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EVALUATION OF GROWTH AND FLOWERING OF CULTIVARS DERIVED FROM THE RUGOSA (*Rosa rugosa* Thunb.) GROWING IN THE NATIONAL COLLECTION OF ROSE CULTIVARS IN THE POLISH ACADEMY OF SCIENCES BOTANICAL GARDEN IN POWSIN

PART II. THE MODERN CULTIVARS

Marta Joanna Monder

Polish Academy of Science Botanical Garden – Center for Biological Diversity Conservation in Powsin,
Department of Botanical and Horticultural Collections, Prawdziwka 2, 02-973 Warsaw, Poland
e-mail: mondermarta@obpan.pl

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Abstract

In the years 2000-2011, observations were made of shrubs of the cultivars derived from the Rugosa (*R. rugosa* Thunb.) gathered in the Collection of Rose Cultivars of the Polish Academy of Sciences (PAS) Botanical Garden - Center for Biological Diversity Conservation (CBDC) in Powsin, Poland, including 29 varieties. In the second part, the results are presented for 17 modern cultivars ('Bokratrack', 'Dart's Defender', 'Handwar', 'Hanpur', 'Hansno', 'Hanuhl', 'Korgosa', 'Korhassi', 'Korruge', 'Magsed', 'Rokoko', 'Speruge', 'Strolen', 'Stronin', 'Thérèse Bugnet', 'Uhlwe', 'White Grootendorst'). Every year, damage to shrubs caused by frost was recorded; the date of bud break and the date when leaves developed in springtime were recorded; regeneration of shrubs damaged in winter was observed; the dates of initial, full and final flowering were recorded; the presence of disease symptoms was observed; and notes were made concerning the need to do spring pruning and pruning after flowering. The winter seasons 2002/2003, 2005/2006, 2009/2010, 2010/2011 were unfavourable for roses. In terms of the features in question, the cultivars varied. The observations made confirm the high frost resistance of Rugosa hybrids and their low cultivation requirements, owing to which they deserve a wider application, in accordance with their intended use, both as amateur varieties and for urban green areas.

Key words: Botanical Garden, *Rosa rugosa*, shrub roses, ground cover roses, frost damage, collection, greenery, urban green areas, hedge

INTRODUCTION

In the second half of the 20th century, there appeared a particular need to look for plants which tolerate unfavourable growth conditions, mainly in urban green areas and along transport routes (Latocha, 2002). Such plants play one of the most important roles in shaping the natural urban space. In the last century, the condition and development of urban green areas were greatly affected by having to counteract the degradation of the natural environment. Urban environmental conditions were expected to improve. At the same time, the existence of green areas is at risk due to the activity of both natural and anthropogenic factors (Bożętka, 2008).

Based on the conducted research, the species, together with *R.* × *rugotida*, is recommended when selecting trees and shrubs for particularly difficult conditions along the streets of Warsaw and other cities in central Poland (Borowski and Latocha, 2006). The increased attractiveness of shrubs of this species results from their long flowering (repeat-flowering) period and ornamental hips. What is also important is its ecological roles. Its hips are a vital source of food, and the thorny shrubs are a shelter for small animals and birds (Popek, 2002) as well as insects. The data were tabulated for 17 species and cultivars of ornamental trees and shrubs from the Rosaceae family. The calculated pollen productivity was 8-14 kg×ha^{-1} in the most productive cherries and crabapples grown in monocultures, but it was only half of that in some species. In most roses, pollen productivity was 3-10 kg×ha^{-1} but in *Rosa rugosa* Thunb. up to 20 kg×ha^{-1} and in *R. multiflora* Thunb. 15-50 kg×ha^{-1} (Szklanowska, 1992).

Mainly for the above reasons, the Rugosa and its varieties are particularly valued both for applications in difficult areas (Epping and Hasselkus, 1989) and in breeding (Ogilvie and Arnold, 1993). Over the recent decades, many valuable cultivars have originated that are used mainly as ground cover roses, more rarely park roses, recommended for difficult urban conditions. They include the previously examined *R.* × *rugotida* 'Dart's Defender' from Darthuis Boomkw.; 'Bokratrack' – from the subgroup of ground cover Fleur Robuste® created by BOOT & HORTORUS; 'Handwar', 'Hanpur', 'Hansno', 'Rokoko' bred by Baum and Uhl's 'Hanuhl' from the Pavement® subgroup, as well as 'Ritausma' and 'Stronin' introduced by Strobel nurseries.

In the National Collection of Rose Cultivars of the Polish Academy of Sciences Botanical Garden CBDC in Powsin, growth and flowering were observed of the cultivars derived from the Rugosa from the moment they had been planted until 2011. The observations aimed to increase knowledge about their breeding and ornamental value as well as possibilities of use. This paper is divided into two parts. The first part presents results for 12 historical cultivars (Monder, 2012), while this second part presents 17 modern cultivars bred after World War 2.

PLANT MATERIAL

Part 1 of the paper presents the results for 12 historical cultivars derived from the Rugosa gathered in the Collection of Rose Cultivars of the PAS Botanical Garden CBDC in Powsin, Poland (Monder, 2012). Part 2 presents the results for 17 modern cultivars. 'Korgosa', 'Korhassi' and 'Korruge' were bud-grafted onto rootstock type *Rosa canina* L., whereas the other ones grew on their own roots. Shrubs obtained from Polish nurseries, to a smaller extent from foreign ones, were planted in the years 1998-2009. The number and age of the shrubs as well as their origin are presented in Table 1. The first subgroup of cultivars (Monder, 2012) comprises the following: 'Bokratrack', 'Handwar', 'Hanpur', 'Hansno', 'Hanuhl', 'Rokoko', 'Speruge', 'Strolen', 'Stronin', 'Uhlwe'. The second subgroup includes 'Dart's Defender', 'Korgosa', 'Korhassi', 'Korruge', 'Magsed', 'Thérèse Bugnet', 'White Grootendorst' (Table 1).

METHODS

The details concerning the growing conditions for the shrubs in the collection were presented in the first part of the paper (Monder, 2012). For the modern varieties described in this paper, the same research criteria were applied as for the historical varieties described in the first part of the paper (Monder, 2012). These are as follows: frost damage; the period of bud and leaf development during springtime was observed; the average period of flowering of the shrubs was recorded (dates of initial, full and final flowering) as well as the height of the shrubs during the flowering period and at the end of the growing period were recorded. The condition of foliage was observed and notes were made concerning the need to do spring pruning and pruning after flowering (Monder, 2012). An approximate date of bud and leaf development was given for the years when the shrubs did not require spring pruning after frost damage. Necessary rejuvenating pruning is carried out in the collection every couple of years in early spring by entirely cutting out the oldest shoots, so it does not affect their further vegetative development.

Meteorological conditions in the years 1999-2011, based on the measurements made in the PAS Botanical Garden CBDC in Powsin, were presented in the first part of the paper (Monder, 2012).

RESULTS AND DISCUSSION

There are differences in terms of morphological features (Krüssmann, 1974; Monder, 2001, 2009), cultivation requirements and frost resistance between Rugosa historical hybrids (Monder, 2012) and modern hybrids. The origin of many cultivars, which is often unexplained or uncovered (Table 1), complicated these relationships.

The success of cultivation and decorativeness of shrubs is greatly affected by frost resistance and varieties derived from the Rugosa are ones of few roses recommended for planting in the cool climate of Canada and Scandinavia (Carlson, 1993; Ogilvie and Arnold, 1995). In the conditions of central Poland, in the Botanical Garden the cultivars were characterized by different frost resistance. High frost resistance in most of them (Table 2 and 3) encourages their cultivation. In terms of this feature, they considerably surpass numerous Tea Hybrid and Floribunda roses used in flower beds (Czekalski et al. 1990) as well as numerous other varieties growing in the conditions of the Botanical Garden in Powsin (Monder, 2004a, 2004b, 2007a, 2007b, 2008a, 2008b, 2010).

In the Botanical Garden in Powsin, most of the examined modern cultivars were not frost-damaged during the observation period or the damage was not significant. Frost damage during the most severe winters affected only 5 cultivras: 'Korgosa', 'Korhassi', 'Korruge', 'Magsed' and 'White Grootendorst'. In the case of 'Korhassi', 'Magsed' and 'White Grootendorst', frost damage was recorded only on rather short sections of one-year-old shoots, in which case cutting by 20-30 cm of the length was sufficient. In spring

2009 and 2010, on the other hand, shrubs of 'Korgosa' and 'Korruge' required pruning at a height of several centimetres from ground level, due to strong frost damage of older shoots. Initially, the shrubs of the two latter cultivars were cut higher, at a height of a few dozen centimetres, but developing young shoots died back and it turned out that lower pruning was necessary. The shrubs of 'White Grootendorst' and 'Korhassi' quickly regenerated, compensating for losses and achieving their characteristic size by the autumn, whereas the shrubs of 'Korgosa' and 'Korruge', after strong pruning, were slightly lower at the end of 2009 and 2010 seasons than in the previous years (Table 3).

The development of buds and leaves in most of the modern cultivars derived from the Rugosa, including *R. × rugotida* 'Dart's Defender', is early like in historical Rugosas (M o n d e r , 2012) as well as in Pimpinellifolias (M o n d e r , 2011). The development of buds began in the last decade of March, and leaves often appeared already in the first decade of April (Table 3). The earliest development of buds and leaves was characteristic for 'Thérèse Bugnet', 'Uhlwe', 'White Grootendorst' and 'Korgosa', as long as they did not require pruning (Table 3). The latest bud and leaf development after frost damage in winter concerned 'Korgosa' and 'Korruge' in the years when they had to be pruned, which caused young shoots to appear later. Pruning delayed the development of shrubs of ground cover roses during springtime in Henschke's research (2007). Also 'Dart's Defender', 'Stronin' and 'Korruge' developed leaves several days later in comparison with the earliest Rugosas (Table 3).

Table 1.
The modern cultivars of Rugosa (*Rosa rugosa* Thunb.) hybrids belonging to the Collection of Rose Cultivars of the PAS Botanical Garden in Powsin

Cultivar	Origin	Year of planting in collection	Number of shrubs
'Bokratrack' (SHORT TRACK)	unknown, J.K. Kraan, intr. BOOT & Co 2003	2009	10
'Dart's Defender'	*R. rugosa* 'Hansa' x *Rosa nitida* Willd., Darthuis Boomkw. 1971	1999	3
'Handwar' (ROSA ZWERG, DWARF PAVEMENT)	unknown, K. Baum 1983	2004	3
'Hanpur' (PURPLE PAVEMENT)	seedling of 'White Hedge', K. Baum 1983	2009	5
'Hansno' (SCHNEEKOPPE, SNOW PAVEMENT)	unknown, K. Baum 1983	2004	8
'Hanuhl' (SCARLET PAVEMENT)	'Frau Dagmar Hartopp' x 'Moje Hammarberg', J. Uhl 1991	2009	5
'Korgosa' (KORDES ROSE ROBUSTA)	seedling x *R. rugosa* var. *regeliana* Wittm., Reimer Kordes 1979	1999	4
'Korhassi' (HANSALAND)	unknown, W. Kordes' Söhne 1993	2003	3
'Korruge' (RUGELDA)	'Kormarie' x 'Korgosa', W. Kordes' Söhne 1989	2004	4
'Magsed' (RED RUGOSTAR)	'Anytime' x *R. rugosa* 'Magnifica', Ralph S. Moore before 1995, introd. Meilland 1997	2006	6
'Rokoko' (PINK PAVEMENT, SHOWY PAVEMENT)	unknown, K. Baum 1985	2009	5
'Speruge' (RED DAGMAR)	unknown, H. Spek 1997	2006	3
'Strolen' (POLARSONNE)	unknown, introd. BKN Strobel GmbH & Co. KG 1991	2006	6
'Stronin' syn. 'Ritausma' (POLAREIS)	*R. rugosa* var. *plena* Regel x 'Abelzieds', D.A. Rieksta 1963, introd. BKN Strobel 1991	2005	3
'Thérèse Bugnet'	'Pelouses' x 'University' or [(*R. acicularis* x *R. kamtschatica*) x (*R. amblyotis* x *R. rugosa* 'Plena')] x 'Betty Bland', G. Bugnet 1950	1999	4
'Uhlwe' (PIERETTE)	unknown, J. Uhl 1987	1998	4
'White Grootendorst'	sport of 'F.J. Grootendorst', Paul Edy 1962	2003	4

Table 2.
Frost damage in the modern cultivars derived from the Rugosa (*Rosa rugosa* Thunb.) in the PAS Botanical Garden in Powsin according to the scale of frost damage to deciduous plants by Łukasiewicz (1992)

Cultivar	Year											
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
'Bokratrack'	-	-	-	-	-	-	-	-	-	-	0	0
'Dart's Defender'	0	0	0	0	0	0	0	0	0	0	0	0
'Handwar'	-	-	-	-	-	0	0	0	0	0	0	0
'Hanpur'	-	-	-	-	-	-	-	-	-	-	0	0
'Hansno'	-	-	-	-	-	0	0	0	0	0	0	0
'Hanuhl'	-	-	-	-	-	-	-	-	-	-	0	0
'Korgosa'	0	0	0	4	0	4	6	0	0	6	6	6
'Korhassi'	-	-	-	-	0	0	4	0	0	4	6	4
'Korruge'	-	-	-	-	-	4	6	0	0	6	6	6
'Magsed'	-	-	-	-	-	-	-	0	0	4	4	4
'Rokoko'	-	-	-	-	-	-	-	-	-	-	0	0
'Speruge'	-	-	-	-	-	-	-	0	0	0	4	0
'Strolen'	-	-	-	-	-	-	-	0	0	0	0	0
'Stronin'	-	-	-	-	-	-	0	0	0	0	0	0
'Thérèse Bugnet'	0	0	0	0	0	0	0	0	0	0	0	0
'Uhlwe'	0	0	0	0	0	0	0	0	0	0	0	0
'White Grootendorst'	-	-	-	-	4	0	4	0	0	4	4	4

Similarly to the historical Rugosas, also the modern ones reached their specific height after 2-4 years from planting and maintained it throughout the whole study period. The cultivars that were most strongly affected by frost damage in winter (2008/2009, 2009/2010, 2010/2011), i.e. 'Korgosa' and 'Korruge', regenerated and compensated for losses well. The highest shrubs were produced by 'Korhassi', 'Thérèse Bugnet', 'Uhlwe' and 'White Grootendorst'. The lowest were the shrubs of 'Bokratrack', 'Hanpur' and 'Magsed' (Table 3). A very compact and quite regular habit was characteristic for most cultivars: 'Bokratrack', 'Handwar', 'Hanpur', 'Hansno', 'Hanuhl', 'Korhassi', 'Rokoko', 'Speruge', 'Strolen', 'Stronin', 'Thérèse Bugnet', 'Uhlwe' and 'White Grootendorst'. In the collection, 'Dart's Defender' turned out to be a very expansive variety which intensely spreads by means of suckers. 'Korgosa', 'Korruge' and 'Magsed' created shrubs with rather loose construction.

In the case of most of the examined modern Rugosas, flowering began much earlier, even by a month, in comparison with numerous other cultivars from various groups (Monder, 2004a, 2008a, 2008b, 2010), and at a similar time to the historical Rugosas (Monder, 2012), Pimpinellifolias (Monder, 2011) and many other historical roses (Monder, 2007a). In the collection, shrubs flower from the second decade of May; the earliest-flowering are 'Bokratrack', 'Hanuhl' and 'Thérèse Bugnet', whereas the latest to flower are 'Korruge' and 'White Grootendorst' (Table 3). 'Korgosa' and 'Korruge' produce flowers on this year's shoots, so their hard pruning after frost damage did not cause a lack of flowering. After flowering cessation, inflorescences were removed only in 'Korruge' for aesthetic reasons. Other cultivars, most of which produce decorative hips, were not pruned after flowering and do not require this procedure. During damp, long-lasting rainy weather, the flowers of 'Ritausma' were struck with grey mould.

Leaves which discolour in autumn are an additional ornamental element in: 'Bokratrack', 'Dart's Defender', 'Handwar', 'Hanpur', 'Hansno', 'Hanuhl', 'Korhassi', 'Magsed', 'Rokoko', 'Speruge', 'Strolen', 'Stronin', 'Thérèse Bugnet', 'Uhlwe' and 'White Grootendorst'. Leaves did not discolour in 'Korgosa' and 'Korruge'. In addition, hips and shoots may be ornamental in wintertime: cherry-coloured in 'Thérèse Bugnet', strongly thorny in others.

The ornamental value of 'Hansa' and 'Dart's Defender' was highly evaluated in the research conducted by Zaraś and Latocha (2000). In that research, the significant advantages of 'Hansa' included early leaf development, while in the case of 'Dart's Defender' – profuse and original thorns. Both cultivars were highly evaluated in terms of their long flowering period and autumn discolouring of leaves as well as numerous ornamental hips in the leafless period. Similar features are characteristic for the other varieties of Rugosas, both modern and historical ones (Monder, 2012).

During the observations made in the PAS Botanical Garden CBDC in Powsin, 'Korgosa', 'Korruge', and 'Magsed' were infected with black spot, and in one season 'Korhassi' was infected with powdery mildew. No symptoms of black spot and powdery mildew, the two most common diseases of roses, were observed in the other cultivars.

The observations made confirm the high frost resistance of Rugosa hybrids and their low cultivation requirements, owing to which they deserve a wider application, in accordance with their intended use, both as amateur varieties and for urban green areas. The modern cultivars are characterized by a great diversity in terms of their growth and flowering period (Table 2 and 3) as well as the colour of flowers and other ornamental features.

Table 3.
Evaluation of growth and flowering of the modern cultivars derived from the Rugosa (*Rosa rugosa* Thunb.) in the PAS Botanical Garden in Powsin

Cultivar	Average date of					Shrub height [cm] at the time of flowering / at the end of October				
	bud break	leaf development	initial flowering	full flowering	final flowering	2000	2003	2006	2009	2011
'Bokratrack'	semi-early	semi-early	15.05-28.05	22.05-16.06	15.06-1.07	-	-	-	30/50	50-60
'Dart's Defender'	early	late	17.05-1.06	27.05-10.06	15.06-1.07	60	100	100	110-120	100-120
'Handwar'	early / semi-early	early / semi-early	15.05-26.05	17.05-15.06	12.06-19.06	-	-	60-70	100-120	100-120
'Hanpur'	semi-early	early	17.05-25.05	20.05-30.05	10.06-17.06	-	-	-	30/50	50-60
'Hansno'	early / semi-early	semi-early	17.05-25.05	23.05-3.06	7.06-15.06	-	-	50/80	120-150	120-150
'Hanuhl'	early	semi-early	10.05-15.05	15.05-28.05	10.06-20.06	-	-	-	-	100
'Korgosa'	early	early	12.05-21.05	15.05-25.05	15.06-25.06	100/130	100/130	80/130	100/150	120/150
'Korhassi'	early	semi-early	15.05-1.06	20.05-5.06	20.06-7.07	-	-	80/130	150/170	130/150
'Korruge'	late	late	5.06-10.06	10.06-13.07	10.07-15.07	-	-	60/120	100/150	100/130
'Magsed'	early	semi-early	30.05-2.06	2.06-30.06	5.07-15.07	-	-	-	50/70	50/70
'Rokoko'	early	semi-early	10.05-20.05	15.05-28.05	10.06-20.06	-	-	-	-	100
'Speruge'	early	semi-early	15.05-1.06	20.05-5.06	20.06-7.07	-	-	-	80	80
'Strolen'	early	semi-early	15.05-1.06	21.05-5.06	23.06-7.07	-	-	60/120	120-150	120-150
'Stronin'	early	late	25.05-27.05	30.05-25.06	3-10.07	-	-	50/90	150	150
'Thérèse Bugnet'	early	early	10-12.05	15.05-10.06	10-12.06	150	180	180	180	180
'Uhlwe'	early	early	20-25.05	25.05-25.06	20.06-1.07	80	100/150	170	180	180
'White Grootendorst'	early	early	1-5.06	5-20.06	-	-	50/90	150/160	140/160	140/160

CONCLUSIONS

1. The examined modern cultivars derived from the Rugosa show high tolerance to winter conditions. In central Poland, there is no damages caused by frost in the case of the following cultivars 'Bokratrack', 'Dart's Defender', 'Handwar', 'Hanpur', 'Hansno', 'Hanuhl', 'Rokoko', 'Speruge', 'Strolen', 'Stronin', 'Thérèse Bugnet', 'Uhlwe'. Little damage occur during severe winters in 'Korgosa', 'Korhassi', 'Korruge', 'Magsed', 'White Grootendorst'.

2. Flowering of the examined cultivars derived from the Rugosa begins early, from mid-May to the beginning of June. The earliest to flower, in the second decade of May, is 'Thérèse Bugnet'. The latest to flower is 'Magsed'. Numerous varieties repeat flowering.
3. High tolerance to diseases, little tending needs and the high decorative value are distinctive for the examined cultivars. They should be used as park, ground cover and also soil-protective forms, especially in urban green areas, along streets, in parks, as well as for amateur cultivation.

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Część II. Odmiany współczesne

Streszczenie

W latach 2000-2011 prowadzono obserwacje krzewów 29 odmian pochodzących od róży pomarszczonej (*R. rugosa* Thunb.) gromadzonych w Kolekcji Odmian Uprawnych Róż PAN w Ogrodzie Botanicznym CZRB w Powsinie. W części drugiej przedstawiono wyniki dla 17 odmian współczesnych (‘Bokratrack’, ‘Dart’s Defender’, ‘Handwar’, ‘Hanpur’, ‘Hansno’, ‘Hanuhl’, ‘Korgosa’, ‘Korhassi’, ‘Korruge’, ‘Magsed’, ‘Rokoko’, ‘Speruge’, ‘Strolen’, ‘Stronin’, ‘Thérèse Bugnet’, ‘Uhlwe’, ‘White Grootendorst’). Corocznie u krzewów notowano uszkodzenia spowodowane przez mróz; zapisywano datę pękania pąków i rozwoju liści na wiosnę; obserwowano regenerację uszkodzonych w czasie zimy krzewów; notowano datę początku, pełni i końca kwitnienia; obecność objawów porażenia przez choroby; oraz uwagi dotyczące konieczności wykonywania cięcia wiosennego i po kwitnieniu.

Sezony zimowe 2002/2003, 2005/2006, 2009/2010, 2010/2011 należały do niekorzystnych dla róż. Odmiany wykazywały zróżnicowanie pod względem badanych cech. Do zalet większości odmian należy wysoka mrozoodporność, wczesne kwitnienie, małe wymagania pod względem cięcia, dobra zdrowotność. Bardzo wysoką odpornością na mróz charakteryzują się: ‘Bokratrack’, ‘Dart’s Defender’, ‘Handwar’, ‘Hanpur’, ‘Hansno’, ‘Hanuhl’, ‘Rokoko’, ‘Strolen’, ‘Stronin’, ‘Thérèse Bugnet’, ‘Uhlwe’. Do odmian najsilniej uszkadzanych przez mróz należały ‘Korgosa’ i ‘Korruge’. Najwcześniej, w połowie maja, zakwitają ‘Hanuhl’ i ‘Thérčse Bugnet’, blisko trzy tygodnie później – ‘Korruge’. Odmiany pochodzące od róży pomarszczonej, zgodnie ze swym przeznaczeniem, powinny znaleźć szersze zastosowanie jako róże parkowe, a przede wszystkim oraz okrywowe i glebochronne na terenach zieleni miejskiej i amatorsko.