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LITHUANIAN
RESEARCH CENTRE
FOR AGRICULTURE
AND FORESTRY



Small fruit breeding tendencies in Lithuania

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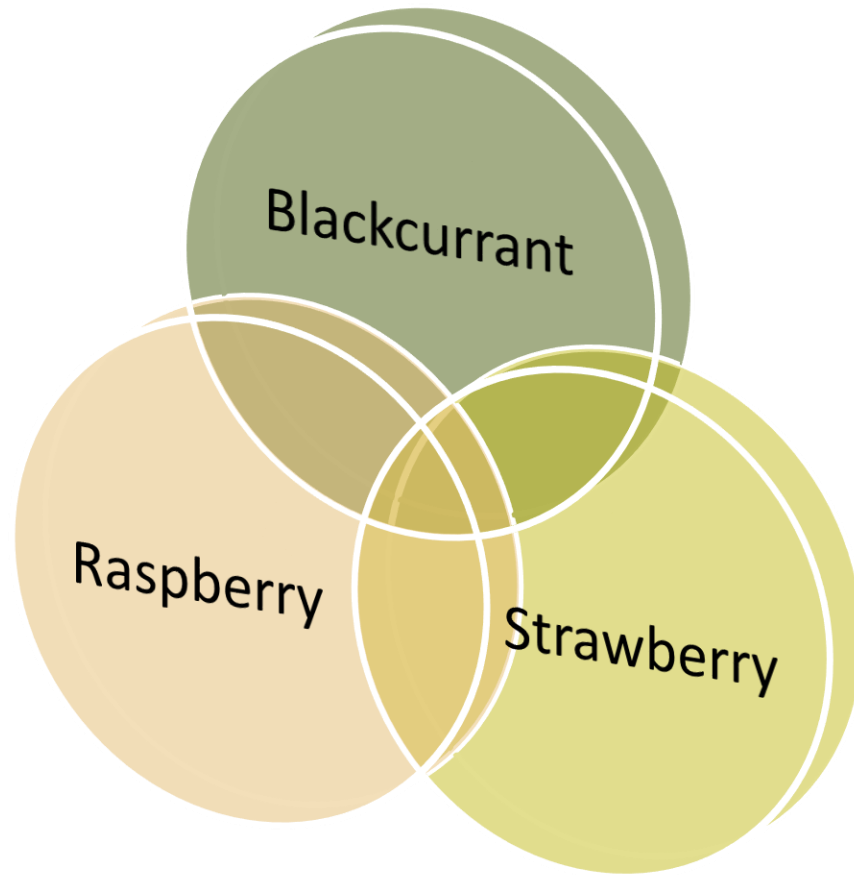
Main facts about Lithuania



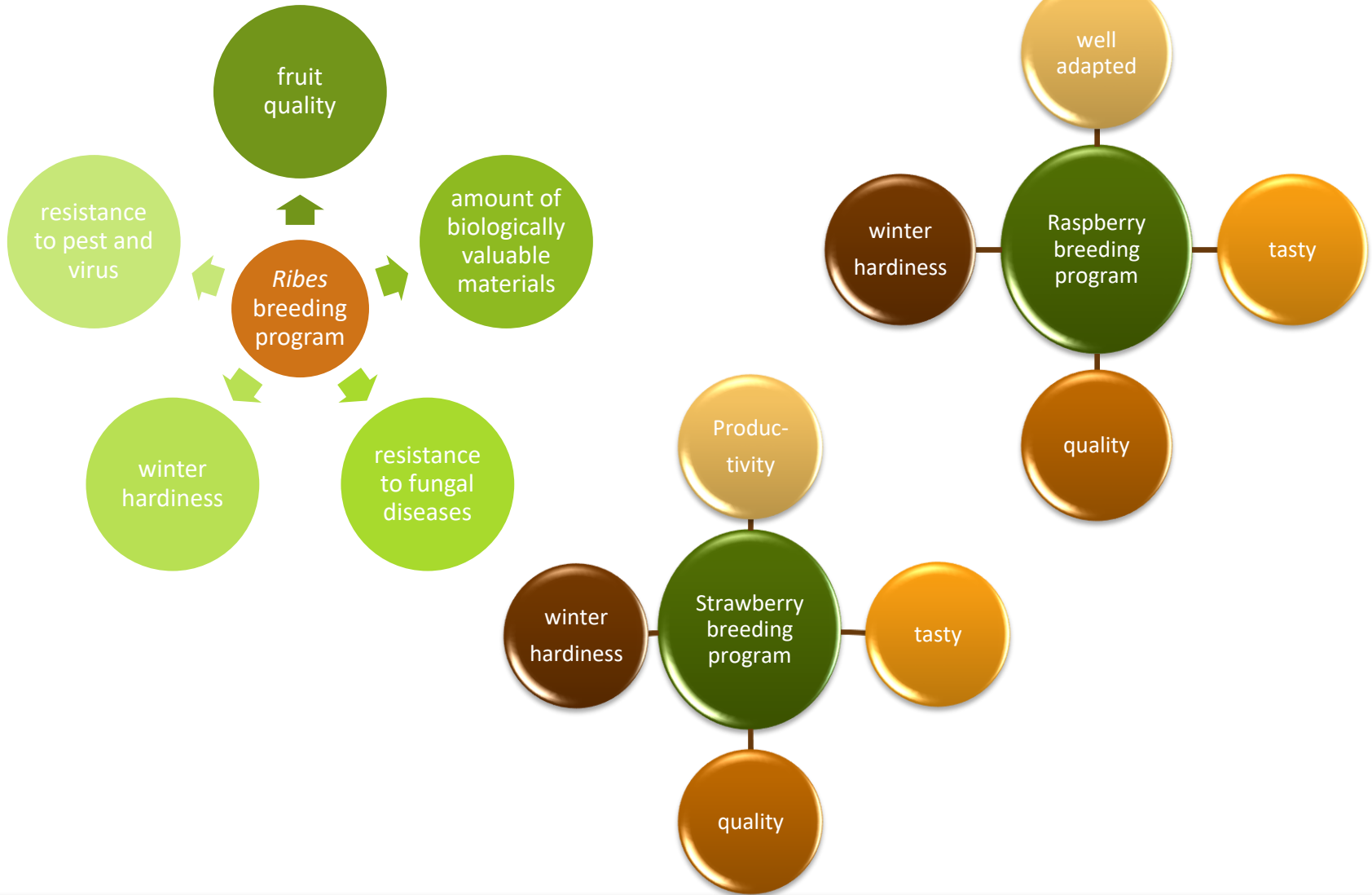
- **Population:** ~3 000 000
- **Area:** 65 300 sq. M
- **Bordering countries:** Russia (Southwest), Poland (South), Belarus (East), Latvia (North), Baltic Sea (West).
- **Ethnicities:** Lithuanians 85,08%, Poles 6,65%, Russians 5,88%, Others 2,39%
- **Native languages:** Lithuanian [official] 85%
- **Languages spoken:** Lithuanian[official] 96%
- **Climate:** average winter temperature: -5°C (lowest -27°C), average summer temperature: $+17^{\circ}\text{C}$ (highest $+35^{\circ}\text{C}$).
- **The agricultural** sector now employs only some 12 percent of the population.

INTRODUCTION

Most popular small fruits



Conventional breeding



Interspecific hybridization



In interspecific crosses many *Ribes* species were used: *R. americanum*, *R. sanguineum*, *R. dikuscha*, *R. aureum*, *R. nigrum* ssp. *sibiricum*, *R. uva-crispa*, *R. sanguineum*, *R. ussuriense*, *R. janczewski*, *R. pauciflorum*.



Interspecific hybrids between *R. ideaus* and *R. occidentalis*.



Interspecific hybridization using 10 *Fragaria* species and forms with different genomic constitution and ploidy level were performed.



In vitro techniques (1)

- Method of isolated embryo was used to increase germination of *Ribes* interspecific hybrids *in vitro*.
- Intersectional *Eucoreosma* section hybrids *R. nigrum* x *R. janczewskii* F₁, *R. nigrum* x *R. usuriensis* F₂, *R. nigrum* x *R. uva-crispa* F₂, *R. nigrum* x *R. rubrum* F₃, *R. nigrum* (*R. americanum* x *R. nigrum*) x *R. sanguineum* F₃ were obtained using embryo rescue method.
- Polyploidization in *in vitro* was used in order to restore fertility of interspecific hybrids, or restore homozygous state of target genes.
- Tetraploid blackcurrant C1 and C2 genotypes were induced and currently are studied in field collections.



In vitro techniques (2)

- Methods of screening for cold hardiness in strawberry seedlings under controlled conditions were developed.
- Results of cold acclimation and freezing treatments of *Rosacea* family plants *in vitro* show that for maximal cold hardiness acclimation for 56 days or longer is required. The hybrid *F. orientalis* x *F. vesca* and hybrids *F. ananassa* x *F. virginiana* showed highest viability after the freezing.
- The expression of dehydrin proteins in *Rosaceae* during cold acclimation were studied. A novel XERO₂ - like dehydrin, which is expressed during cold acclimation in *F. vesca*, was identified.

Molecular markers

- Markers for *Ce* and *P* genes, responsible for blackcurrant resistance to gall mite, are used in breeding programs. It was established, that species *R. sanguineum*, *R. americanum*, *R. aureum*, *R. nigrum* spp. *sibiricum* may be used as donors for resistance to gall mite.
- PCR based markers for *Rpfi* gene were developed and used for screening strawberries for red stele resistance.
- The genetic diversity of all our blackcurrant, raspberry and strawberry cultivars and hybrid clones developed mostly was evaluated using SSR and AFLP markers.
- This enable to select most promising donors for further studies or breeding, easily identify cultivars and distinguish them between many cultivars.

Preservation of genetic resources

- *In vitro* culture techniques, including storage under growth limiting conditions and cryopreservation, provide storage alternatives for protecting valuable germplasm.
- Vitrifaction, vitrifaction method with aluminium plates, incapsulation/dehydratation, incapsulation/vitrifaction methods were evaluated in the cryopreservation studies of *Rosacea* and other plants.
- Cryopreservation technologies of different explants including meristems, buds, embryos and suspension cells was evaluated.

Blackcurrant breeding (1) *International program between Sweden-Latvia-Lithuania*



'Ritmo'



'Domino'



'Viktor'



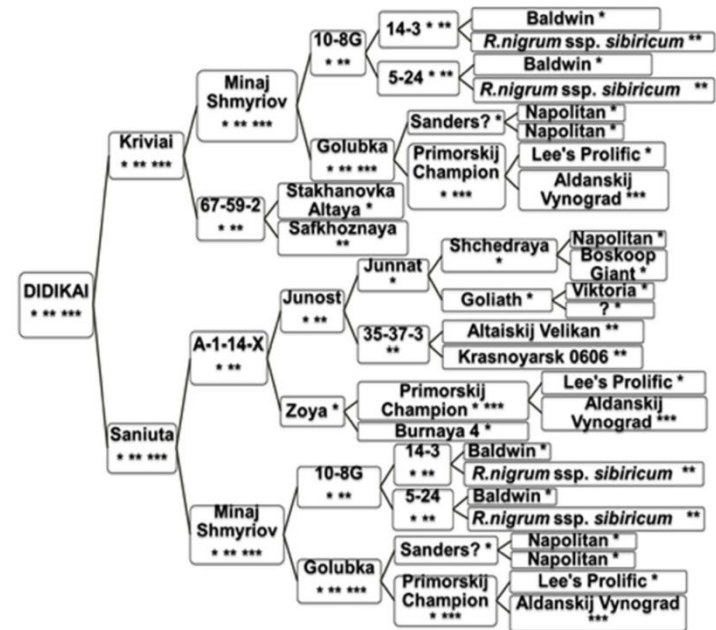
'Karina'

Blackcurrant breeding (in DUS testing) (2)

‘Didikai’



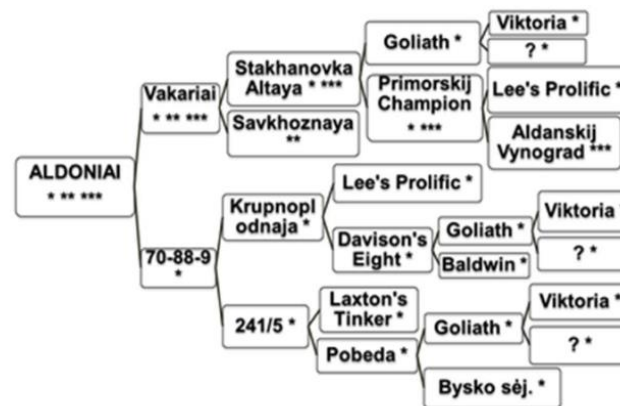
- ➔ Early season cultivar.
- ➔ Pedigree: ‘Kriviai’ × ‘Saniuta’.
- ➔ Berries are with very good taste and big size.
- ➔ Bushes are medium high, resistant to cold.
- ➔ Enough resistance to fungal diseases, resistant to gall mite.
- ➔ Distinguished by a high level of self-pollinating (77 %).
- ➔ Suitable for organic horticulture.



Blackcurrant breeding achievements (in DUS testing) (3)

'Aldoniai'

- ➔ Middle season cultivar.
- ➔ Pedigree: 'Vakariai' × Nr. 70-88-9.
- ➔ Berries are with good taste and big size.
- ➔ Bushes are high, resistant to cold, blossom resistant to spring frosts.
- ➔ Enough resistance to fungal diseases, resistant to gall mite.
- ➔ Distinguished by a high level of self-pollinating (77 %).
- ➔ Suitable for organic horticulture.



Raspberry breeding (4)



'Mistika' – F₂ seedling of 'Norna'. Plant height 1.4 m. 14.1 stems per bush, average yield 3.3 t ha⁻¹. Average fruit weight 2.4 g, fruit very attractive, very tasty, has high sugar content. Picking time lasts from 07-02 to 07-25.

'Vizija' – F₂ seedling of 'Norna'. Plant height 1.5 m, has 24.6 stems per bush. Average yield 3.5 t ha⁻¹. Average fruit weight 2.3 g, fruit very attractive, very tasty, has high ascorbic acid content. Picking time lasts from 07-09 to 07-28.

Wild strawberry breeding (5)



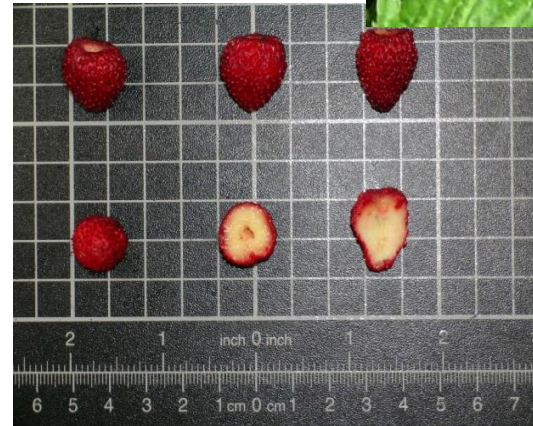
'Dena'



'Elina'



'Meda'



'Redita'

All of them are remontant - producing berries from June to October , with production peaking in mid-summer. They produce high yields of rather big berries with excellent aroma of wild strawberry. 'Dena' distinguished by early fruiting, 'Meda' – by high yield (up to 4 t/ha), 'Redita' by big size (over 3 g), berries of oblong shape and easy picking, 'Elina' by nice white aromatic berries. All of them are tolerant to drought and cold. Propagated by seeds.

CONCLUSIONS

- Over 30 small fruit cultivars were released as products of small fruit breeding programmes in Lithuania.
- Interspecific breeding, employment of *in vitro* methods, usage of molecular markers allows to introduce resistance to biotic and abiotic stress into cultivars, and enables to fasten breeding process.
- Cryopreservation of genetic resources was started; new methods are being developed.

Thank you for the attention

