

# Genetic and chemical variability of wild red raspberry (*Rubus idaeus* L.) growing in Poland



M. Pelc<sup>\*1</sup>, J. L. Przybył<sup>1</sup>, O. Kosakowska<sup>1</sup>,  
E. Szalacha<sup>2</sup>, I. Szymborska<sup>1</sup> and Z. Węglarz<sup>1</sup>  
Warsaw University of Life Sciences – SGGW  
Faculty of Horticulture and Landscape Architecture  
<sup>1</sup> Department of Vegetable and Medicinal Plants  
<sup>2</sup> Laboratory for Basic Science in Horticulture  
Nowoursynowska 166, Warsaw, Poland  
<http://krwil.sggw.pl>  
<sup>\*</sup> ✉ [malgorzata\\_pelc@sggw.pl](mailto:malgorzata_pelc@sggw.pl)

## INTRODUCTION

Red raspberry (*Rubus idaeus* L.) is a thorny shrub species of the *Rosaceae* family. It reproduces by vegetative expansion and by seeds, which are usually dispersed by birds. Wild red raspberry is widely distributed in Europe, northern Asia and America. In Poland usually occurs in forests, open stands between the trees, in neglected field and boundary stripes (Rumińska et al.1990).

The leaves and fruits are the medicinal raw material of red raspberry. Tea made from the dried leaves has been used for centuries in folk medicine in the treatment of children's stomach problems and diarrhoea, wounds, colic pain and as a uterine relaxant. The sweet, aromatic dried fruits are used as a fever reducing remedy and as a component of popular forest tea (Ritch-Krc et al. 1996).

## MATERIALS AND METHODS

In the presented study genetic and chemical variability of 8 populations of red raspberry growing wild in the eastern Poland (Bieszczady and Podlasie regions) were investigated. The genetic diversity was determined by RAPD (Random Amplification Polymorphic DNA) technique. The genetic distances between 8 populations of *Rubus idaeus* L. were calculated using the POPGENE program (Population Genetic Analysis) version 1.3.1 (Nei 1978, Yeh et al. 1999). The resulting clusters were expressed as dendrogram. Total content of flavonoids, tannins and phenolic acids were determined according to Polish Farmakopea (VI) and qualitative analysis was performed by HPLC.



Pic. 1. Red raspberry plants

## REFERENCES

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- 4 Ritch-Krc E. M., Thomas S., Turner N. J., Towers G. H. N.1996: Carrier herbal medicine: traditional and contemporary plant use. *Journal of Ethnopharmacology* 52: 2, 85-94.
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## RESULTS AND DISCUSSION

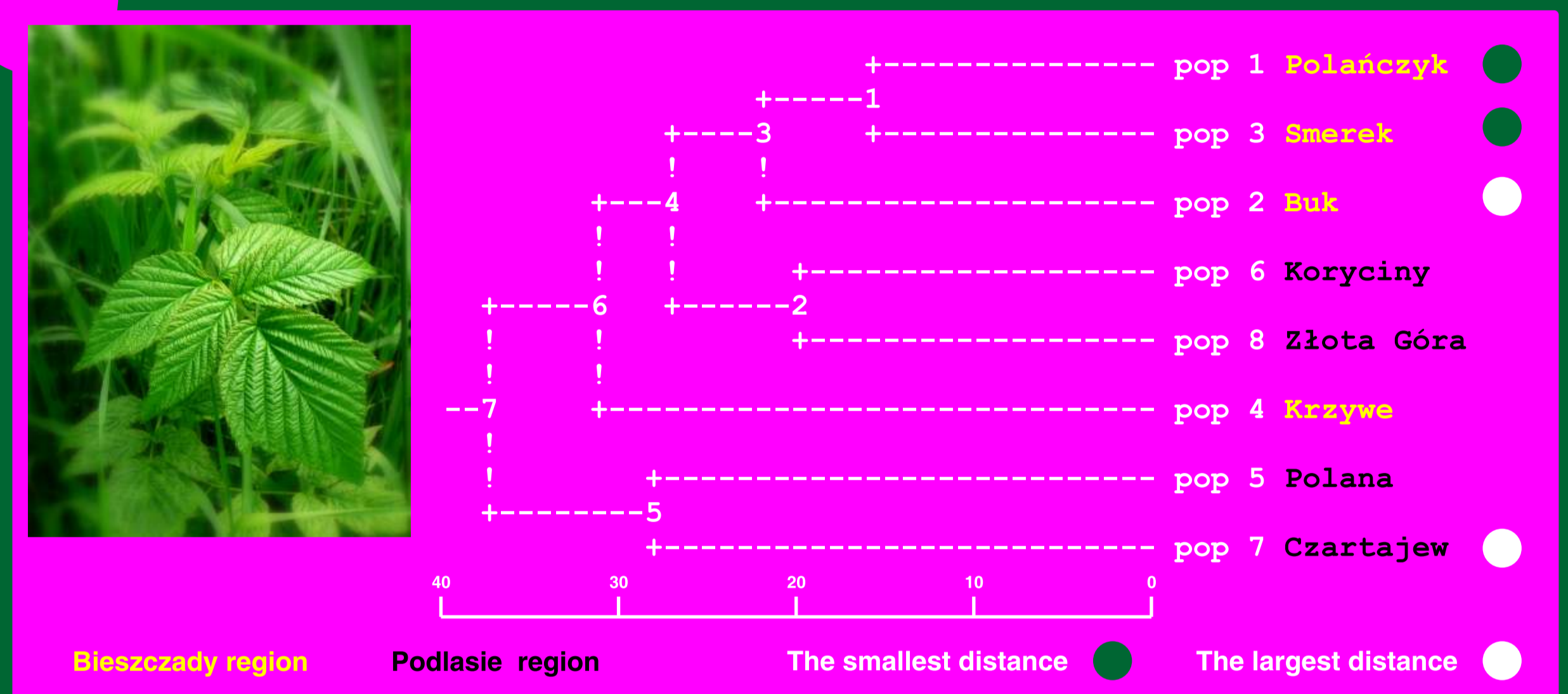
The RAPD analyses indicated high genetic variability between the populations. The highest genetic distance between population of Buk (Bieszczady region) and Czartajew (Podlasie region) was found (Table 1 and Figure 1).

Tab. 1. Genetic identity (above diagonal) and distance (below diagonal)

Population	pop ID	1	2	3	4	5	6	7	8
Polanńczyk	1	****	0.6615	<b>0.6923</b>	0.5846	0.5846	0.6922	0.4769	0.6308
Buk	2	0.4132	****	0.6308	0.4615	0.4923	0.6000	<b>0.3538</b>	0.5385
Smerek	3	<b>0.3677</b>	0.4608	****	0.5538	0.5846	0.6000	0.3846	0.6000
Krzywe	4	0.5368	0.7732	0.5909	****	0.5385	0.5231	0.4615	0.6154
Polana	5	0.5368	0.7087	0.5368	0.6190	****	0.5538	0.5846	0.5231
Koryciny	6	0.3678	0.5108	0.5108	0.6480	0.5909	****	0.5077	0.6615
Czartajew	7	0.7404	<b>1.0389</b>	0.9555	0.7732	0.5368	0.6779	****	0.5077
Złota Góra	8	0.4608	0.6190	0.9555	0.4855	0.6480	0.4132	0.6779	****

Bieszczady region Podlasie region The smallest distance The largest distance

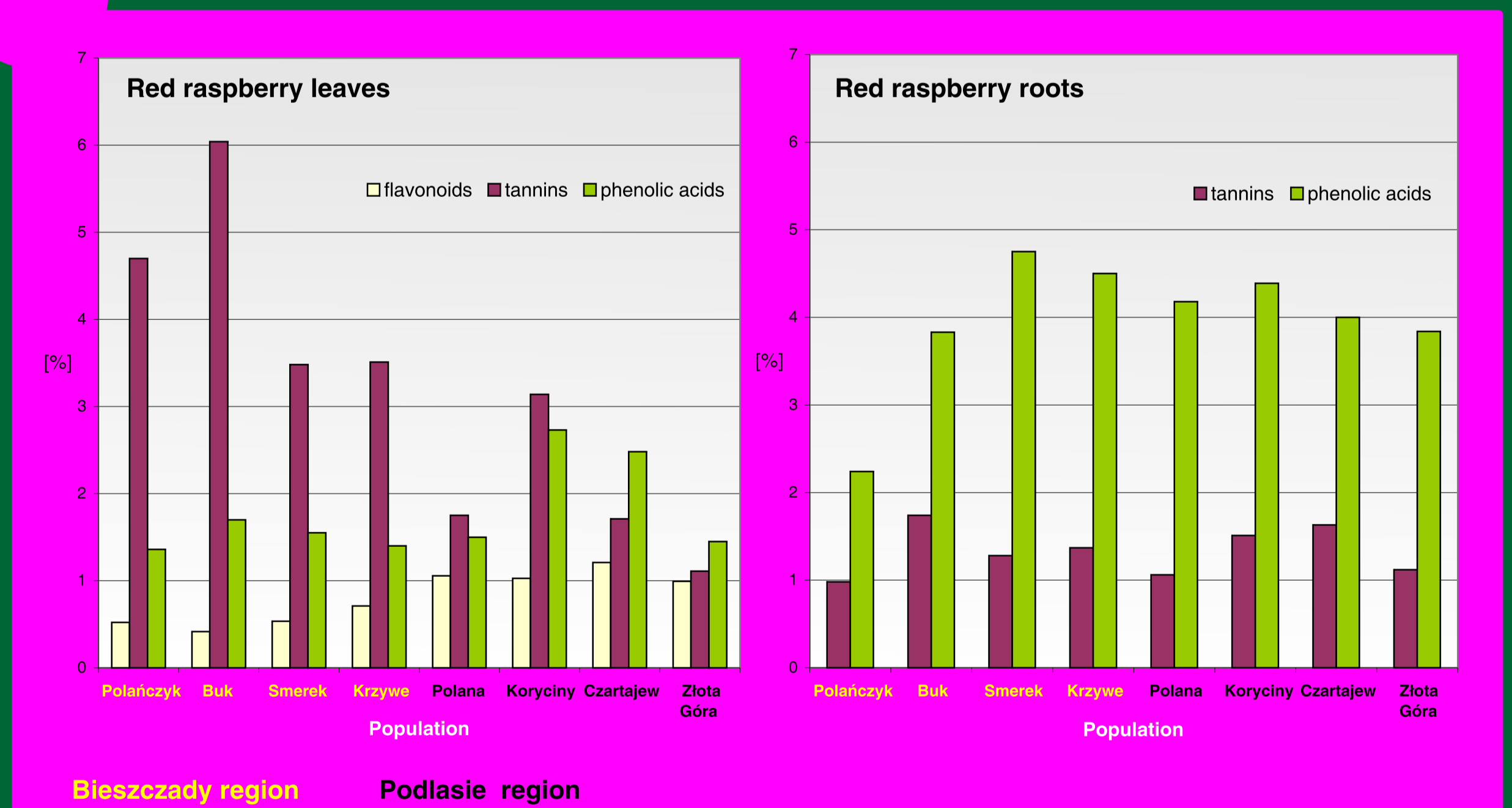
Fig. 1. Genetic distance dendrogram



Chemical analysis revealed differences among populations in the total content of flavonoids, phenolic acids and tannins in the leaves and roots. The leaves of red raspberry from Podlasie contained more flavonoids and phenolic acids and less tannins than populations from Bieszczady. The leaves from Buk population (Bieszczady) were characterized by highest content of tannins (Figure 2).

Flavonoids, namely quercetin, hyperoside, rutin, kaempferol, and isorhamnetin derivatives (isorhamnetin-3-glucoside and isorhamnetin-3-rutinoside) were found in the leaves. The dominant compound were rutin and isorhamnetin-3-rutinoside. Five phenolic acids were also identified, i.e. caffeic, chlorogenic, ellagic, rosmarinic and gentisic acids. The total content of phenolic compounds in the roots was higher in comparison with leaves, but catechin and 4-hydroxy-phenylacetic acid were only identified (Table 2).

Fig. 2 and 3. Total content of flavonoids, tannins and phenolic acids in leaves and roots (%)



Tab. 2. Qualitative analysis of phenolic compounds in leaves and roots (mg × 100g<sup>-1</sup>)

Population	Leaves										Roots				
	Flavonoids						Phenolic acids				Phenolic acids	Catechins			
	Quercetin	Rutin	Hyperoside	Isorhamnetin-3-rutinoside	Isorhamnetin-3-glucoside	Kaempferol	Astragaln	Coffeic acid	Rosmarinic acid	Ellagic acid	Chlorogenic acid	Gentisic acid	4-hydroxy-phenylacetic acid	Catechin	
Bieszczady region	Polanńczyk	0,78	234,6	9,51	33,92	100,0	6,14	33,09	3,28	30,25	70,04	35,24	55,66	1149,20	1144,3
	Buk	0,84	136,5	34,83	120,9	71,04	6,65	102,0	22,61	30,88	127,4	77,23	52,94	611,20	818,40
	Smerek	0,28	126,4	5,17	36,46	40,34	6,09	64,22	4,00	30,30	30,46	43,97	31,24	1723,90	1737,40
	Krzywe	1,23	198,0	6,43	50,30	44,45	6,60	125,6	11,07	25,43	22,47	69,55	17,10	649,80	687,40
Podlasie region	Polana	6,08	88,3	72,02	291,42	68,32	6,21	126,9	10,37	37,43	36,07	59,56	155,4	1171,80	1532,90
	Koryciny	0,20	100,9	8,74	39,21	31,27	7,94	87,95	4,33	12,93	25,95	41,25	55,35	760,80	957,90
	Czartajew	0,67	84,7	10,33	179,6	23,77	6,32	26,69	2,21	6,57	24,94	29,04	24,44	955,00	1234,80
	Złota Góra	0,21	52,0	3,44	17,64	13,87	6,19	74,37	6,16	11,25	20,26	38,31	6,40	695,20	869,60