



INTRODUCTION

Plants in the genus *Plantago*, more commonly known as plantains, have been considered valuable for their herbal properties for centuries. The herb is astringent, anti-toxic, antimicrobial, anti-inflammatory, anti-histamine, as well as demulcent, expectorant, stytic and diuretic. Many of them are perennial species. In Poland growing the most common species on natural sites are: *Plantago major* L., *P. media* L. and *P. lanceolata* L. Herbal raw material obtained from these species are leaves.

The aim of investigation was to evaluate the morphological and chemical variability within perennials species of the genus *Plantago* L. collected in the experimental field of Department of Vegetables and Medicinal Plants (SGGW) in Wilanów.

MATERIAL AND METHODS

The study was carried out in the years 2010 – 2011. The study included the following plant species: *Plantago lanceolata* L. (3 populations), and at 1 population of *P. maritima* L., *P. media* L., *P. major* L., *P. major* L. 'Purpurea'.

The three phases of development of plants (vegetative, full flowering, after flowering) was a collection of 25 randomly selected whole plants of each species and populations. After harvesting, the biometric measurements of morphological characteristics and development of plants (size and shape of leaves, length of inflorescence) were done. In the leaves, after drying the content of irydoid glycosides, polyphenolic acids and flavonoids was determined according to the method described in Polish Pharmacopoea VI (2002).



Plantago lanceolata



Plantago maritima



Plantago media



Plantago major



Plantago major 'Purpurea'

RESULTS

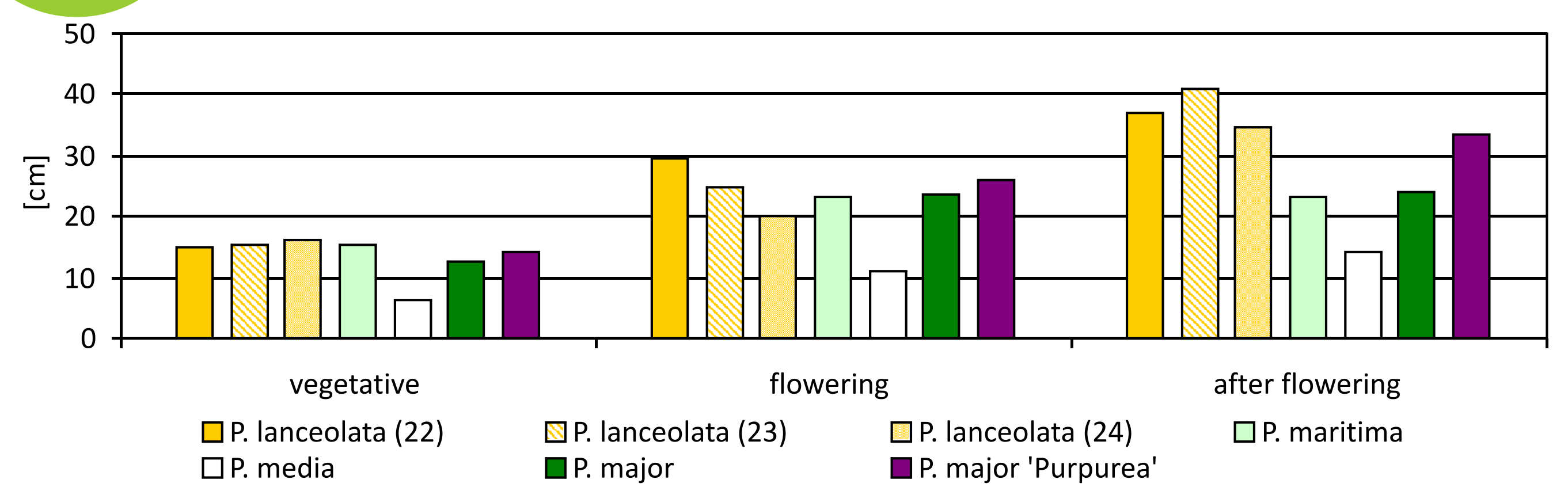


Figure 1. Length of leaves in three development phase of plants (cm)

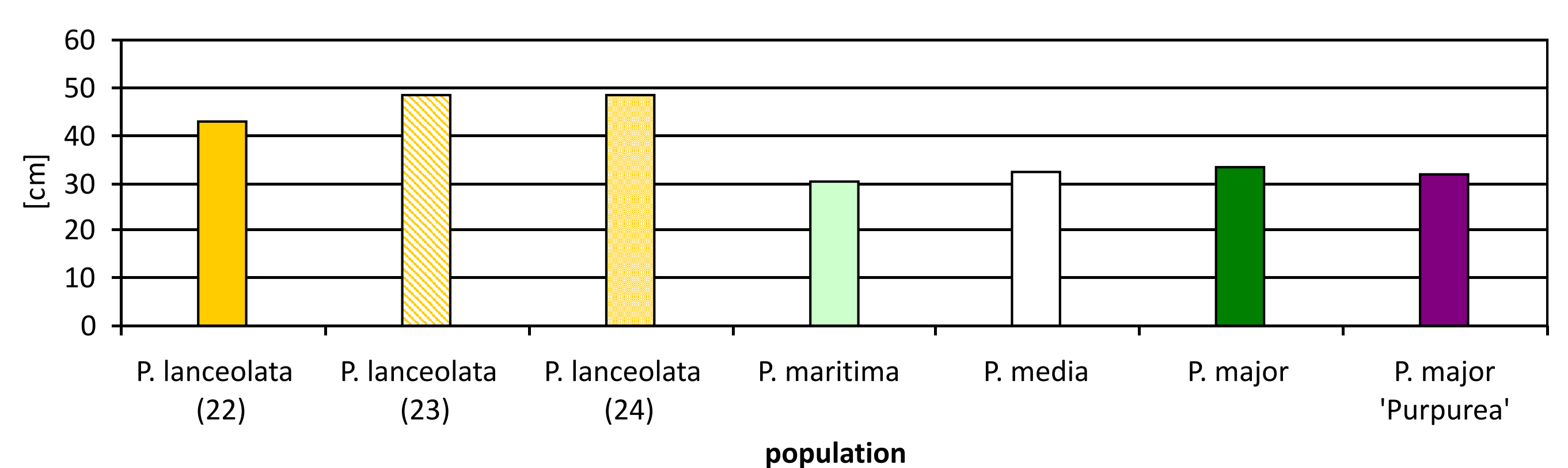


Figure 2. Length of flowering branch (cm)

Table 1. Content of irydoid glycosides (%)

POPULATION	VEGETATIVE PHASE	FLOWERING PHASE	AFTER FLOWERING PHASE
<i>P. lanceolata</i> (22)	0.5 d	5.5 a	1.1 cd
<i>P. lanceolata</i> (23)	0.4 d	4.8 ab	0.9 d
<i>P. lanceolata</i> (24)	0.4 d	4.0 b	1.0 cd
<i>P. maritima</i>	0.4 d	4.1 b	2.1 c
<i>P. media</i>	0.5 d	2.0 c	1.2 cd
<i>P. major</i>	2.1 c	1.8 cd	0.5 d
<i>P. major</i> 'Purpurea'	3.5 b	2.1 c	0.4 d

Note: Means marked with different letters differ significantly at $\alpha = 0.05$

Table 2. Content of flavonoids (%)

POPULATION	VEGETATIVE PHASE	FLOWERING PHASE	AFTER FLOWERING PHASE
<i>P. lanceolata</i> (22)	0.22 i	0.38 f	1.18 a
<i>P. lanceolata</i> (23)	0.25 h	0.37 f	0.75 b
<i>P. lanceolata</i> (24)	0.20 hj	0.40 e	0.30 g
<i>P. maritima</i>	0.10 k	0.30 g	0.18 j
<i>P. media</i>	0.19 j	0.24 ij	0.23 ij
<i>P. major</i>	0.52 c	0.58 c	0.20 hj
<i>P. major</i> 'Purpurea'	0.23 ij	0.41 e	0.37 f

Note: Means marked with different letters differ significantly at $\alpha = 0.05$

Table 3. Content of polyphenolic acids (%)

POPULATION	VEGETATIVE PHASE	FLOWERING PHASE	AFTER FLOWERING PHASE
<i>P. lanceolata</i> (22)	0.19 h	0.25 g	0.70 b
<i>P. lanceolata</i> (23)	0.19 h	0.25 g	0.70 b
<i>P. lanceolata</i> (24)	0.29 f	0.25 g	0.51 d
<i>P. maritima</i>	0.18 h	0.29 f	0.18 j
<i>P. media</i>	0.09 i	0.19 h	0.45 e
<i>P. major</i>	0.73 b	0.19 h	0.60 c
<i>P. major</i> 'Purpurea'	0.09 i	0.21 fg	0.80 a

Note: Means marked with different letters differ significantly at $\alpha = 0.05$

CONCLUSIONS

1. The content of irydoid glycosides in the leaves significantly depends on the species, population and harvest time (plant development phase).
2. The content of polyphenolic acids depends on the origin of the material (species and population) and the date of the harvest.
3. The highest content of flavonoids was found in leaves harvested at the flowering phase except *P. lanceolata* (population 22 and 23).
4. The leaves of *P. maritima* and *P. major* 'Purpurea' are rich of irydoid glycosides, flavonoids and polyphenolic acids.