

Chemical variability of wild growing *Geum urbanum* L.



A. Kuczerenko*, Z. Węglarz, J. L. Przybył
 Warsaw University of Life Sciences – SGGW
 Faculty of Horticulture and Landscape Architecture
 Department of Vegetable and Medicinal Plants
 Nowoursynowska 166, Warsaw, Poland
<http://krwil.sggw.pl>
 * ✉ a.kuczerenko@wp.pl

INTRODUCTION

Geum urbanum L. is a perennial belonging to *Rosaceae* family (Strzelecka and Kowalski 2000). This plant grows in Poland in deciduous and mixed forests on moderately humid and rich soils (Matuszkiewicz 2001). Both above- and underground parts of these plant are rich in phenolic compounds, especially tannins (Wichtl 2004). They reveal antidiarrheal, antihemorrhagic, antipyretic and antiseptic activity (Duke 2002).

The aim of undertaken investigation was to compare wild growing bennet's herb populations, from eastern and central areas of Poland, in respect of accumulation of selected phenolic compounds.

MATERIALS AND METHODS

In the presented study genetic and chemical variability of 18 populations of bennet's herb growing wild in the central and eastern Poland were investigated.

Qualitative analysis of phenolic acids and flavan-3-ols in herb and underground organs of bennet's herb was performed by HPLC (Table 1 and Table 2)

The genetic diversity was determined by RAPD (Random Amplification Polymorphic DNA) technique. The genetic distances between populations of *Geum urbanum* L. were calculated using the POPGENE program (Population Genetic Analysis) version 1.3.1 (Nei 1978). The resulting clusters were expressed as dendrogram (Figure 1).

RESULTS AND DISCUSSION

Chemical analysis revealed differences between the investigated populations in the content of phenolic acids and flavan-3-ols in the herb and underground organs. Catechin, epigallocatechin gallate, ellagic acid, gallic acid and chlorogenic acid were found in herb, while catechin, epicatechin, epigallocatechin, epicatechin gallate, epigallocatechin gallate as well as ellagic and gallic acids in underground organs. The content of this compounds in the raw materials was distinctly higher for populations from central Poland. The populations differed specially in respect of the content of catechin (from 130 to 860 mg × 100g⁻¹) and epicatechin (from 54 to 630 mg × 100g⁻¹) in underground organs.

The RAPD analysis indicated genetic variability of investigated populations but there was no clear correlation between this genetic variability and variability of chemical composition of determined phenolic agents.

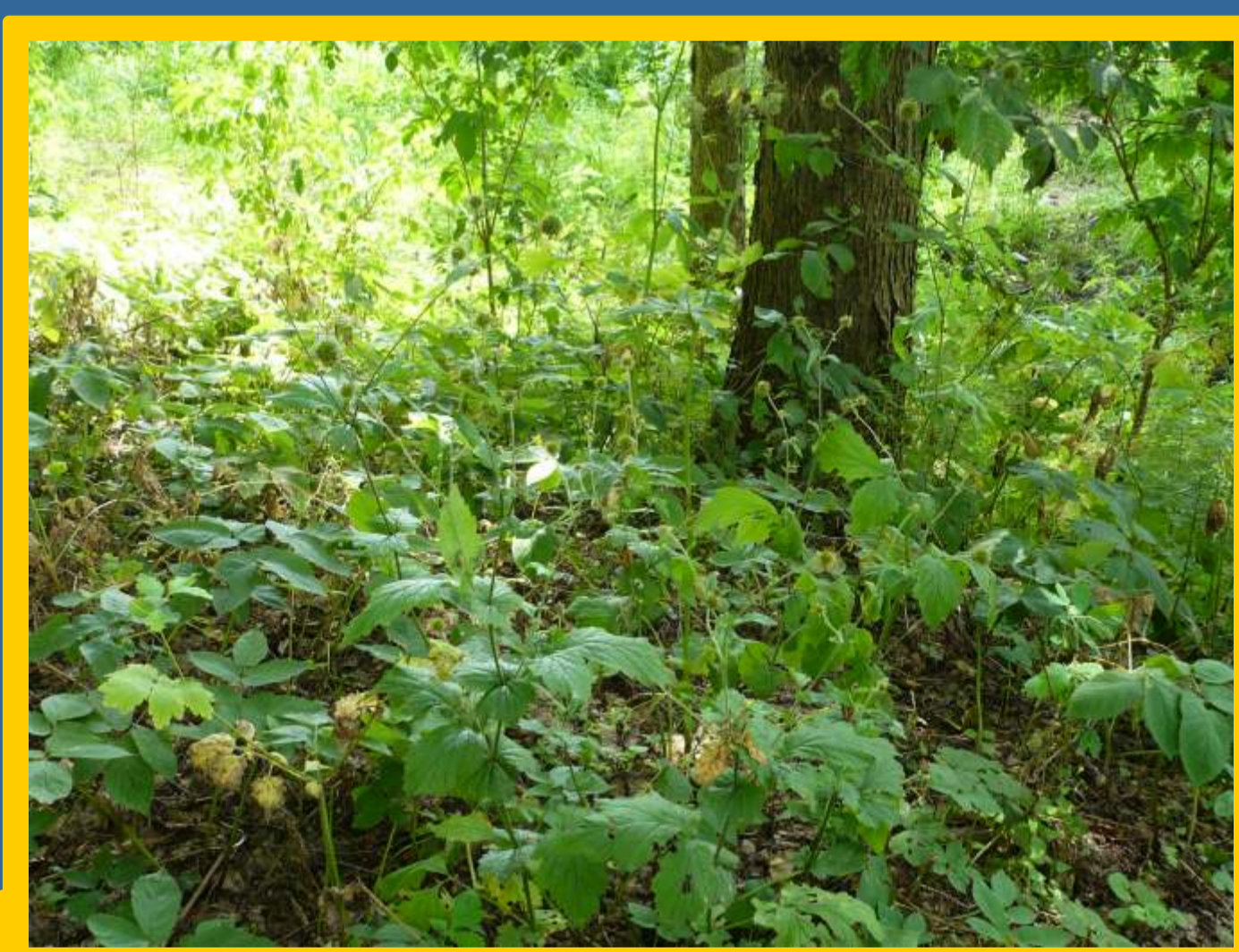


Fig. 1. *Geum urbanum* L. in natural site (Izydory - eastern Poland)



Fig. 2. *Geum urbanum* L. in natural site (Barcząca – central Poland)

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Tab. 1. Content of phenolic compounds in underground organs (mg × 100g⁻¹)

Population	Polyphenolic acids				Flavan-3-ols		
	Ellagic acid	Gallic acid	(+) Catechin	(-) Epicatechin	(-) Epigallocatechin	(-) Epicatechin Gallate	(-) Epigallocatechin Gallate
Stanisławów	49,36j	86,12efg	339,92h	303,60e	110,07e	81,02g	79,83g
Mienia	44,15k	143,80ab	843,97b	630,72a	160,06a	173,63c	296,6a
Barcząca	111,76b	148,83ab	886,85a	462,62b	150,17ab	144,02de	236,76b
Gliniak	71,00h	80,69fg	236,53j	297,08e	109,49e	56,27h	60,14hi
Mińsk	95,34 d	117,55bcd	710,55c	421,35c	150,15ab	174,19c	217,85c
Marianka	148,35a	156,83a	584,96e	478,00b	130,86cd	191,78b	54,92ijk
Mean	88,66	122,30	600,46	432,23	135,13	136,82	157,68
Klukowc	99,36 c	104,98cde	348,43h	305,40e	130,86cd	83,5g	163,49f
Maikinia	91,15 e	96,22cde	309,88i	99,22i	121,48de	54,39h	58,97hij
Brok	44,35k	63,16ghi	202,14k	54,40j	90,85f	156,61d	48,82kl
Treblińska	88,35 f	146,72ab	597,55d	68,40j	133,9cd	414,48a	191,18d
Seroczyn	66,76i	86,12efg	127,29n	119,00h	32,52h	29,46ij	44,41i
Izydory	95,34d	39,29i	190,30l	162,59g	51,07g	53,03h	50,60kl
Kienkowska	48,99j	42,37i	156,44m	96,88i	37,74h	21,59j	48,20kl
Laliny	91,15e	38,83i	199,14kl	158,26g	55,40g	42,45hi	85,46fg
Krasowice	73,43 g	48,46hi	244,88j	238,03f	56,39g	74,89g	232,12b
Drohiczyn	33,91 l	128,33abc	429,29f	164,00g	139,38bc	132,36e	67,56h
Korycin	18,03 m	141,33ab	408,78g	309,62e	112,45e	102,78f	89,82f
Krosowice	47,55 j	78,24fgh	427,07f	367,24d	154,64a	103,71f	54,92ijk
Mean	66,53	84,50	303,43	178,59	93,06	105,77	94,63
Mean	73,24	97,10	402,44	263,13	107,08	116,12	115,65

Values marked with the same letters are not significantly different at $\alpha=0.05$ (Tuckey test)

Tab. 2. Content of phenolic compounds in herb (mg × 100g⁻¹)

Population	Polyphenolic acids			Flavan-3-ols	
	Ellagic acid	Chlorogenic acid	Gallic acid	(+) Catechin	(-) Epicatechin Gallate
Stanisławów	83,55f	21,47f	186,38a	62,15e	3,25g
Mienia	62,87j	15,34fgh	15,54fg	38,37i	1,31jk
Barcząca	23,57m	10,00h	12,42g	101,05a	1,77j
Gliniak	82,13f	80,91bc	41,41de	63,51e	1,54ij
Mińsk	89,49e	2,32i	29,97efg	92,89b	1,80i
Marianka	58,44l	17,37fg	19,59fg	89,38c	8,77b
Mean	66,67	24,57	50,88	74,56	3,07
Klukowc	58,74kl	17,12fg	51,37d	33,59j	7,76c
Maikinia	112,19b	14,09gh	33,14def	35,31j	4,15e
Brok	97,64d	14,58gh	78,25c	56,49f	3,82f
Treblińska	67,26i	10,00h	117,02b	45,38g	2,36h
Seroczyn	121,44a	96,04a	26,56efg	90,72bc	3,35g
Izydory	108,11c	39,57e	115,46b	40,65hi	2,19h
Kowalski	61,93jk	83,06b	18,68fg	42,16h	1,08k
Laliny	71,63h	81,97b	17,29fg	39,63i	1,10k
Kienkowska	76,43g	19,03fg	22,35efg	68,00d	16,12a
Drohiczyn	16,15n	45,88d	11,86g	47,53g	2,46h
Korycin	23,51m	75,28c	15,37fg	47,67g	4,52d
Krosowice	82,13f	80,91bc	22,47efg	63,51e	1,54ij
Mean	74,74	48,15	46,12	50,89	4,29
Mean	72,05	40,29	46,40	58,78	3,88

Values marked with the same letters are not significantly different at $\alpha=0.05$ (Tuckey test)

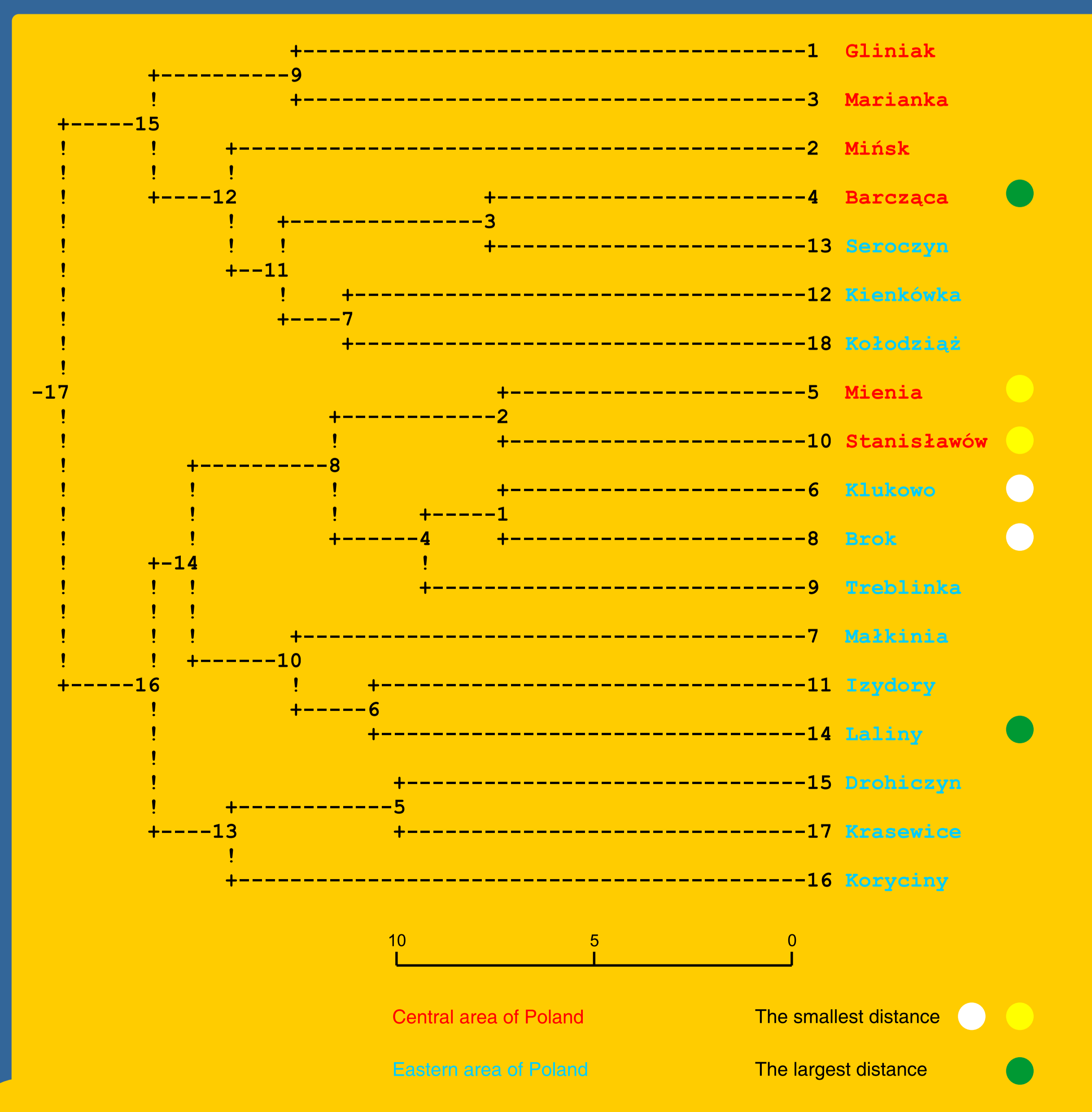


Fig. 1. Dendrogram of genetic similarity of *Geum urbanum* L. populations