State of the art of *Lathyrus* and other grain legumes collections in Serbia

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- **Public institute - operates as a research institute and seed company, linking basic research with applied research, farmers and the market**

- **Largest Institute overseen by the Ministry of Education, Science and Technological Development of the Republic of Serbia**

Germplasm collections of **grain legume species** are maintained in:

- Vegetable Crops and Forage Crops Department of the Institute of Field and Vegetable Crops in Novi Sad
- Institute for Maize Research “Zemun Polje”, Belgrade
- Institute for Vegetable Crops, Smederevska Palanka

National Gene Bank is at the final stage of establishment

- **Active germplasm collections (breeding collections) are formed and conserved within breeding programs of each species**

- **Breeders maintain these collections**

- **Conservation of germplasm of less used species, that are currently not involved in breeding**

Genetic resources of grain legumes in Vegetable Crop Department and Forage Crop Department, Institute of Field and Vegetable Crops Novi Sad

Genus	Species	English name	Number of accessions
Cicer	*arietinum*	chichpea	58
Lathyrus	***sativum***	**grass pea**	**35**
	spp.	**vetchlings**	**52**
Lens	*culinaris*	lentil	51
Lupinus	*spp.*	lupins	164
Pisum	*sativum*	common pea	975
	fulvum	red-yellow pea	13
Phaseolus	*vulgaris*	common bean	750
	coccineus	runner bean	18
Vicia	*faba*	faba bean	121
	sativa	common vetch	496
	grandiflora	large-flowered vetch	462
	hirsuta	tiny vetch	46
	narbonensis	Narbonne vetch	45
	panonica	Hungarian vetch	44
	villosa	Hairy vetch	27
Vigna	*angularis*	adzuki bean	7
	radiata	mung bean	7
	unguiculata	cowpea	9

- **Passport data based on FAO/Bioversity Multi-Crop Passport Descriptors**

- **Evaluation of accessions according to International Descriptor Lists (plant, flower, seed traits)**

- **Evaluation of most important agronomical traits (yield, yield components, biotic and abiotic stress resistance)**

- **Molecular characterization of accessions applying different types of molecular markers**

- **Chemical composition**

65 accesions of *Phaseolus vulagris*

and

13 accessions of *Phaseolus coccineus*
included in EURISCO
(SMARTLEG)

Lathyrus sp.

• Grass pea (*Lathyrus sativus* L.) is grown on smaller acreage in Serbia and its neighboring countries

• Nowadays *Lathyrus* is being successfully reintroduced

• Spring-sown cultivars in organic production

• Dual-purpose crop for

high forage and **grain yields**

Lathyrus sp.

- Passport data
- Phenotypic characterization (part of the accessions)
- Agronomical field trials

Lathyrus breeding at Forage Crop Department

Main goals:

- earliness
- early spring and early summer drought resistance
- high forage dry matter yield and crude protein content
- high grain yield and crude protein content

Two recognized cultivars: **Sitnica** and **Studenica**

Research on intercropping of annual legumes for grain yield production, including grass pea

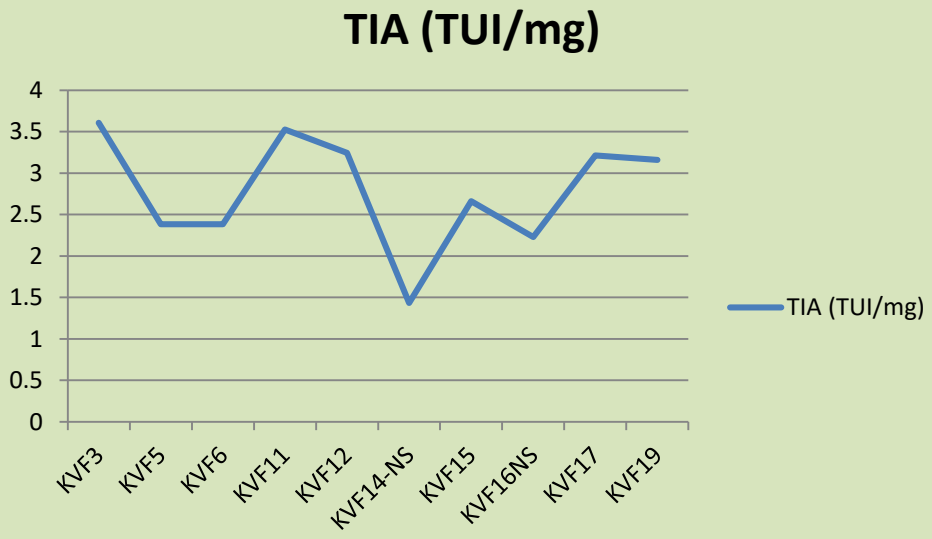
Lathyrus

Table 6
Concentrations of phenolic compounds found in *P. vulgaris* and *L. sativus* extracts (μg/g dw). Sample labels (given in Table 2) are additionally suffixed with H (herb) or R (root).

Class	Compound	"Butmirski trešnjo"		"Zlatko"		"Sataja"		"Maksa"		"Erdevik"		"Gomiljani"	
		PV01H	PV01R	PV02H	PV02R	PV03H	PV03R	PV04H	PV04R	LS01H	LS01R	LS02H	LS02R
Hydroxybenzoic acids	*p*-Hydroxybenzoic acid	13.6 ± 0.82	9.41 ± 0.57	*20.6 ± 1.2*	11.7 ± 0.70	11.2 ± 0.67	10.3 ± 0.62	13.9 ± 0.83	15.5 ± 0.93	31.4 ± 1.9	17.9 ± 1.1	23.4 ± 1.4	26.8 ± 1.6
	Protocatechuic acid	13.4 ± 1.1	<0.08	*9.21 ± 0.74*	<0.08	5.78 ± 0.46	2.56 ± 0.21	16.3 ± 1.3	3.20 ± 0.26	8.89 ± 0.71	4.81 ± 0.39	3.63 ± 0.29	1.17 ± 0.09
	Gentisic acid	18.7 ± 1.5	2.75 ± 0.22	*16.8 ± 1.3*	9.85 ± 0.79	26.5 ± 2.1	2.57 ± 0.21	44.0 ± 3.5	5.70 ± 0.46	<0.08	<0.08	<0.08	<0.08
	Vanillic acid	33.9 ± 0.10	69.8 ± 0.21	*35.0* ± 0.11	70.4 ± 0.21	53.5 ± 0.16	76.3 ± 0.23	53.5 ± 0.16	81.8 ± 0.25	9.05 ± 0.03	37.1 ± 0.11	18.0 ± 0.05	25.8 ± 0.08
	Gallic acid	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	66.9 ± 6.0	80.2 ± 7.2	67.2 ± 6.0	<0.12	<0.12	<0.12
	Syringic acid	2.69 ± 0.01	7.00 ± 0.01	2.03 ± 0.01	9.00 ± 0.02	4.67 ± 0.01	6.83 ± 0.01	<0.12	6.83 ± 0.01	11.2 ± 0.02	3.19 ± 0.01	10.7 ± 0.02	2.53 ± 0.01
Hydroxycinnamic acids	*p*-Coumaric acid	34.3 ± 3.1	2.80 ± 0.25	27.0 ± 2.4	<0.2	7.82 ± 0.70	6.72 ± 0.61	6.31 ± 0.57	6.04 ± 0.54	14.2 ± 1.3	11.5 ± 1.0	9.50 ± 0.86	6.91 ± 0.62
	Ferulic acid	55.0 ± 0.01	15.7 ± 0.02	54.8 ± 0.01	5.89 ± 0.01	15.4 ± 0.02	9.98 ± 0.01	19.5 ± 0.02	7.36 ± 0.01	13.8 ± 0.01	7.80 ± 0.01	8.39 ± 0.01	3.04 ± 0.01
	Caffeic acid	324 ± 23	<0.8	339 ± 24	<0.8	12.3 ± 0.86	<0.8	15.4 ± 1.1	<0.8	10.2 ± 0.71	<0.8	15.0 ± 1.0	<0.8
Cyclohexanecarboxylic acids	Quinic acid	245 ± 0.25	800 ± 0.80	278 ± 0.28	781 ± 0.78	393 ± 0.39	1341 ± 1.3	292 ± 0.29	574 ± 0.57	304 ± 0.30	345 ± 0.35	250 ± 0.25	130 ± 0.13
Chlorogenic acids	5-*O*-Caffeoylquinic acid	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Coumarins	Esculetin	<0.02	<0.02	<0.02	<0.02	3.99 ± 0.24	<0.02	<0.02	<0.02	2.91 ± 0.18	<0.02	2.62 ± 0.16	<0.02
Isoflavones	Daidzein	<0.2	163 ± 15	<0.2	198 ± 18	2.15 ± 0.19	235 ± 21	37.0 ± 3.3	385 ± 35	<0.2	<0.2	<0.2	<0.2
	Genistein	< 2	145 ± 10	1.35 ± 0.10	388 ± 27	5.80 ± 0.41	140 ± 9.8	17.0 ± 1.2	263 ± 18	<2	<2	<2	<2
Flavones	Apigenin	< 8	< 8	< 8	<8	<8	<8	<8	<8	<8	<8	<8	<8
	Baicalein	< 16	< 16	< 16	<16	<16	<16	<16	<16	<16	<16	<16	<16
	Luteolin	< 40	< 40	< 40	<40	<40	<40	<40	<40	<40	<40	<40	<40
	Chrysoeriol	< 4	< 4	< 4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Flavone	Vitexin	< 0.2	3.02 ± 0.15	0.880 ± 0.04	2.91 ± 0.15	<0.2	0.606 ± 0.03	0.935 ± 0.05	3.46 ± 0.17	0.661 ± 0.03	0.880 ± 0.04	<0.2	<0.2
gly-	Apigenin 7-*O*-glucoside	*< 0.2*	*< 0.2*	<0.2	0.824 ± 0.04	0.256 ± 0.01	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
co-	Luteolin 7-*O*-glucoside	5.38 ± 0.16	< 4	5.29 ± 0.16	<4	4.62 ± 0.14	<4	6.53 ± 0.20	<4	<4	<4	<4	<4
sides	Apiin	1.21 ± 0.06	< 0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	< 0.06
Flavonols	Kaempferol	<16	<16	<16	<16	<16	<16	<16	<16	<16	<16	<16	<16
	Quercetin	286 ± 0.86	<16	284 ± 0.85	<16	<16	<16	288 ± 0.87	<16	<16	<16	<16	<16
	Isorhamnetin	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	132 ± 7.9
Flavonol	Quercitrin	5.60 ± 0.34	<0.06	6.15 ± 0.37	<0.06	<0.06	<0.06	16.5 ± 0.99	<0.06	11.0 ± 0.66	<0.06	<0.06	<0.06
gly-	Kaempferol 3-*O*-glucoside	42.9 ± 1.7	3.24 ± 0.13	40.3 ± 1.6	2.59 ± 0.10	24.0 ± 0.96	3.24 ± 0.13	91.5 ± 3.7	3.14 ± 0.13	1.70 ± 0.07	4.63 ± 0.19	2.69 ± 0.11	4.48 ± 0.18
co-	Hyperoside	347 ± 21	<0.06	187 ± 11	<0.06	488 ± 29	<0.06	572 ± 34	<0.06	<0.06	<0.06	<0.06	<0.06
sides	Quercetin 3-*O*-glucoside	344 ± 10	<0.06	196 ± 5.9	<0.06	646 ± 19	<0.06	565 ± 17	<0.06	<0.06	<0.06	<0.06	<0.06
	Rutin	2495 ± 75	2.41 ± 0.07	2358 ± 71	105 ± 3.2	1061 ± 32	<2	2029 ± 61	31.2 ± 0.94	<2	<2	<2	<2
Flavanones	Naringenin	0.488 ± 0.03	8.06 ± 0.56	0.969 ± 0.07	17.3 ± 1.2	1.93 ± 0.14	4.10 ± 0.29	2.33 ± 0.16	13.4 ± 0.94	0.728 ± 0.05	2.98 ± 0.21	1.29 ± 0.09	8.70 ± 0.61
Flavanols	Catechin	<0.4	<0.4	<0.4	<0.4	122 ± 0.12	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
	Epicatechin	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	94.1 ± 0.09	<0.4	<0.4	<0.4
	TOTAL	4269 ± 139	1232 ± 28	3862 ± 121	1603 ± 52	2891 ± 88	1839 ± 35	4153 ± 136	1480 ± 65	581 ± 12	436 ± 3.4	345 ± 4.3	341 ± 11

*Compounds below quantification limit were given as <*LoQ*, where *LoQ* is method quantification limit, calculated from instrument quantification limit (given in Orčić et al., 2014) and sample dilution.

Šibul F., Orčić D., Vasić M., Anačkov G., Nađpal J., Savić A., Mimica-Dukić N. (2016): Phenolic profile, antioxidant and anti-inflamatory potential of herb and root extracts of seven selected legumes. Industrial Crops and Products, 83: 641-653



Tripsin inhibitor activity of selected faba bean accessions

Tripsin inhibitor activity of selected common bean cultivars