



Capturing Brassica wild relatives diversity in the South Eastern Europe - EUBRASSWILD

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Institute of field and vegetable crops, Novi Sad, Serbia (IFVCNS)

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Novi Sad

2019
European Youth Capital

2022
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Institute of Field and Vegetable Crops

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Founded as the Agricultural experimental and control station, today the Institute of Field and Vegetable Crops

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International projects

7	5	13
HORIZON EUROPE	HORIZON 2020	COST
2	26	8
FAO	BILATERAL	IPA
6	5	3
SEE-ERA NET and SEEDNET	FP7	FP6
13		
OTHERS		



Project activity: Collection of plant material

2021

Two expeditions, six locations, mostly in South-Eastern part of the country

Acquisition of 25 new accessions (wild Brassicaceae)

University of Niš, Faculty of sciences and mathematics

Department of biology and ecology



prof. dr Bojan Zlatković



Brassica accessions collected in Serbia in 2021

No.	Family	Genus	Subnomen	Subspecies	Location 1	Location 2	Location 3	UTM	Habitat	Substrate	Altitude	Legator	Determinator
1	Brassicaceae	Alyssoides Mill.	<i>Alyssoides utriculata</i> (L.) Medik.	<i>utriculata</i>	Serbia	Klisura reke Jerme	Odorovačko ždrelo	42°59'27.75"N, 22°37'50.68"E	cracks in the rock and scree	limestone	522	Marjanović-Jeromela, A., Nagl, N. Zlatković, B.	Zlatković, B.
2	Brassicaceae	Alyssum	<i>Alyssum orientale</i>		Serbia	Klisura reke Jerme	Pogranovski manastir	42°58'51.77"N, 22°38'19.60"E			509	Marjanovic-Jeromela, A., Nagl, N., Marković, M.,	Zlatković, B.
3	Brassicaceae	Aurinia Desv.	<i>Aurinia corymbosa</i> Griseb.		Serbia	Sićevačka klisura	Sićevo, brana	43°19'56.52"N, 22° 5'45.61"E	rocky landscape	limestone	257	Nagl, N., Marković, M., Zlatković, B.	Zlatković, B.
4	Brassicaceae	Aurinia Desv.	<i>Aurinia saxatilis</i> (L.) Desv.	<i>orientalis</i> (Ard.) T. R.	Serbia	Klisura reke Jerme	Manastir Sv, Jovan, kod mosta	42°58'51.77"N, 22°38'19.60"E	cracks in the rocks	limestone	509	Marjanović-Jeromela, A., Nagl, N. Zlatković, B.	Zlatković, B.
5	Brassicaceae	Brassica	<i>Brassica rapa</i> L.	<i>campestris</i>	Serbia	Stara planina	Temska	43°15'23"N, 22°32'24"E	arable soil		501	Rajkovic, D., Terzic, S., Marković, M.	Marković, M., Zlatković, B.
6	Brassicaceae	Brassica	<i>Brassica rapa</i> L.	<i>campestris</i>	Serbia	Stara planina	Temska	43°15'23"N, 22°32'24"E	arable soil		501	Marković, M.	Marković, M.
7	Brassicaceae	Brassica	<i>Brassica rapa</i> L.	<i>campestris</i>	Serbia	Stara planina	Temska	43°15'23"N, 22°32'24"E	arable soil		501	Marković, M.	Marković, M.
8	Brassicaceae	Brassica	<i>Brassica rapa</i> L.	<i>campestris</i>	Serbia	Stara planina	Temska	43°15'23"N, 22°32'24"E	arable soil		501	Marković, M.	Marković, M.
9	Brassicaceae	Brassica	<i>Diplotaxis tenuifolia</i> (L.) DC.	<i>tenuifolia</i>	Serbia	Niš	Klinički centar Niš	43°18'51.84"N, 21°54'55.35"E	ruderal area	alluvium	198	Marković, M.	
10	Brassicaceae	Diplotaxis DC.	<i>Diplotaxis tenuifolia</i> (L.) DC.	<i>tenuifolia</i>	Serbia	Niš	Klinički centar Niš	43°18'51.84"N, 21°54'55.35"E	ruderal area	alluvium	198	Marković, M.	Zlatković, B.
11	Brassicaceae	Diplotaxis DC.	<i>Diplotaxis tenuifolia</i> (L.) DC.	<i>tenuifolia</i>	Serbia	Niš	Klinički centar Niš	43°18'51.84"N, 21°54'55.35"E	ruderal area	alluvium	198	Marković, M.	Zlatković, B.
12	Brassicaceae	Diplotaxis DC.	<i>Diplotaxis tenuifolia</i> (L.) DC.	<i>tenuifolia</i>	Serbia	Niš	Romsko naselje		ruderal area	alluvium	198	Marković, M.	Zlatković, B.
13	Brassicaceae	Diplotaxis DC.	<i>Diplotaxis tenuifolia</i> (L.) DC.		Serbia	Sićevačka klisura	između tunela	43.327529, 22.160774	nearby road, sunny habitat		254	Rajković, D., Marković, M., Terzić, S.	Marković, M.
14	Brassicaceae	Diplotaxis DC.	<i>Diplotaxis tenuifolia</i> (L.) DC.		Serbia	Niš	Trošarina				198	Marković, M.	Marković, M.

No.	Family	Genus	Subnomen	Subspecies
15	Brassicaceae	Isatis L.	<i>Isatis tinctoria</i> L.	<i>tinctoria</i>
16	Brassicaceae	Isatis L.	<i>Isatis tinctoria</i> L.	
17	Brassicaceae	Lunaria L.	<i>Lunaria annua</i> L.	<i>pachyrhiza</i> (Borbás) Hayek
18	Brassicaceae	Lunaria L.	<i>Lunaria annua</i> L.	<i>pachyrhiza</i> (Borbás) Hayek
19	Brassicaceae	Raphanus L.	<i>Raphanus raphanistrum</i> L.	
20	Brassicaceae	Raphanus L.	<i>Raphanus raphanistrum</i> L.	
21	Brassicaceae	Sinapis L.	<i>Sinapis arvensis</i> L.	
22	Brassicaceae	Sinapis L.	<i>Sinapis arvensis</i> L.	<i>arvensis</i>
23	Brassicaceae	Sinapis L.	<i>Sinapis arvensis</i> L.	
24	Brassicaceae	Sisymbrium	<i>Sisymbrium loeselii</i> L.	
25	Brassicaceae	Sisymbrium	<i>Sisymbrium loeselii</i> L.	



Determinator
Zlatković, B.
Zlatković, B.
Zlatković, B.
Zlatković, B.
Zlatković, B.
Marković, M.
Zlatković, B.
Marković, M.
Rajković, D., Marković, M.
Rajković, D., Marković, M.

Field trial

2022

The collected seeds of Brassica accessions were sown in the field at the end of the March

Unfavorable environmental conditions severely affected growth and development of the accessions



Only several plants from accessions number 20 (*Raphanus raphanistrum*), 22 (*Synapis arvensis*) and 23 (*Synapis arvensis*) germinated and grown to flower.

Probably due to severe drought the low amount of seed was produced, but it was not viable.

2022

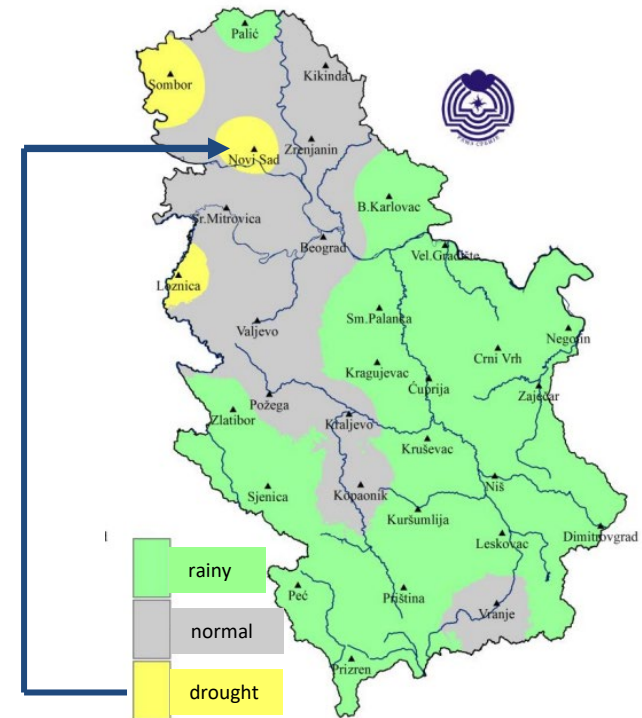
More wild Brassicas collected

Seeds from eight species: *Isatis tinctoria*, *Raphanus raphanistrum*, *Lunaria annua*, *Alyssoides utriculata*, *Alyssum orientale*, *Sinapis arvensis*, *Aurinia corymbosa*, *Aurinia saxatilis* were collected

2023

Struggles with growing wild *Brassic*s in field conditions

Meteorological conditions were quite unusual
warmer temperatures and
much higher precipitation.



2023

Limited soil drainage and excess soil moisture, low soil fertility (low content of organic matter), unfavorable soil properties (salinity, high clay content), bad conditions for rooting

The crop was hit by two high-intensity storms on 19 July and 21 July





Mitigating risks in cultivating wild Brassicas

Low germination rate

- Difficulty in achieving optimal germination of wild brassica seeds.
- Implications for overall crop yield and success.

Direct sowing approach

- Challenges faced due to unpredictable environmental conditions affecting seed germination

Severe drought stress

- Drought conditions led to increased stress on the plants.
- Negative effects on growth, development, and overall crop health

Overcoming Challenges

- Germinating indoors in Petri dishes than container/biodegradable pot and than transplanting on field after risk of frost has passed
- Mulching: Applying organic or synthetic mulch to retain soil moisture
- Drip irrigation: efficient water delivery to plants, reducing stress during dry periods
- Regularly monitor weather forecasts to anticipate potential drought periods



Collard greens *B. oleracea acephala*



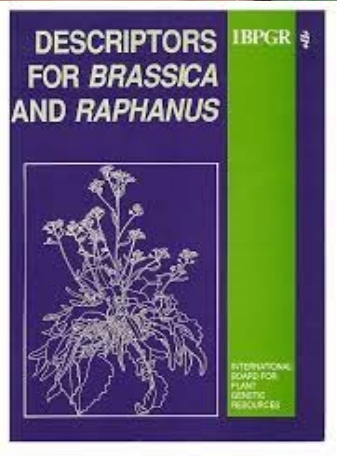
4 samples from 3 countries: Montenegro, Bosnia and Herzegovina, Croatia



8 samples from 6 locations in Vojvodina province, Serbia

Collard greens *B. oleracea acephala*

Characterization of collected populations



Green house – open field

Available seed upon request



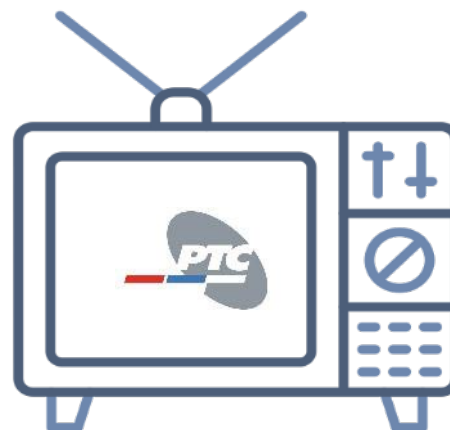
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Scientific Journal



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Original scientific paper
Оригиналан научни рад
UDC635.344-521:575.087.1
DOI 10.7251/AGREN2303077U

University of Banjaluka, Faculty of Agriculture
Agro-
knowledge
Journal **A**

Genetic diversity of leafy kale genetic resources (*Brassica oleracea* var. *acephala* L.)

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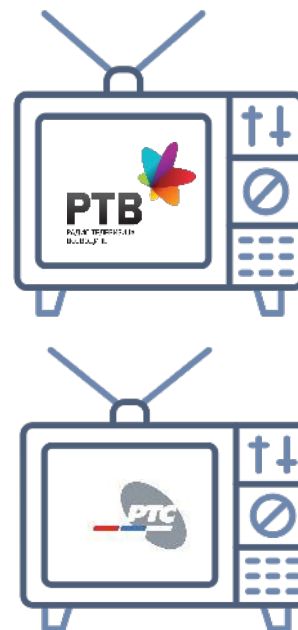
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³Institute of field and vegetable crops, Novi Sad, Serbia

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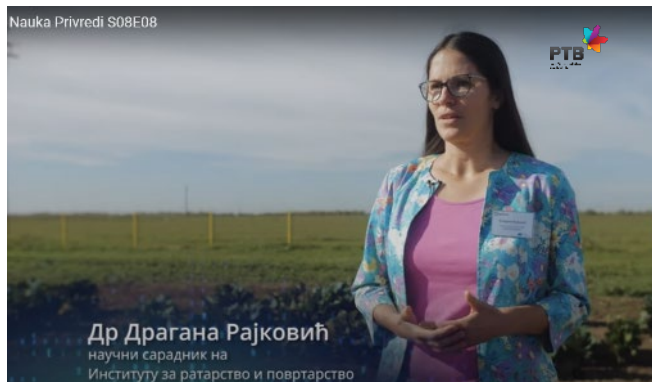




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Scientific Journal

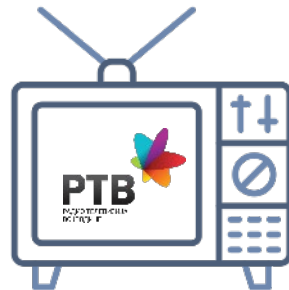


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Scientific Journal



11th International Symposium of Agricultural Sciences AgroRes, 26-28 May 2022, Trebinje

Assessment of molecular diversity of *Brassica oleracea* var. *acephala*

Family *Brassicaceae* is abundant in species used in food production, but also contains many industrial species, vegetables and ornamentals. Green collar (*Brassica oleracea* var. *acephala* L.) was traditionally grown in Balkan Peninsula and its wide green leaves, rich in vitamins A and C, are used for cooking. There is great diversity in *B. oleracea* *acephala* germplasm that reflects on agronomic, morphological and molecular characteristics.

Material & Methods

32 SSRs to assess genetic variation of 38 accessions of green collar (3 commercial varieties, 35 locally grown populations) collected in Western Balkan: 18 from Bosnia and Herzegovina, 8 from Serbia (Vojvodina), 7 from Croatia and two from Montenegro

Results

High level of overall genetic diversity between/within accessions and commercial varieties ($H_e > 0.81$) due to highly polymorphic SSR markers ($PIC > 0.86$) applied for allele genotyping.

Accession	PC	He
Q102 FOS	0.822	0.822
Q103 AŠIa	0.799	0.823
Q109 F1a	0.819	0.821
Q103 AŠ2	0.841	0.823
Q101 G11	0.823	0.820
Q111 AŠ2	0.798	0.823
Q103 A11	0.801	0.713
Q103 C12	0.912	0.876
Ru2422	0.772	0.789
Ru2411	0.822	0.812
Ha12 C08	0.924	0.879
Ha14 C12	0.791	0.888
avg	0.822	0.824

Descriptive statistics: PC – polymorphic information content; He – expected heterozygosity



Species	Accession code/variety	Accession name	Country of origin
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	Commercial variety	'Yakobitkiča (obuz)'	Moravica (Serbia via Juba (Serb))
	Commercial variety	'Vijetnik (Bez ob'k Tuzlana)'	Herzegovina
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	Commercial variety	'Vrsak (Bez (Serbian))'	Herzegovina
	Commercial variety	'Vrsak (Bez (Serbian))'	Montenegro
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-138	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-135	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-136	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-139	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-140	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-141	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-142	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-143	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-144	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-145	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-146	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-147	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-148	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-149	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-150	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-151	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-152	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-153	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-154	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-155	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-156	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-157	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-158	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-159	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-160	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-161	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-162	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-163	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-164	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-165	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-166	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-167	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-168	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-169	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-170	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-171	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-172	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-173	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-174	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-175	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-176	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-177	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-178	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-179	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-180	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-181	-	Croatia
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<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-183	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-184	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-185	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-186	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-187	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-188	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-189	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-190	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-191	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-192	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-193	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-194	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-195	-	Croatia
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<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-197	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-198	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-199	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-200	-	Croatia
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<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-203	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-204	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-205	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-206	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-207	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-208	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-209	-	Croatia
<i>Brassica oleracea</i> L. var. <i>acephala</i> L.	18-210	-	Croatia

Green collar accessions

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Program of bilateral cooperation Slovenia/Serbia:
Evaluation for reintroduction of under-utilized species from *Brassicaceae* sp. and *Lathyrus* sp.



First conference about medicinal and wildgrowing edible plants Pirot, Serbia, July 12 - 14. 2021.

- Oral presentation
- Scientific board
- Programme board

Medicinal plants from Brassicaceae family - black and white mustard

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Истраживачко друштво „Бабин нос“, Темска, Пирот
Институт за шумарство, Београд

ЕТНОБОТАНИКА ETHNOBOTANY



Прво саветовање о лековитом и самониклом јестивом биљу
First conference about medicinal and wild-growing edible plants

Зборник резимеа
Book of abstracts



Carinata and camelina boosting the sustainable diversification in agricultural production systems



Portfolio of innovative crop diversification solutions including two promising easy-to-grow oilseed crops: carinata (*Brassica carinata* L. Brown) and camelina (*Camelina sativa* L. Crantz)

WP2 - valorisation of the carinata and camelina feedstocks i.e. oil, meal and co-products derived from camelina and carinata

New biobased products: convert erucic acid of carinata into brassilic and pelargonic acid from which obtaining a number of biodegradable products (brassilic acid) such as mulch films, pots, clips, and pheromone supports, new biopolymers, biodegradable bio-herbicides



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Marginal agricultural land and climate-resilient and biodiversity-friendly industrial crops for innovative bio-based value chains

Sustainable biomass production on marginal lands - Applying innovative low ILUC cropping systems on selected non edible (industrial): oilseeds, fibres, dryland shrubs, woody species

Bio-based products: biochemicals, biomaterials, elastomers

Sustainable bio-based value chains - Biodiversity restoration potential



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Center of Excellence for
Innovations in Breeding
of Climate Resilient Crops

„CLIMATE CROPS“

