

Increasing emphasis is being placed on the need for northern Europe to become more self-sufficient in the production of protein crops. This necessitates increased utilisation of legumes, including peas. Grey peas are a staple food in Latvia, and have been traditionally grown and used for food. There is still a strong consumer interest in grey peas, particularly at Christmas and New Year celebrations. However, the area under cultivation is quite small, and the vast majority of production is utilised for local consumption. All the varieties grown are Latvian cultivars, developed at the Priekuli Plant Breeding Institute and the Stende Cereal Breeding Institute. An application for geographical designation for one of the local cultivars has been made in collaboration with a local farmer and a distributor. The Latvian gene bank holds a total of 63 pea accessions, the majority of which are grey peas. The collection includes 10 varieties, 1 landrace, and 52 accessions which were repatriated from the N.I.Vavilov Research Institute of Plant Industry (VIR) collection. In some cases, the identity of these repatriated accessions can be deduced from the names, but the identity of the majority of them is unknown, and may include landraces, breeding lines and other germplasm. Descriptors for peas have been developed, and all 10 varieties have been characterised. In addition, SSR markers have been utilised to genetically fingerprint the majority of the collection. The SSR data has been analysed in an attempt to identify the genetic relationships of the unknown accessions repatriated from the VIR collection with the accessions with known provenance. Genetic diversity within the collection was also assessed.

## Evaluation of pea varieties according to plant descriptors

Descriptors for peas have been developed, and all 10 pea varieties in the Latvian genetic resources collection have been characterised using plant morphological descriptors for three years (2007-2009).

Code	Descriptor	Aina	Almara	Balva	Retrija	Bruno	Lāsma	Rota	Selga	Vitra	Zaiga
III/1	Seed: shape	2	2	2	6	6	2	2	2	6	2
III/2	Seed: colour of cotyledon	2	1	2	2	2	2	2	2	2	1
III/3	Plant: anthocyanin colouration	2	2	1	2	2	1	2	2	2	1
III/4	Stem: fasciation	1	1	1	1	1	1	1	1	1	1
III/5	Stem: length	7	7	7	7	5	7	7	7	7	7
III/6	Stem: number of nodes up to and including first fertile node	12	14	13	12	14	13	13	12	13	12
III/7	Leaflet: dentations	1	1	1	1	1	1	1	1	1	1
III/8	Leaflet: degree of dentations	3	3	3	3	5	3	5	5	3	5
III/9	Stipule: type of development	9	9	9	9	9	9	9	9	9	9
III/10	Time of flowering	76	82	77	74	75	78	78	76	79	75
III/11	End of flowering	20	15	18	17	17	18	15	17	20	17
III/12	Varieties with anthocyanin only: flower: anthocyanin colouration of wing	2	3	*	3	2	*	3	2	3	*
III/13	Varieties without anthocyanin only: Flower: colour of standard	*	*	1	*	*	1	*	*	*	1
III/14	Flower: shape of base of standard	3	5	5	3	7	5	5	3	7	3
III/15	Pods per node	6	6	6	6	6	6	6	6	6	6
III/16	Pod length	5	7	5	5	5	7	5	7	7	7
III/17	Pod: degree of curvature	3	3	3	3	3	3	3	3	3	3
III/18	Pod: type of curvature	2	2	2	2	2	2	2	2	2	2
III/19	Pod: number of seeds	3	5	3	3	5	5	5	5	5	5
III/20	Pod: number of ovules	4.2	6.2	4.1	3.5	5.8	6.2	5.4	6.0	6.5	5.4
III/21	Varieties with anthocyanin only: seed: marbling of testa	1	1	*	2	2	*	2	1	1	*
III/22	Varieties with anthocyanin only: seed: violet or pink	1	2	*	1	2	*	1	1	1	*
III/23	Varieties with anthocyanin only: seed: colour of testa	3	3	*	2	2	*	2	2	1	*
III/24	Seed: black colour of hilum	1	1	1	2	1	1	1	1	1	1
III/25	Seed: weight	5	3	3	7-9	5	3-5	3	5	3-5	3-5
III/26	Protein content, %	5	7	5	5	7	5	5	5	7	5
III/27	Susceptibility to pod spot ( <i>Ascochyta pisi</i> )	1	1	1	1	1	1	1	1	1	1
III/28	Susceptibility to powdery mildew ( <i>Erysiphe pisi</i> )	1	1	1	1	1	1	1	1	1	3
III/29	Susceptibility to downy mildew ( <i>Peronospora pisi</i> )	1	1	1	1	1	1	1	1	1	1
III/30	Susceptibility to pulses rust ( <i>Uromyces ssp.</i> )	1	1	1	1	1	1	1	1	1	1

\* - trait not present in accession. Full list of descriptors - <http://www.genres.lv/en/kulturaugi/deskriptori/>

Latvian pea genetic resources are also being utilised in breeding efforts, combining modern foreign cultivars with locally adapted material. Agronomic evaluation of new breeding material is being undertaken at Priekuli Plant Breeding Institute. Four hybrid lines: H.97-2-20, H.91-14-23, H.91-14-43, H.86-19-3 and nine field pea cultivars: 'Aina', 'Almara', 'Rota', 'Lāsma', 'Selga', 'Vitra', 'Zaiga', 'Retrija' and 'Bruno' were tested in field trials during 2010-2012 in Priekuli. The tested lines and varieties included white and red-violet blossomed accessions. In some cases, the newly developed lines were superior to the standard variety in both yield and other seed quality parameters.



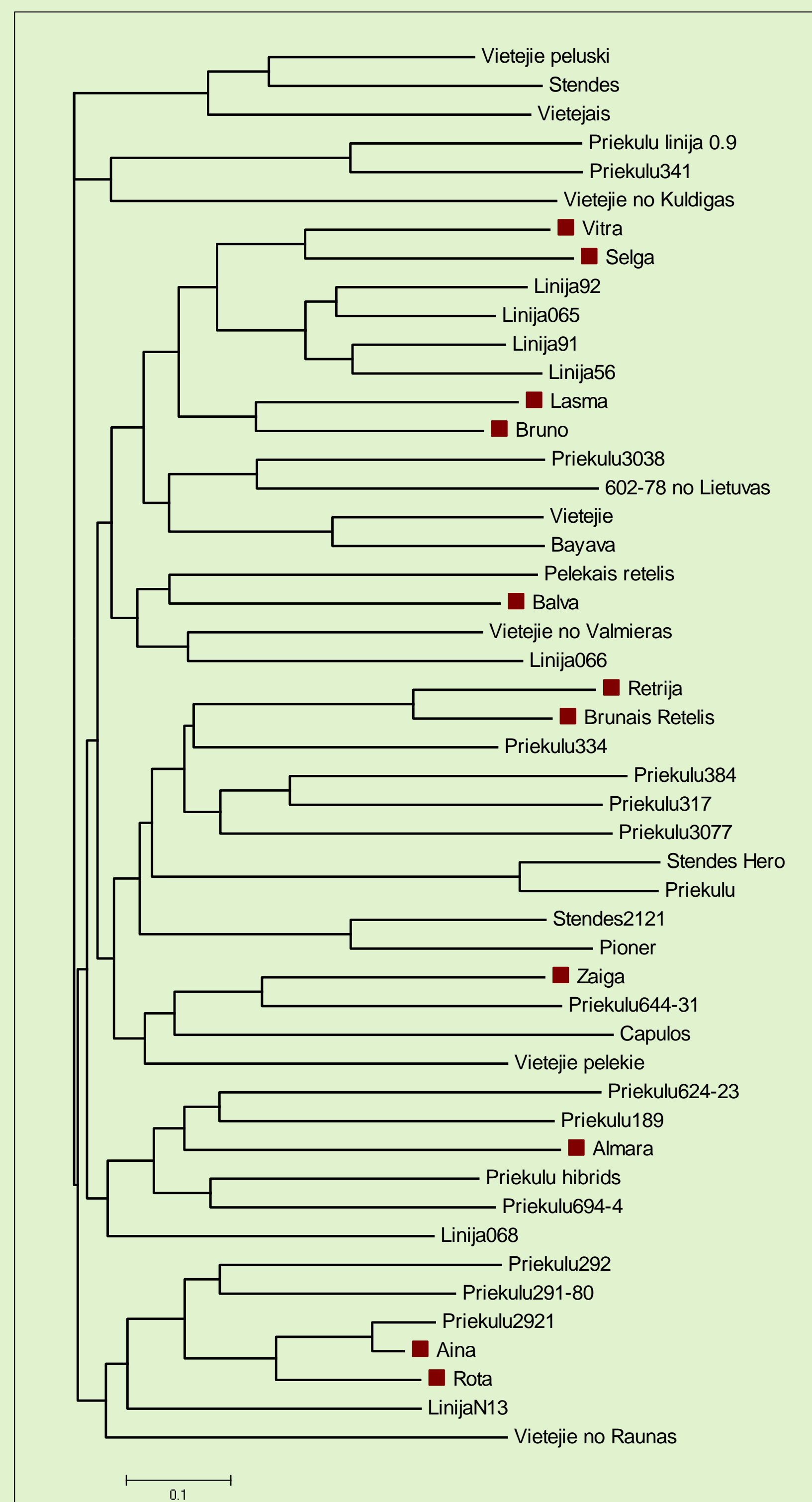
Comparison of agronomic properties of white blossomed pea varieties developed at Priekuli Plant Breeding Institute (2010 – 2012)

Varieties/ Hybrid lines	Seed yield		1000 seed weight		Protein content	
	t ha <sup>-1</sup>	relat., %	g	relat., %	%	relat., %
'Zaiga' (St.)	2.25	100	213.0	100	22.9	100
'Lāsma'	2.46	109	231.7	109	21.8	95
H 86-19-3	<b>4.00</b>	<b>178</b>	207.0	97	<b>24.7</b>	<b>108</b>
H 91-14-23	<b>3.01</b>	<b>134</b>	<b>226.0</b>	<b>106</b>	<b>25.9</b>	<b>113</b>
H 91-14-43	<b>3.38</b>	<b>150</b>	203.3	95	<b>24.3</b>	<b>106</b>

Analysis of the genotyping results will enable a more targeted assessment of the accessions repatriated from the VIR institute, and can serve as a basis for rational utilisation and conservation of the Latvian pea genetic resource collection, as well a basis for evaluation of new acquisitions.

## SSR fingerprinting

Seeds were germinated and DNA was extracted from fresh leaves. Six individuals from each accession were used. For pea collection fingerprinting, six SSR markers were used: AD270, AC58, AB25, AD 61, AA355, AB53 (Lordon et al (2005) Theor Appl Genet 111:1022–1031).



The genetic fingerprinting of the Latvian pea collection enabled the genetic diversity and relationships between the accessions to be investigated. The pea varieties and landraces are fairly well characterised, having been described according to the developed descriptors, and some pedigree information is also available. However, little or no information is available about the accessions which were repatriated from the VIR institute beyond seed colour and accession name. The amount of genetic diversity within the varieties is lower than in the VIR accessions (average allele number 11.2 and 20.7, and observed heterozygosity 0.18 and 0.24 respectively). Analysis of the genetic relationships indicates that there is no separate grouping of the varieties from the VIR accessions. The dendrogram confirms some known relationships, e.g. 'Retrija' is a selection from the land race 'Brūnais Retelis', however not others, e.g. 'Pioner' and 'Rota' have one common parent, and 'Rota' is a parent of 'Almara'. In other cases, accessions with similar seed colour were grouped together, e.g. 'Linija065', 'Linija92', 'Linija91' and 'Linija56' are yellow; 'Zaiga' and 'Priekulu644-31' are green.