *Solanum tuberosum* subsp. *tuberosum* and *S. andigena*, Neotuberosum, somaclonal variation
- Resistance depends on tuber depth, size of lenticels, resistance of skin to spore germination
Resistance to other pests and diseases

Plotato leaf roll virus

Potato cyst nemathodes
*Globodera rostochiensis*
*Globodera pallida* (variety Inovator)

Resistance to potato wart disease

Resistance to common scab and other blemish diseases
New Slovenian potato varieties

Pšata - excellent table early maincrop variety with moderate yield

Bistra – maincrop table variety, suitable also for organic production

KIS Sora – leading high yielding multipurpose maincrop variety, excellent quality, cooking type A, tolerant to cold storage

KIS Mirna – second early table variety tolerant to drought

KIS Sotla – multipurpose maincrop variety

KIS Vipava – early table variety with very long dormancy, suitable for organic production

KIS Kokra – late blight resistant maincrop variety suitable for organic production

KIS Krka – excellent maincrop table variety tolerant to drought, suitable for light sandy soils

KIS Mura – very good maincrop table variety suitable for heavy soils, with a long dormancy
Our future?

Acknowledgement

The breeding work during last 20 years was supported by several projects and grants of Slovenian Research Agency and Slovenian Ministry of Agriculture, Forestry and Food.