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THE SITES OF WILD CHERRY STANDS IN FOOTHILLS OF THE BIESZCZADY MOUNTAINS

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Abstract. Stands dominated by wild cherry [*Cerasus avium* (L.) Moench] are characterised and site conditions under which such stands may come into being are described. It was found that in foothills of the Bieszczady Mts. wild cherry can form self-sown stands on brown soils rich in nutrients and humus compounds formed of clay shale. Adequate terrain configuration, which gives protection against spring frosts and provides proper soil moisture, creates optimal conditions for growth of wild cherry stands. Rich forest floor vegetation, composed of species typical for eutrophic beech forests, sub-mountain sycamore maple forests, and riparian forests, was observed under canopy of wild cherry stands.

Key words: forest sites, wild cherry stands, wild cherry (*Cerasus avium*)

INTRODUCTION

Wild cherry is one of the most important wild fruit tree species occurring in forests of Poland. It plays the role of biocoenotic admixture in forest stands and its wood is in high demand. The monographic elaborations concerning wild cherry [Hrynkiewicz--Sudnik 1972, Dzikie drzewa... 1990] give characteristics of this species but they do not include results of the detailed studies on its stands which are rare in Poland. Information on the occurrence of such plant formations in the Rodope Mts. in Bulgaria and Atlas Mts. in Algeria may be found in literature [Hrynkiewicz-Sudnik 1968].

A study presented in this paper concerned foothills of the Bieszczady Mts. where under specific site conditions self-sown wild cherry stands ("wild cherry groves") came into being. Wild cherry is the dominant tree species in these stands. The objectives of this study were to determine site conditions under which stands with wild cherry as the dominant species are formed, to describe such stands, and to attempt to determine a phytosociological status of this interesting forest community not described in Poland hitherto.

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MATERIAL AND METHODS

In July 2006 six sample plots, 10 are each, were established in wild cherry stands situated in the Sanok Hills and the Dynów Plateau (Fig. 1). One of these plots (T4) was established in the temporary seed production stand in the Niewistka Forest Section of the Brzozów Forest District, and five plots were situated in stands established by natural seeding in the Tyrawa Wołoska commune. In these stands, contrary to the plot situated in the seed stand, no silvicultural treatments (cleanings, thinnings), normally conducted in State Forests, were carried out. The total area of all wild cherry stands growing in the region under investigations was about 10 ha.

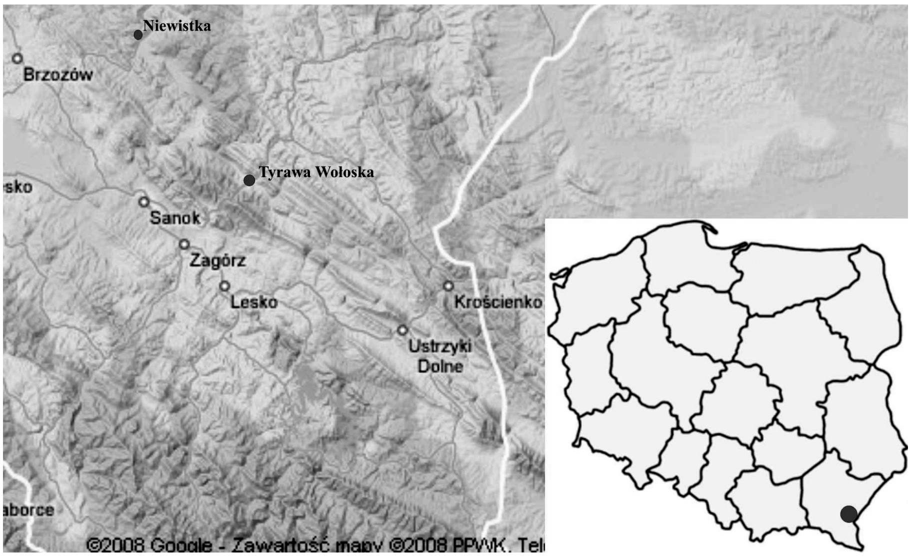

Fig. 1. Location of study areas
Rys. 1. Lokalizacja powierzchni badawczych

In each plot a 100 cm deep soil pit, was made, and soil samples were taken from all distinguished genetic horizons. From surface horizons of humus accumulation (A, AB) the collective samples from several places around the pit and in the pit were taken. The sample plots were established in places where wild cherry formed a closed main stand. It should be pointed out that the established plots were characterised by homogeneous soil conditions. This was initially checked by making several soil borings, i.e. they did not include diversified micro-sites differing in respect of a soil sub-type or its moisture variety. In each plot the following works were carried out according to the soil-site methodology [Instrukcja... 2003]:

– description of the location and terrain configuration,
– description of the soil profile with collecting soil samples,
– measurement of diameter breast high of all trees,
– measurement of height of several trees necessary to estimate the mean height of the stand,

- taxation description of the stand,
- floristic description with estimation of vegetation ground cover acc. to Braun--Blanquet scale.

The measurement results permitted to determine the mean diameter b.h. and mean height of wild cherry. The growing stock of the stand was calculated on the basis of volume of individual trees using the empirical formula worked out for *Cerasus avium* in Belgium [Zianis et al. 2005].

In soil samples containing particles less than 2 mm in diameter the following data were determined [Ostrowska et al.1991]:
- calcium carbonate ($CaCO_3$) content by Scheibler volume method,
- soil reaction in H_2O and in 1M KCl solution by a potentiometric method,
- hydrolitic acidity (Y) by Kappen method,
- exchangeable acidity (H) by Sokolov method,
- total exchangeable basic cations (S) by Kappen method,
- content of exchangeable Ca, Mg, K, and Na in extract of 1M ammonium acetate of pH 7.0,
- organic carbon (Corg.) by Tiurin method modified by Oleksynowa,
- total nitrogen (Nog) by Kjeldahl method,
- available phosphorus by Bray and Kurtz I method [Reeuwijk 1995],
- granulometric composition by Bouyoucos-Casagrande areometric method modified by Prószyński [Komornicki 1991].

On the basis of these determinations the sorptive capacity (T), degree of saturation of the sorptive complex with basic cations (V), and organic matter content were calculated for each soil sample. Also the Trophic Index of Forest Soils [Brożek 2001] and Site Soil Index [Brożek et al. 2006] were calculated for six soil profiles investigated.

RESULTS

Soils and site forest types

The field studies and laboratory analyses (Table 1) showed that stands of *Cerasus avium* grow on Humic Cambisol soils and on the richest varieties of Eutric Cambisol soils [Klasyfikacja... 2000] forming sites of the moist upland and fresh upland forest types. These soils were characterised by the profile structure Ol-A-ABbr-Bbr-C. Humus mineral horizons were well developed. Horizon A together with a transitional horizon (ABbr) reached depth of 25-50 cm. They were characterised by over 3% organic carbon content (in horizon A), and from 1.04% to 1.23% in a transitional horizon ABbr. Small values of the C/N index ranging from 9.6 to 12.0 in horizon A and from 8.0 to 9.1 in horizon AB reflected a very efficient distribution of organic matter in these horizons. This was due to high nitrogen content in these horizons amounting to 0.26-0.47% in horizon A and 0.12-0.19 in horizon ABbr. During digging of soil pits a very favourable aggregate structure was observed in surface horizons as well as their loose nature and presence of earth-worms, which at granulation of the middle dusty clay or silty dust meant a high biological activity of these soils. The clay shale was the parent rock of these soils which caused that soils occupied by wild cherry stands are almost without

Table 1. Chemical soil properties of the wild cherry stands
Tabela 1. Wybrane właściwości chemiczne gleb lasów czereśniowych

Soil profile Profil	Depth Głębokość cm	Horizon Poziom	pH w in H_2O	pH w in KCl	S	Y	V	S_1	H	H_{Al3+}	$CaCO_3$ %	P mg·kg^{-1}	$C_{org.}$	$N_{og.}$	C/N
					cmol$_{(+)}$kg^{-1}								%		
T1	2-20	A	4.5	3.8	11.5	10.1	53	7.8	2.9	2.73		4.7	2.53	0.26	9.9
	20-50	BbrA	4.7	3.4	12.7	9.6	57	9.1	6.8	6.74		0.5	1.04	0.12	8.6
	50-80	BbrC	5.2	3.3	24.9	7.3	77	21.1	4.2	3.57		0.1	0.53	0.09	6.1
	80-100	Cgg	5.8	4.0	31.5	3.4	90	27.1	0.6	0.37		3.3			
T2	0-10	A	5.5	4.8	18.5	7.2	72	14.1	0.2	0.12		5.7	3.49	0.32	10.8
	10-40	BbrA	4.7	3.6	7.5	9.8	43	4.0	6.5	6.39		1.9	1.23	0.14	9.1
	40-70	BbrC	5.0	3.6	13.6	6.9	66	10.0	5.0	4.86		0.8	0.57	0.07	7.7
	70-100	C	5.2	3.6	17.4	5.2	77	12.6	2.4	2.28		5.3			
T3	0-10	A	5.3	4.3	13.1	7.6	63	8.8	0.6	0.39		6.5	3.01	0.25	12.0
	10-40	BbrA	4.9	3.7	9.7	7.4	57	5.7	3.1	2.93		1.7	1.21	0.15	8.0
	40-75	Bbr	5.3	3.9	8.6	4.2	67	5.7	1.1	0.96		0.4	0.64	0.08	8.0
	75-100	BC	5.6	4.1	12.6	2.6	83	8.7	0.5	0.44		1.3			
T4	2-10	A	5.5	4.9	22.8	7.2	76	18.8	0.2	0.03		8.6	3.92	0.36	11.0
	10-40	ABbr	5.4	4.2	12.4	5.3	70	10.3	0.4	0.25		1.2	1.07	0.12	8.7
	40-85	BbrCgg	6.5	5.0	14.4	1.7	90	13.2	0.1	0.04		1.0	0.36	0.05	7.3
	85-100	Cgg	7.0	5.5	–	1.2	–	17.6	0.1	0.00	10.3	1.2			
T5	0-5	A	6.6	6.3	53.6	2.8	95	33.8	0.1	0.00		4.6	5.50	0.47	11.6
	5-25	ABbr	6.2	5.1	26.1	3.2	89	19.2	0.1	0.02		1.2	1.68	0.19	8.7
	25-50	Bbr	6.7	5.8	29.4	1.8	94	20.0	0.1	0.02		0.8	0.73	0.09	8.4
	50-70	BbrC	7.9	7.0	–	0.8	–	39.4	0.0	0.00	8.9	1.2			
	70-80	C	8.2	7.2	–	0.4	–	40.5	0.0	0.00	20.0	0.0			
T6	0-12	A	4.7	3.8	10.0	15.0	40	6.5	3.0	2.84		14.9	3.57	0.37	9.6
	12-35	BbrA	4.4	3.6	3.3	11.3	23	1.5	2.8	2.68		7.3	1.16	0.14	8.5
	35-70	Bbr	4.6	3.7	3.8	8.2	32	2.0	8.2	8.04		1.1	0.44	0.07	6.7
	70-100	BbrC	5.5	3.9	14.2	3.8	79	10.2	1.2	1.05		4.9			

S – sum of exchangeable bases by Kappen method, Y – total acidity, V – degree of base saturation (by Kappen method), S1 – sum of exchangeable bases in the extract 1M CH_3COONH_4, H – exchangeable acidity, H_{Al3+} – exchangeable Al, P – available phosphorus, $C_{org.}$ – organic C, $N_{og.}$ – total N.

S – suma zasadowych kationów wymiennych oznaczona metodą Kappena, Y – kwasowość hydrolityczna, V – stopień wysycenia kompleksu sorpcyjnego kationami zasadowymi (na podstawie metody Kappena), S1 – suma zasadowych kationów wymiennych oznaczona w wyciągu 1M CH_3COONH_4, H – kwasowość wymienna, H_{Al3+} – glin wymienny, P – fosfor przyswajalny, $C_{org.}$ – węgiel organiczny, $N_{og.}$ – azot ogólny.

a skeleton. In only one of the six profiles the unweathered clay shale forming the skeleton at the depth of 80-100 cm was present. In other pits only single compact shale fragments were present in fine-grained weathered material with granulation of middle clays or strong dusty clays and silt formations (Table 2).

Table 2. Soil texture of wild cherry stands
Tabela 2. Skład granulometryczny gleb lasów czereśniowych

Soil profile Profil	Depth Głębokość	Horizon Poziom	Percentage of fraction, mm Procent frakcji ziemistych o średnicy, mm						Textural group Gatunek gleby	
			2.0-0.1	0.1- -0.05	0.05- -0.02	0.02- -0.006	0.006- -0.002	< 0.002	PTG	PN-R- -04033: 1998
T1	2-20	A	14	13	24	19	9	21	gspy	gpł
	20-50	BbrA	9	7	17	24	15	28	ił	gpł
	50-80	BbrC	8	2	12	21	21	36	ił	ipl
	80-100	Cgg	8	3	13	23	22	31	ił	gpł
T2	0-10	A	17	14	24	16	10	19	gspy	gpł
	10-40	BbrA	17	14	22	17	10	20	gspy	gpł
	40-70	BbrC	18	11	17	19	8	27	gcpy	gc
	70-100	C	16	14	24	16	7	23	gspy	gpł
T3	0-10	A	17	14	26	17	8	18	gspy	gpł
	10-40	BbrA	16	16	22	19	10	17	gspy	gpł
	40-75	Bbr	16	17	21	19	9	18	gspy	gpł
	75-100	BC	16	16	19	18	10	21	gspy	gpł
T4	2-10	A	16	13	33	14	9	15	pyi	gpł
	10-40	ABbr	15	12	25	21	7	20	gspy	gpł
	40-85	BbrCgg	13	13	25	17	7	25	gspy	gpł
	85-100	Cgg	14	13	18	17	7	31	gcpy	gc
T5	0-5	A	19	9	29	14	8	21	gspy	gpł
	5-25	ABbr	13	9	22	21	10	25	gcpy	gpł
	25-50	Bbr	9	8	26	22	12	23	ipy	płi
	50-70	BbrC	6	4	30	31	13	16	ipy	płi
	70-80	C	9	4	22	31	16	18	ipy	płi
T6	0-12	A	17	13	31	16	7	16	pyi	gpł
	12-35	BbrA	13	5	33	22	9	18	gspy	płi
	35-70	Bbr	13	15	20	21	10	21	gcpy	gpł
	70-100	BbrC	12	20	21	18	8	21	gspy	gpł

Textural group by PTG: gspy – middle dusty clay, gcpy – strong dusty clay, pyi – silty dust, ił – silt, ipy – dusty silt.

Textural group by PN-R-04033:1998: gpł – dusty clay, gc – strong clay, płi – silty dust.

Grupy mechaniczne wg PTG: gspy – glina średnia pylasta, gcpy – glina ciężka pylasta, pyi – pył ilasty, ił – ił zwykły, ipy – ił pylasty.

Grupy mechaniczne wg PN-R-04033:1998: gpł – glina pylasta, gc – glina ciężka, płi – pył ilasty.

Chemical properties of the investigated soils indicated their eutrophic character. This was manifested by large quantities of exchangeable cations Ca, Mg, K, and Na in humus horizons (6.5-33.8 cmol(+)kg^{-1}) and in deep horizons (10.2-40.5 cmol(+)kg^{-1}). At the same time a high saturation of the sorptive complex with basic cations occurred in these soils, which with the exception of a single case (profile T6) exceeded 50% already in surface horizons. In the deep horizons of the profile it ranged from 77% to 100%. In profile T6 a stronger lixiviation of cations to the depth of 70 cm was found (Table 2). Carbonates appeared in two from among six investigated soils – at the depth of 85 cm in Humic Cambisol under the seed stand in the Niewistka Forest Section (plot T4), and at the depth of 50 cm in Eutric Cambisol (plot T5). In horizons of humus accumulation in Humic Cambisol soils the acid reaction was found (pH 4.5-5.5 in H_2O). The reaction in enrichment horizons of these soils increased with increase of depth reaching pH 5.2-7.0 in H_2O in the deepest horizons. In Eutric Cambisol soil, rich in carbonates, the reaction measured in H_2O changed with depth from pH 6.6 to pH 8.2 (Table 1). The highest concentration of phosphorus was found in horizons of humus accumulation (A) where it was 4.6-14.9 $mg \cdot kg^{-1}$, while the transitional horizons below them (ABbr) were characterised by lower contents of this element (0.5-7.3 $mg \cdot kg^{-1}$). The horizons of enrichment and the parent rock contained 0.1-1.1 $mg \cdot kg^{-1}$ and 0-5.3 $mg \cdot kg^{-1}$ of phosphorus respectively.

The numerical indexes of soil fertility – the Trophic Index of Forest Soils [Brożek 2001] and Site Soil Index [Brożek et al. 2006] have confirmed high fertility of the investigated soils indicating high trophic requirements of wild cherry. Values of the Trophic Index of Forest Soils ranged from 38.3 (plot T6) to 43.3 (plot T5). They corresponded to values characterizing hipertrophic soils [Brożek 2001]. Values of the Site Soil Index ranged from 37 to 40. Such values characterise the richest forest sites.

Forest stand and forest floor vegetation

Wild cherry was the main stand tree species in each plot. It was accompanied by single specimens of *Acer campestre*, *Alnus incana*, *Acer pseudoplatanus*, *Tilia cordata*, and *Fagus sylvatica.* There was no second stand storey present but a shrub layer was strongly developed, formed by *Sambucus nigra*, *Ligustrum vulgare*, and *Eunymus europaeus.* These single storey stands were characterised by diversified taxation characteristics due to various methods of silvicultural treatments applied. Their mean height ranged from 19.4 m to 31.5 m, while the maximum height of trees varied from 25.2 m to 33.5 m. The mean diameter b.h. ranged from 22 cm to 38 cm, and therefore the growing stock of stands was strongly diversified ranging from 111 $m^3 \cdot ha^{-1}$ to 430 $m^3 \cdot ha^{-1}$.

In all plots the ground vegetation cover was very rich and much diversified. Such species as *Anemone nemorosa*, *Pulmonaria obscura*, *Corydalis solida*, *Primula officinalis*, and *Ficaria verna* were flowering in early spring (Table 3). After several weeks such species as *Alliaria petiolata*, *Polygonatum multiforum*, *Paris quadrifolia*, *Ranunculus cassubicus*, *Melandrium rubrum*, and *Dentaria bulbifera* begun to flower. In early summer the short vegetation cover of spring was changing into tall very luxuriant ground cover composed of *Salvia glutinosa*, *Stachys sylvatica*, *Rubus caesus*, and less abundant other species. In total, 52 vascular plant species, typical for fertile forest sites (fresh and moist upland forests) were found in the forest vegetal ground cover of all plots. The species characteristic for the order *Fagetalia* made a numerous group including species associated with communities of beech forests (alliance *Alno-Padion*; Table 3). Taking into account the facts that in the past the area covered by wild cherry stands in Tyrawa Wołoska was an arable land, and that the age of these stands is 60-70 years, it must be concluded that during those years the forest phytocoenosis has been

Table 3. The species of ground cover in the wild cherry stands
Tabela 3. Wykaz roślin runa pod drzewostanami czereśniowymi

Species Gatunek	T1			T2			T3			T4			T5			T6		
	IV	V	VII	IV	V	VII	IV	V	VII	IV	V	VII	IV	V	VII	IV	V	VII
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Ch. Fagion																		
Dentaria bulbifera	+	+								1	1	+				+	+	
Glechoma hirsuta	+	+	+										+	1	1			
Polystichum braunii					r	r												
Symphytum cordatum										+	+							
Symphytum tuberosum																+	+	
Ch. Alno-Ulmion																		
Carex remota											+	+						
Chrysosplenium alternifolium	+	1		1	1													
Circaea luteliana												1						
Festuca gigantea												r						
Ficaria verna	1			3	2		4	3		3	2		+	+		3	2	
Geranium phaeum																	r	
Ch. Tilio p.-Acerion																		
Actaea spicata		+	+		r	r								1	1			
Ch. Fagetalia																		
Anemone ranunculoides										r	r							
Asarum europeum	+	1	1	1	1	1	1	1	1	+	+	+	1	1	1	1	1	1
Carex sylvatica											+	+		+	1			
Corydalis solida	1	+		1	+		1	+		+	+		+	+		+	+	
Dryopteris filix-mas			+						1						r			r
Euphorbia amygdaloides				r	r					+	+							
Galeobdolon luteum	+	+	+	+	+	+	+	+	+	+	+	+				2	2	2
Impatiens noli-tangere		+	1					+	1		1	2						
Lysimachia nemorum												r						
Paris quadrifolia	r	r	r	+	+											+	+	
Polygonatum multiflorum	+	1	+	+	+			1		+	+		+	+	+	1	1	+
Primula elatior	1	1	+	2	1	+	1	+		1	+		2	1	r	1	+	+
Pulmunaria obscura	1	+	+	1	+	1	1	+	1	3	+	1	4	2	2	1	1	+
Ranunculus cassubicus	+	1		r	+		r	+					+	1				
Sanicula europaea														+	+			
Stachys sylvatica	+	1	2	1	2	4	+	1	2	+	1	3	1	1	3	+	+	1

Table 3 – cont.
Tabela 3 – cd.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Ch. Q.-Fagetea																		
Anemone nemorosa	3	1		4	2		+	1		2	1		+	+		5	2	
Brachypodium sylvaticum								1	1									
Salvia glutinosa	1	1	2	+	1	2	+	+		+	+	1	+	1	2	+	+	
Ch. Galio-Urticenea																		
Alliaria petiolata		r			+			+			+	r		+			+	
Chaerophyllum aromaticum				+	+	+	1	2	3	+	1	2	+	+	+	+	1	1
Chaerophyllum temulum		+	+	+	+	+	1	1	1	+	+	+	1	2	2			
Galium aparine			+												+			
Geranium robertianum						r			+			+			+			+
Geum urbanum			+						1						+			
Other – Inne																		
Ajuga reptans		+	+		+	+												
Arum orientale										r	r							
Athyrium filix-femina		+	+		+	+					1	2						
Dryopreris carthusiana					r	r												
Fragaria vesca							r											
Lysimachia nummularia			r						+									
Maianthemun bifolium	+	+		+	+	+							+	+	+			
Melandrium rubrum		+	+					+										
Oxalis acetosella	+	+		1	1	+	+	+		+	+					+	+	+
Rubus plicatus x hirtus	+	2	3	+	+		+	1	1				+	1	1	1	2	3
Rumex obtusifolius								r										
Senecio nemorensis		+	1		+	1								+	1			
Solidaga virga-aurea						r									r			
Streptopus amplexifolius														r				
Urtica dioica	+	+	+							+	+	1		+		1	2	4

1-5, +, r – covering by Braun-Blanquet scale.
Date of observation: IV – 5 April, V – 2 May, VII – 7 July.
1-5, +, r – stopnie ilościowości według skali Braun-Blanqueta.
Terminy wykonania zdjęć florystycznych: IV – 5 kwietnia, V – 2 maja, VII – 7 lipca.

fully reconstructed. However, basing on forest floor vegetation and structure of the stands it is supposed that the present wild cherry forests are not stable and they will be successively transformed into communities of the rich Carpathian beech forest sub-association *Dentario glandulosae-fagetum lunarietosum* or mountain sycamore maple forest *Lunario-Aceretum pseudoplatni*.

DISCUSSION

This study showed that under proper site conditions wild cherry is able to form self-sown stands. Such conditions are created by the fertile and very fertile arable and meadow lands lying fallow on steep southern and southwestern slopes or the landslides with exposed soil. Single wild cherry trees growing near such places could have initiated creation of natural wild cherry stands which at age of 60-70 years have a proper crown closure and are of good quality. Therefore, wild cherry may be accepted as a pioneer species invading alone non-forested fertile lands. Similar observations were made by Burgsdorf [1791] in the late 18th century, and recently by Russell [2003] who concluded that wild cherry requires open lands for its natural regeneration. Hrynkiewicz-Sudnik [1968] found that wild cherry trees occurring in a stand of a full crown closure reach considerable height growing over surrounding trees of other species, and form stems naturally prooned to the height of over 10 meters. Size of trees present in sample plots in foothills of the Bieszczady Mts. has confirmed this opinion. In the best stand selected as a seed stand wild cherry in age of 70 years reached height of 33.5 m, similar to that reported by Hrynkiewicz-Sudnik [1972]. Similar heights are reached by the main Polish forest trees of the quality class 1 when they are 100-105 years old (acc. to yield tables of Szymkiewicz [2001]). Lower heights, average (19-22 m) as well as maximum (25-33 m) were reached by other untended wild cherry stands in Tyrawa Wołoska, but their height was not smaller than average heights of Scots pine, oak, beech or fir stands of the quality class 1 at the age of 60-70 years [Szymkiewicz 2001]. Burgsdorf [1971], Hrynkiewicz-Sudnik [1972], Jaworski [1995], and Russell [2003] considered wild cherry as a species of high edaphic requirements. The present study has confirmed this opinion. It may also be added that calcium carbonate is not an indispensable component, although it is desirable in soils of stands under discussion, and also that wild cherry is quite tolerant to souring of surface soil horizons, even to pH 4.3 in H_2O. While the reaction of deeper layers (pH 5.5-8.5) observed during this study was similar to that given by Russell [2003]. All investigated soils, even acid ones, were characterised by the presence of mull humus, favourable aggregate structure of the mineral humus horizons and their high biological activity manifested by the presence of numerous earth-worms. Thus, it may be concluded that wild cherry has a favourable influence on the biological fitness and fertility of the soil. Light requirements of wild cherry observed during this study were conformable to literature data. Soil moisture found under wild cherry stands was somewhat different from the one reported by other authors. Hrynkiewicz-Sudnik [1972], Jaworski [1995], and Tomanek [1997] estimated that wild cherry has small moisture requirements, while majority of stands described in this paper was growing near water springs or streams (Table 4). It was observed that such a location stimulated growth of these stands as they reached greater height than the stand situated on the top of a small hummock. It should also be mentioned that precipitation in the region under investigations is high, i.e. 800-900 mm annually. It may therefore be concluded that wild cherry is quite tolerant to low soil moisture, but fresh or moist soils with flowing ground water, rich in oxygen and nutrients, create the best conditions for its growth.

According to Jaworski [1995] thermal requirements of wild cherry are medium, but opinions concerning its resistance to low temperatures vary. Schramm [1930] reported that during frosty winters in the 1930s many wild cherry trees in the Bieszczady Mts. died, and only trees growing in stands' interior survived, while Balcerkiewicz [1990]

Table 4. Characteristic of altitude, soil types and site types in the wild cherry stands
Tabela 4. Cechy położenia, typy gleb i siedlisk oraz cechy drzewostanów czereśniowych

Profil	T1	T2	T3	T4	T5	T6
Location Lokalizacja	Tyrawa Wołoska g. Horotki	Tyrawa Wołoska g. Horotki	Tyrawa Wołoska g. Horotki	Nadl. Brzozów	Tyrawa Wołoska ur. Jagodziska	Tyrawa Wołoska g. Horotki
Altitude, m Wysokość, m n.p.m.	385	395	420	330	380	405
Location characteristics, terrain configuration Cechy położenia, ukształtowanie terenu	upper slope part, above stream górna część stoku, powyżej strumienia	upper slope part, above stream górna część stoku, powyżej strumienia	middle slope part, above spring środkowa część stoku nad źródliskiem	bottom of old landslide dno dawnego języka osuwiska	ridge hump garb grzbietu	middle slope part środkowa część stoku
Exposure Wystawa	SW	SW	S	E	S	S
Slope Nachylenie	15°	20°	25°	10°	12°	15°
Soil type Typ gleby	BRs	BRs	BRs	BRs	BRw	BRs
Stand species composition Skład gatunkowy drzewostanu	10 Czer., pjd. Klp	10 Czer., pjd. Klp	9 Czer., 1 Klp	8 Czer., 2 Bk, Js, Jw	7 Czer., 3 Js, Klp, pjd. Lp, Wrzb	10 Czer., pjd. Ols, Klp
Stand age Wiek drzewostanu	65	65	60	70	60	65
Crown closure Zwarcie	0.9	0.8	0.7	0.7	0.7	0.9
Mean diameter b.h. D przec.	29	31	28	33	22	38
Mean height H przec.	21.2	22.1	21.2	31.5	19.4	22.4
Site forest type Typ siedliskowy lasu	Lwyż w moist upland forest	Lwyż w moist upland forest	Lwyż w moist upland forest	Lwyż w moist upland forest	Lwyż św fresh upland forest	Lwyż w moist upland forest
Community of potential	*Dentario glandulosae-*	*Dentario glandulosae-*	*Dentario glandulosae-*	*Dentario glandulosae-*	*Dentario glandulosae-*	*Dentario glandulosae-*

vegetation Zbiorowisko roślinności potencjalnej	*-fagetum*	*-fagetum*	*-fagetum*	*-fagetum*	*-fagetum*	*-fagetum*

is of the opinion that this species is resistant to low temperatures. Stands in Tyrawa Wołoska mainly grow on warm southern and southwestern steep slopes and on hummocks where cold air does not stay. Less frequently wild cherry grows in mountain top hollows but with depressions forming channels for cold air outflow down slopes. It was observed during this study that sometimes there were frost cracks on wild cherry stems, and that spring frosts damage its flowers.

This study was the first analysis of the forest floor vegetation under the canopy of wild cherry stands in Poland. In the Ukrainian Carpathians the ground vegetation under groups of wild cherry trees was described by Gamor [2002]. He found that the greatest number of species, i.e. 154, was growing below the altitude of 500 m, and that the southwestern slopes were richer in species. Above 500 m the number of species dropped to 105, and on northern slopes even to 81. The area investigated in foothills of the Bieszczady Mts. was situated below 500 m in altitude, and the plots were located on southern and southwestern slopes where 52 plant species were found, but the investigated area was much smaller than that described by Gamor. Species from families *Asteracae* and *Poaceae* were the most numerous in the Ukrainian Carpathians, while in foothills of the Bieszczady Mts. *Labiatae* and *Ranunculaceae* were the most numerously represented. Almost all species found under wild cherry stands during the study reported in this paper also occurred under trees of this tree species in the Ukrainian Carpathians.

Wild cherry is a species characteristic for the *Tilio-Carpinetum* forest association [Matuszkiewicz 2001] occurring there as an admixture tree. Probably wild cherry stands described in this paper represent a different plant community. This opinion seems to be supported by forest forming ability of wild cherry and the lack of hornbeam and other species characteristic for *Tilio-Carpinetum.* The plant community of wild cherry forests, dynamically changing between early spring and summer, exhibited similarity to fertile beech forests of the alliance *Fagion* and sub-mountain slope sycamore maple forests (*Lunarno-Aceretum*). Also several riparian species from the alliance *Alno-Padion* occurred there. The authors of this paper propose to name the community of wild cherry forests *Cerasus avium-Salvia glutinosa,* and are of the opinion that the most valuable stands should be protected.

Hrynkiewicz-Sudnik [1972], on the basis of literature data and his own observations reported that between 1964 and 1968 there were 845 known localities of wild cherry in Poland and southwestern Ukraine. Presently, after about 40 years, 905 stands with over 10% proportion of wild cherry were inventoried in Polish State Forests. In 83 such stands wild cherry proportion reached over 30%. Moreover, wild cherry in form of single trees or tree groups occurs in 8537 stands (SILP). These figures would be higher if stands with wild cherry under other than state ownership were taken into account.

The results of this study showed that it would be possible to use wild cherry as a nurse crop on very fertile soils not used by agriculture in the foothill region of the Carpathians. They also showed that wild cherry is a fast growing pioneer species able to invade open lands and quickly convert this non-forested environment into forest stands with humus soils and characteristic vegetation. Biological as well as economic reasons speak in favor of such an opinion. The present price of wild cherry wood is over twice as high as that of pine or larch, and its valuable wood assortments are even three times more expensive [Cennik detaliczny... 2007]. Excellent qualities of wild cherry wood are well known in Western Europe (e.g. Germany, France, or Italy). It is grown there as a valuable plantation tree, and its wood is competing with wood imported from tropical forests since if treated with oil or water solution of nigrosine may imitate mahogany or ebony [Karczmarski 2007]. This author also discusses silvicultural problems of wild cherry in Poland pointing out that so far in Polish forestry this tree species was not looked upon as a forest formation tree, not even as a stand enriching admixture and perhaps, only as a biocoenotic admixture. In consequence wild cherry, if occurring more numerously in a stand, was treated as a species incompatible with the site. The results of the study presented in this paper showed wild cherry as a valuable tree species able to form valuable stands. They also showed a pioneer role of this tree in afforestation of fertile non-forested lands. This is a true image of wild cherry. Its most valuable stands are worth to be protected.

CONCLUSIONS

1. Wild cherry (*Cerasus avium*) may under proper site conditions play a role of the main forest tree species.
2. Wild cherry is a pioneer tree species able to grow in open areas, and therefore may be used in formation of nurse stands on fertile lands being afforested.
3. In foothills of the Bieszczady Mts. wild cherry found favourable conditions for formation of stands on Humic Cambisol and Eutric Cambisol soils formed from clay shale and making fresh and moist upland forest sites. The presence of calcium carbonate in these soils is not necessary although desirable for growth of wild cherry.
4. Humus of the mull type is formed under the canopy of wild cherry stands. The litter is decomposed quickly thus improving and forming a deep and structural horizon of humus accumulation due to a high biological activity of soils, which demonstrates a favourable effect of the first generation of wild cherry forests on properties of surface soil layers.
5. Places occupied by wild cherry forests such as steep fragments of southern and southwestern slopes, local depressions in upper parts of slopes with channels for cool air outflow, have confirmed the opinions known from literature about susceptibility of this tree species to spring frosts.
6. In forest floor vegetation of wild cherry stands the early spring aspect and late spring aspect may be clearly distinguished, while the richness of this vegetation, typical for eutrophic forest communities, has confirmed high requirements of wild cherry in respect of soil fertility as well as ability of this tree species to create favourable conditions for the development of the forest floor vegetation of high trophic requirements.

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SIEDLISKA LASÓW CZEREŚNIOWYCH POGÓRZA BIESZCZADÓW

Streszczenie. W pracy przedstawiono charakterystykę drzewostanów z dominacją czereśni ptasiej [*Cerasus avium* (L.) Moench] oraz warunków siedliskowych, w jakich mogą powstawać takie drzewostany. Stwierdzono, że na pogórzu Bieszczadów czereśnia ptasia może tworzyć samosiewne drzewostany na bogatych w składniki pokarmowe i związki próchniczne glebach brunatnych, wytworzonych na podłożu łupków ilastych. Korzystne warunki dla rozwoju drzewostanów czereśniowych stwarza odpowiednie ukształtowanie terenu, zapewniające ochronę przed wiosennymi przymrozkami i jednocześnie odpowiednie uwilgotnienie gleby. Pod okapem czereśni kształtuje się bujne runo, złożone z gatunków związanych z eutroficznymi lasami bukowymi, podgórskimi, wilgotnymi lasami jaworowymi oraz łęgami.

Słowa kluczowe: siedliska leśne, drzewostany czereśniowe, czereśnia ptasia (*Cerasus avium*)

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