

The characteristics of flowers, and of clumps of selected iris species and varieties, from the *Limniris* section

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Abstract: *The characteristics of flowers, and of clumps of selected iris species and varieties, from the Limniris section.* This paper describes four-year-old clumps of low-maintenance, beardless irises that are immune to the diseases that affect bearded irises. The following iris varieties were selected for investigation: *Iris setosa* L., the interspecies hybrid *Iris ×sibtosa* (*I. sibirica* × *I. setosa*), *I. versicolor*, *I.* ‘Magnat’, *I.* ‘Wojewoda’, *I.* ‘Giant Shoulders’, *I.* ‘Wycieruch’, *I.* ‘Marsz Turecki’ and *I.* ‘Stone Flower’. The biometrical parameters of clumps, leaves and flowers were assessed. The irises investigated were classified as medium or large according to size of flower. It was found that the leaves in iris clumps are longer than the clump is high. The exception was *I.* ‘Magnat’, whose leaves are not arched. The most numerous flower shoots were noted on diploid *I.* ‘Wycieruch’ (77) and tetraploid *I.* ‘Wojewoda’ (63), whereas there were fewer on the other taxa. An attempt was made to classify the beardless irises according to clump height. The authors propose a division of beardless irises into plants with straight leaves and those with arching leaves, as well as a further division based on clump height: dwarf (40 cm and shorter), low (40–59 cm), medium (60–79 cm) and high (80 cm and higher).

Key words: irises, clump height, leaf length, flower size, colour

INTRODUCTION

Irises are perennials whose flowers are distinguished by a great variety of colours and miscellany of patterns on the

perianth leaves [Epperson, 2000]. Depending on the species, flower width ranges from 2.5 to 25 cm. Iris leaves are grass-like or sword-like and embrace the shoot with their bracts [Strassburger, 1960, Komarnicki, 1993]. The plant height is greatly diversified, ranging from 10 to 200 cm, which allows them to be used in a variety of flower compositions. As both the leaves and the flowers are decorative, they can add splendour to the garden from early spring until late autumn with proper selection of species and varieties [Lubowicka, 1984]. Irises from the beardless section (*Limniris*) are growing in popularity throughout the world. They are low-maintenance plants and are resistant to the diseases that affect bearded irises. What is more, they can be cultivated on a variety of sites. Notwithstanding this, they remain little-known in Poland, where the varieties that are offered on the market are old and not particularly attractive [Komarnicki, 2010].

The aim of this work is to assess the colour and morphological characteristics of the flowers, leaves and clumps of selected species and new varieties of beardless irises. Based on measurements taken, an attempt is made to establish a classification of beardless irises according to clump height and straight or arching leaves.

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MATERIAL AND METHODS

The collection of beardless irises was set up in 2007 in a field in Bibice near Kraków in Małopolska. The plants came from the Polish iris breeder Lech Komarnicki, who is associated with the British Iris Society (BIS), the American Iris Society (AIS) and the Middle European Iris Society (MEIS). The following taxa were chosen for investigation: *Iris setosa* L., the interspecies hybrid *Iris ×sibtosa* (*I. sibirica* × *I. setosa*), *I. versicolor*, *I. ‘Magnat’*, *I. ‘Wojewoda’*, *I. ‘Giant Shoulders’*, *I. ‘Wycieruch’*, *I. ‘Marsz Turecki’* and *I. ‘Stone Flower’*. They were cultivated in a light loam with a pH approximate to neutral. Four-year-old clumps in full bloom at the turn of May 2011 and June 2011 were analysed. Six of the taxa investigated: *I. setosa*, *I. ‘Marsz Turecki’*, *I. versicolor*, *I. ‘Magnat’*, *I. ‘Giant Shoulders’* and *I. ‘Wycieruch’* were diploids, whereas the other three: *I. ‘Stone Flower’*, *I. ×sibtosa* and *I. ‘Wojewoda’* were tetraploids.

The following biometric measurements, which were conducted on three clumps of fifty clones from each taxon, were taken: clump height from the base to the leaf arching and leaf length from the leaf base to the leaf top (30 leaves from each clump). All of the flower shoots in a clump were counted and measured. The length of the flower shoots from the base to the bracts, and the length of the shoots including the flowers, were also measured (Fig. 1). As no classification of beardless irises existed, authors used their own criteria – straight leaves, arch-

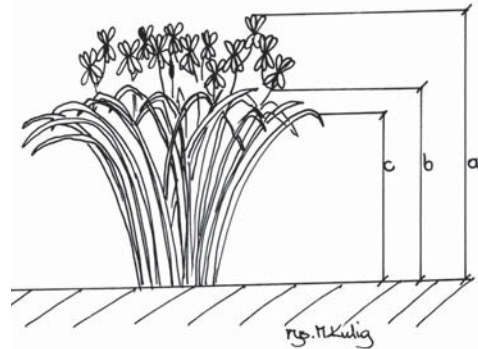


FIGURE 1. Schematic drawing of iris clump: a – length of the whole flower shoot; b – length of the flower shoot to the bracts; c – length of the leaves to the arching (drawing by M. Kulig)

ing leaves and clump height – to divide them. The following measurements of the generative organs were taken on 30 flowers from each clump: flower width and length (Fig. 2), the length and width of the inner and outer perianth leaves, the pedicel length, the length of the whole pistil, the length of the perianth tube, ovary length and ovary width. The



FIGURE 2. Iris flower: a – flower length; b – flower width (photograph by M. Kulig)

colour of the perianth leaves was identified based on the RHS CC [Royal Horticultural Society Colour Chart, 1995]. Note was taken of the order in which the taxa bloomed. The measurements were taken using a Handy Worth caliper with an electronic scale, whose total accuracy was 0.01 mm. The mean results are presented in the tables. The size range and coefficient of variance of the analysed features are stated. The coefficient of variance (V% or CoV) is a non-dimensional value calculated by dividing the standard deviation (STDEV) of a data set by the algebraic mean (or average) of the same dataset. Thus $CoV (V\%) = STDEV/AVERAGE$.

RESULTS

Of the taxa it was the *I.* 'Wycieruch' variety, with an average of 77, that produced the greatest number of flower shoots in a clump, whereas the lowest number, with an average of nine, was observed in *I.* 'Giant Shoulders'. This variety, together with *I.* 'Marsz Turecki', developed the fewest flowers per shoot: only between two and three. *I.* 'Magnat' had the highest number of flowers per flower shoot. *I. versicolor*, meanwhile, though it produced the lowest clumps, had from three to seven flowers per shoot (Table 1).

The average length of the flower shoots to the bracts ranged from 49 cm for *I.* 'Magnat' (V% = 7.4) to 136 cm in *I.* 'Wycieruch' (V% = 4.8). The lowest and highest whole flower-shoot lengths (including the flowers) of 61 cm for *I.* 'Magnat' (variation 3.9%) and 150 cm for *I.* 'Wycieruch' (variation 4.5%) were registered for these varieties (Table 1).

Among the taxa studied, *I.* 'Wycieruch', with an average length of 118 cm (variation 6.9%) formed the longest leaves – however they were already arching at a height of 84 cm. *I.* 'Magnat', meanwhile, had the shortest leaves, with an average length of 57 cm (variation 8.9%). However, because these were straight leaves, clumps of the variety appeared taller than clumps of *I. versicolor* and *I. setosa*, whose leaf lengths were, respectively, 58 and 59 cm. *I. versicolor*, whose leaves arched at a height of 39 cm (Table 1), formed the lowest clumps. With regard to the leaves, the irises were divided into plants with straight (*I.* 'Magnat'), and arching leaves (*I. setosa*, *I. ×sibtosa*, *I. versicolor*, *I.* 'Wojewoda', *I.* 'Giant Shoulders', *I.* 'Wycieruch', *I.* 'Marsz Turecki' and *I.* 'Stone Flower'). Turning to clump height, one taxon each was assigned to the dwarf and medium groups (*I. versicolor* and *I.* 'Wojewoda' respectively), two taxa to the high group (*I.* 'Stone Flower' and *I.* 'Wycieruch') and the remaining taxa to the low group (Table 1).

At 80 mm, the smallest flower width among the irises was recorded for *I.* 'Marsz Turecki' (V% = 8.1), while *I.* 'Giant Shoulders', with a diameter of 131 mm, had the largest flowers, which were also strongly uniform with regard to this feature (V% = 2.8) – Table 2. While at 138 mm the flowers of this variety were the longest, they also displayed the greatest variation in length of all the taxa studied (V% = 24.1). *Iris setosa* and *I.* 'Stone Flower' produced the shortest flowers at 100 mm and were also considerably uniform with respect to this feature at, respectively, 3.8 and 7.4%.

The longest inner perianth leaves, at 58 mm, were noted in *I.* 'Giant Shoulders', while the shortest, 12 mm, were recorded in *I. setosa*. The widest inner perianth leaves, 30 mm, occurred in *I.* 'Stone Flower' (variation 5.2%) and the narrowest, 3 mm, in *I. setosa* (V% = 25.9) – Table 2.

The 'Giant Shoulders' variety also had the distinction of recording the longest outer perianth leaves at 69 mm (variation 6.6%) which, in addition, were also the widest at 53 mm (V% = 10.4). *Iris* 'Wycieruch' had the shortest outer perianth leaves at 42 mm (variation 4.0%) whereas the narrowest, at 25 mm, and most variable (V% = 27), of these leaves were observed in *I.* 'Magnat' (Table 2).

The longest pedicel, at 91 mm with a variation of 3.4%, was noted for *I.* 'Wycieruch' flowers and the shortest, at 29 mm with a variation of 30.1%, for *I.* 'Magnat'. Meanwhile, measurement of *I.* 'Giant Shoulders' revealed a similar variation (V% = 38.3), but with a flower pedicel length of 66 mm (Table 2).

Mean pistil length ranged from 36 mm in *I.* 'Wycieruch' (V% = 7.4) to 53 mm in *I. ×sibtosia* (V% = 5.1) – Table 3. The length of the perianth tube was the greatest in *I. setosa* and *I.* 'Magnat' at 10 mm, and the shortest in *I.* 'Marsz Turecki' at 5 mm. Pistil length, at 23.6%, was the most variable in *I.* 'Giant Shoulders' (Table 3), while the longest ovaries were found in *I.* 'Wojewoda' and *I.* 'Giant Shoulders' with variations of 14.9 and 11.6% respectively. Though having the shortest ovary at 8 mm, *I.* 'Marsz Turecki' was more diversified (V% = 20). Average ovary width oscil-

lated between 3 mm in *I.* 'Wycieruch' – at the highest variation coefficient of 29.9% – to 8 mm in *I.* 'Giant Shoulders' at a variation of 18.3% (Table 3).

The colours of the outer perianth leaves in the irises studied did not differ from those of the inner perianth leaves. The plants with flowers from the violet, and violet-blue, colour groups were prevalent. *Iris* 'Wojewoda' was assigned to the group of purple-coloured flowers (Table 4).

DISCUSSION

Irises from the *Limniris* – formerly the *Apogon* – section, which have long, narrow, sword-like leaves, are valued mainly for their many-coloured flowers. A clump of beardless irises resembles grass in its growth habits and has the pleasing addition of a yellow-brown colouring. Irises from the *Limniris* section are employed in perennial flowerbed design to add diversity to the rhythm of compositions [Kingsbury, 2003].

Accounts of the height of Siberian iris varieties have been given by Brookins [1991] and Marcinkowski [1991, 2002, 2009]. Unfortunately, they have not been precise where they have described the height of clumps, the length of leaves – often arching – or the height of flower shoots: in some descriptions flowers are placed above leaves. The measurements conducted in this study give the precise size of the features studied, which will aid designers in composing flowerbeds using beardless irises. With regard to leaf length and flower width the results of the present study are comparable with the data obtained by Varkulevičienė [2011]; yet the plants growing in Bibice

TABLE 1. Morphological characteristics of clumps of the investigated iris species and varieties

Species or variety	Number of flower shoots in clump (pcs)	Number of flowers on shoot (pcs)	Length of flower shoot to the bracts (cm)			Length of the whole flower shoot (cm)			Length of leaves (cm)			Length of leaves to the arching (cm)			Clump-height group
			range	mean	V%	range	mean	V%	range	mean	V%	range	mean	V%	
<i>I. setosa</i>	20	5-6	51-65	60	7.7	65-79	73	7.1	49-76	59	12.3	38-56	47	10.4	low
<i>I. versicolor</i>	35	3-7	51-64	55	7.1	63-75	67	5.4	37-66	58	10.4	30-48	39	14.0	draw
<i>I. 'Giant Shoulders'</i>	9	2-3	53-62	56	6.1	68-79	74	5.1	57-82	73	9.3	42-58	52	9.1	low
<i>I. 'Magnat'</i>	12	5-8	46-55	49	7.4	58-64	61	3.9	44-67	57	8.9	erect			-
<i>I. 'Marsz Turecki'</i>	18	2-3	58-79	68	12.1	71-94	82	11.0	56-80	65	10.8	31-52	42	17.7	low
<i>I. 'Wycieruch'</i>	77	2-6	127-147	136	4.8	139-160	150	4.5	98-130	118	6.9	74-104	84	11.0	high
<i>I. ×sibrosa*</i>	29	3-5	76-93	86	5.6	93-106	101	4.3	54-85	70	14.0	45-64	52	13.7	low
<i>I. 'Stone Flower'</i> *	24	5-7	70-108	93	11.6	89-121	111	8.7	91-127	107	8.1	70-93	80	9.8	high
<i>I. 'Wojewoda'</i> *	63	2-4	72-95	87	7.9	86-107	99	6.8	69-94	79	7.7	47-71	62	16.0	medium

* Tetraploid plants; V% = coefficient of variance (CoV); V% = standard deviation/average.

TABLE 2. Morphological characteristics of the flowers and perianth leaves of the investigated iris species and varieties

Species or variety	Flower pedicel length (mm)			Flower width (mm)			Flower length (mm)			Perianth leaves											
	range	mean	V%	range	mean	V%	range	mean	V%	inner			outer								
										length (mm)			width (mm)			length (mm)			width (mm)		
										range	mean	V%	range	mean	V%	range	mean	V%	range	mean	V%
<i>I. setosa</i>	46-50	48	3.1	91-99	96	4.0	94-104	100	3.8	11-15	12	9.0	2-4	3	25.9	53-63	58	5.1	38-44	41	4.1
<i>I. versicolor</i>	46-81	70	20.4	77-89	84	5.7	91-125	114	12.6	34-38	36	4.0	12-17	14	8.2	50-60	54	5.7	24-30	27	7.2
<i>I. 'Giant Shoulders'</i>	37-84	66	38.3	128-135	131	2.8	100-160	138	24.1	52-63	58	6.5	22-35	28	17	60-75	69	6.6	47-62	53	10.4
<i>I. 'Magnat'</i>	24-45	29	30.1	84-90	87	3.4	95-121	102	10.6	36-44	41	5.6	10-13	11	7.1	54-64	59	5.8	24-27	25	27.0
<i>I. 'Marsz Turecki'</i>	78-89	82	5.8	73-90	80	8.1	123-140	130	4.8	33-43	39	7.2	16-21	19	7.7	48-58	53	5.7	33-45	39	8.9
<i>I. 'Wycieruch'</i>	88-96	91	3.4	72-91	83	8.9	131-149	137	5.5	35-42	39	6.0	12-18	15	10.4	39-45	42	4.0	28-36	30	6.6
<i>I. ×sibrosa*</i>	52-95	65	26.9	106-119	111	5.1	97-131	107	12.8	25-30	28	4.9	9-13	11	10.9	60-72	64	5.1	35-51	46	8.1
<i>I. 'Stone Flower'</i> *	50-73	64	14.0	104-113	107	3.5	95-113	100	7.4	52-58	55	3.0	27-32	30	5.2	60-63	62	2.0	45-51	48	3.4
<i>I. 'Wojewoda'</i> *	47-71	66	16.0	86-107	96	8.7	113-130	123	5.9	38-54	45	8.0	16-24	20	10.5	55-62	60	3.7	34-43	40	6.4

* Tetraploid plants; V% = coefficient of variance (CoV); V% = standard deviation/average.

TABLE 3. Morphological characteristics of the generative elements of the perianth in the investigated iris species and varieties

Species or variety	Length of pistil elements											
	Length of pistil (mm)			Length of perianth tube (mm)			Length of ovary (mm)			Width of ovary (mm)		
	range	mean	V%	range	mean	V%	range	mean	V%	range	mean	V%
<i>I. setosa</i>	40-45	43	3.4	9-11	10	7.1	17-23	20	12.3	4-5	4	10.6
<i>I. versicolor</i>	37-43	39	4.8	7-9	8	10.6	18-22	20	10.0	3-4	4	1.2
<i>I. 'Giant Shoulders'</i>	32-43	39	11.0	6-9	8	22.2	19-24	22	11.6	7-10	8	18.3
<i>I. 'Magnat'</i>	45-48	46	2.3	10-11	10	5.3	18-22	21	8.1	4-5	4	10.6
<i>I. 'Marsz Turecki'</i>	38-46	42	6.0	4-6	5	16.9	6-10	8	20.0	4-5	5	11.9
<i>I. 'Wycieruch'</i>	33-41	36	7.4	4-8	6	23.6	17-21	19	8.2	2-4	3	29.9
<i>I. ×sibrosa*</i>	49-57	53	5.1	8-11	9	14.8	17-22	19	9.4	4-5	4	12.4
<i>I. 'Stone Flower'</i> **	41-50	47	5.5	6-9	8	15.1	18-22	20	7.3	6-7	6	8.6
<i>I. 'Wojewoda'</i> **	37-48	43	8.6	8-9	8	6.5	18-26	22	14.9	4-5	5	11.9

* Tetraploid plants; V% (CoV) = coefficient of variance; V% = standard deviation/average.

TABLE 4. Colours of the investigated iris species and varieties according to the RHS CC (Royal Horticultural Society Colour Chart)

Species or variety	Colour of perianth			
	outer		inner	
<i>I. setosa</i>	violet-blue	93A	perianths reduced	–
<i>I. versicolor</i>	violet	N 87 A	violet	N 87 A
<i>I.</i> ‘Giant Shoulders’	violet-blue	N 89 B	violet-blue	N 89 B
<i>I.</i> ‘Magnat’	violet	83 A	purple-violet	N81 A
<i>I.</i> ‘Marsz Turecki’	violet	83 A	purple-violet	N81 A
<i>I.</i> ‘Wycieruch’	violet-blue	97 A	violet-blue	97 A
<i>I. ×sibtosa</i> *	violet	86 A	violet	86 A
<i>I.</i> ‘Stone Flower’*	violet-blue	N 89 B	violet-blue	N 89 B
<i>I.</i> ‘Wojewoda’*	purple	N 79A	purple	N 79A

* Tetraploid plants.

had more numerous flower shoots, and flowers per flower shoot, than the species Varkulevičienė analysed [2011]. As there is no division of the *Limmiris* section according to height in the literature, the varieties in this section were compared with bearded iris groups. Owing to the height of their flower shoots alone, the analysed taxa can be compared with the Intermediate Bearded (IB), Miniature Dwarf Bearded (MDB), Border Bearded (BB) and Tall Bearded (TB) categories of *Iris* [Warburton, 1978, Köhlein, 1987, Komarnicki, 1993]. With reference to the examples given in the literature quoted earlier, the authors of the present study have attempted to create a garden classification of beardless irises that distinguishes: (1) by whether the bearded irises have straight or arching leaves and (2) by clump height: dwarf (40 cm and shorter), low (40–59 cm), medium (60–79 cm) and high (80 cm and higher).

The flowers of irises studied elsewhere [Köhlein 1987, Marcinkowski 2002] were found to be of medium or large width: 70–100 mm and over 100 mm respectively. The irises in Bibice, meanwhile, differed with regard to flower width and the structure of the generative organs. The discovery of much larger flowers in the tetraploid forms – *Iris ×sibtosa* and *I.* ‘Stone Flower’ – confirmed McEwen’s theses [1966, 1968, 1974]. The situation was similar in the case of *I.* ‘Dreaming Yellow’ [Kulig, 2010], while the diploid *I.* ‘Giant Shoulders’, whose flowers were larger than those of the tetraploid taxa, presented an exception. The length of the pistils in *I. sibirica*, *I.* ‘Stone Flower’ and *I.* ‘Wojewoda’ were consistent with the data supplied by McEwen [1966, 1968, 1974] concerning tetraploids. The diploid *I.* ‘Magnat’, on the other hand, differed only slightly in length from the tetraploid varieties.

CONCLUSIONS

1. The irises studied could be classified according to whether their flowers were medium (66.67% taxa) or large (33.33% taxa).
2. It was found that in iris clumps the leaves are longer than the clump is high. The exception was *I. 'Magnat'*, whose leaves did not arch.
3. The diploid *I. 'Wycieruch'* (77 shoots) and the tetraploid *I. 'Wojewoda'* (63 shoots) had the highest number of flower shoots in a clump, whereas the other taxa had a lot fewer.
4. Doubling the number of chromosomes (tetraploids) may manifest itself in various characteristics and in different taxa.

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Streszczenie: Charakterystyka kwiatów i kępy wybranych gatunków i odmian kosaćców z sekcji *Linniris*. W pracy charakteryzowano czteroletnie kępy kosaćców bezbródkowych, które nie wymagają dużych nakładów pielęgnacyjnych, odporne są na choroby, którym ulegają kosaćce bródkowe. Do badań wybrano: kosaćcie szczecinkowaty (*Iris setosa* L.), mieszańiec międzygatunkowy *Iris × sibtosa* (*I. sibirica* × *I. setosa*), kosaćcie różnobarwny (*Iris versicolor* L.) oraz odmiany *Iris 'Magnat'*, *Iris 'Wojewoda'*, *Iris 'Giant Shoulders'*, *Iris 'Wycieruch'*, *Iris 'Marsz Turecki'* oraz *Iris 'Stone Flower'*. Wykonano pomiary biometryczne kępy, liści oraz kwiatów. Badane kosaćce zaklasyfikowano do grupy o kwiatach średnich i dużych. Stwierdzono, że wysokość kępy kosaćców jest zazwyczaj niższa niż długość liści. Wyjątkiem był *Iris 'Magnat'*, którego liście

nie przewisają. Najwięcej pędów kwiatowych w kępie miały diploidalny *I.* 'Wycieruch' (77) i tetraploidalny *I.* 'Wojewoda' (63), u pozostałych taksonów było ich mniej. Na podstawie morfologii liści wyróżniono grupę kosaćców

bezbródkowych o liściach wyprostowanych oraz przeginających się, zaś ze względu na wysokość kęp wydzielono taksony: karłowe (40 cm i niższe), niskie (40–59 cm), średnie (60–79 cm) oraz wysokie (80 cm i wyższe).