

Earliness and Blooming Time in the Tulip Collection of “Al. Borza” Botanical Garden, Cluj-Napoca, Romania

Mirela Irina CORDEA^{1*} and Angela Doina PUI²

¹Faculty of Horticulture. University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Romania.

²Al. Borza Botanical Garden Cluj-Napoca, Romania.

*Corresponding author, e-mail: mcordea@usamvcluj.ro

Bulletin UASVM Horticulture 72(2) / 2015

Print ISSN 1843-5254, Electronic ISSN 1843-5394

DOI:10.15835/buasvmcn-hort:11662

Abstract

The present paper reveals the results of a study on the tulip collection in the environmental conditions of “Al. Borza” Botanical Garden Cluj-Napoca, concerning two characteristics: earliness of flowering and blooming time. Most tulip cultivars are originated in the Netherlands where environmental conditions are different from those in Cluj-Napoca. The tulip collection of “Alexandru Borza” Botanical Garden of Cluj-Napoca has been set up in order to maintain its decorative value as long as possible. In this regard, there were planted cultivars with various ranges of earliness of flowering and long duration of blooming period. Flowering time of the tulips, which make up the “Alexandru Borza” Botanical Garden of Cluj-Napoca collection last between 6-22 days. The blooming period of these cultivars is not as homogenous within the groups as expected, each group exhibiting cultivars with shorter or longer flowering period than the mean of experiment. The main objective of this study was to identify the genetic sources for earliness and blooming period, which could be used in a breeding program for early flowering tulips, as it is stated by most of the important tulip breeding.

Keywords: *breeding, earliness, flowering, tulip.*

*INTRODUCTION

The “Alexandru Borza” Botanical Garden of Cluj-Napoca is located at 380-420 m altitude on a slight slope with N, N-E and N-V expositions, having a rather earlier spring than the surrounding districts. Its 8.8 °C yearly mean temperature favors the development of vernal plants as tulips.

As Demir *et al.* (2012) mentioned, the climatic conditions are very important for tulip cultivation when grown outdoor, terms in which the “Al. Borza” Botanical Garden Cluj-Napoca collection was also set up.

Tulips are considered the most beautiful flowers of spring, comprising over 150 species, with about 5600 cultivars (Cristea, 2014). The tulip collection of “Al. Borza” Botanical Garden, Cluj-Napoca is a traditional one, being created in

1920, when the botanical garden was established. In all these years, the collection has been enriched, comprising today 141 cultivars and two botanical species of tulips.

Breeders classified (Brickell and Zuk, 1997; Raamsdonk and de Vries, 1996) the tulip cultivars in 16 groups or divisions, regarding the period of flowering and flower appearance, in: Single early tulips, Double early tulips, Triumph tulips, Darwin hybrid tulips, Single late tulips, Lily-flowered tulip, Fringed tulips, Viridiflora tulips, Rembrandt tulips, Parrot tulips, Double late tulips, Kaufmanniana tulips, Fosteriana tulips, Greigii tulips, Botanical species tulips, Multiflowering tulips.

In the “Al. Borza” Botanical Garden tulip collection, all these groups are represented as shown in Tab. 1. The largest number of cultivars

is in the group III (Triumph tulips) with 29 cultivars, the following one, in decreasing number of representatives is group VII (Fringed tulips) with 14 cultivars etc., with a total number of 141 cultivars. Additionally, there are also two botanical tulip species (Botanical tulip species) and group IX 'Rembrandt tulips' with a mix of plants.

A more important character is the number of days the flower maintains its ornamental value (Eijk and Eikelboom, 1980), especially in the ornamental sector of a botanical garden or in landscape architecture.

MATERIALS AND METHODS

The observations were performed in the "Al. Borza" Botanical Garden Cluj-Napoca tulip collection organized in 16 groups of cultivars according to classification published by Brickell and Zuk, 1997; Raamsdonk and de Vries, 1996, in the spring of 2015, concerning the date of beginning and end of flowering. The collection amounts to 141 cultivars and two species of tulips which find proper growing conditions in Cluj-Napoca environment.

For each cultivar 10 plants were studied recording the date on which the flower buds showed their colour and end of flowering when the perianth dropped. These data allowed the computation of earliness of flowering (no. of days from March 20, 2015) and the blooming period (days).

The analysis of variance and LDS test were used to statically differentiate the tested tulip cultivars as far as the two interested characters were concerned, the mean of cultivars being considered as control (Ardelean *et al.*, 2007). In the analyzed collection, to establish if there is a correlation between earliness and the blooming period in the studied genotypes, the correlation coefficient (r) between these two characteristics was computed.

Consequently the best ten cultivars as far as the two analysed characters are concerned will be introduced in a crossing process which will be the first step in a breeding program for early flowering tulips, as it is stated by most of the important tulip breeding (Tuyl and Creij, 2006).

RESULTS AND DISCUSSION

The two studied characters (earliness and the blooming time) are very important regarding the

tulips decorative effect. As far as they represent the splendor of spring, early flowering and its long duration are desirable. On the other hand, a collection is supposed to contain plants with different periods of flowering so that their decorative period may extend as long as possible.

Analyzing the data on earliness of flowering, in the 16 tulip groups of "Al. Borza" Botanical Garden Cluj-Napoca collection, it is obvious that the earliest cultivars belong to groups IV (Darwin hybrid tulips), XII (Kaufmanniana tulips), XIII (Fosteriana tulips) and XIV (Greigii tulips). In these groups most of the cultivars presented earlier flowering than the mean of cultivars (Tab.1).

As its name proves, "The First" was the earliest cultivar (onset of flowering on March, 23) followed, on March, 26 by 'Heart's Delight' from group XII - Kaufmanniana tulips and 'Quebec' from group XIV - Greigii tulips. These results might be considered quite surprising since there was expected a significant precocity of flowering in cultivars of the first two groups 'Single early tulips' and 'Double early tulips', as these groups are named and classified.

The latest flowering cultivars were in groups V - Single late tulips, VI - Lily-flowered tulip, VII - Fringed tulips, VIII - Viridiflora tulips, X - Parrot tulips and XI - Double late tulips. 'Prinses Irene' presents late flowering although it belongs to group I - Single early tulips, suggesting that in some genotypes the earliness of flowering might be seriously influenced by the climatic conditions.

Results on blooming time in the studied tulip collection there show that in group IV - Darwin hybrid, two cultivars: 'American Dream' with 45 blooming days and 'Hakuun' with 34 blooming days, presented the longest period of flowering. It is to be noted that 'The First', with the earliest flowering date also presents a rather long blooming time (22 days).

As stated by Eijk *et al.*, (1977), in tulip, high ornamental value cultivars are considered those with more than six days of blooming time. According to our results, 'West Point' from group VI (Lily-flowered tulip) with only 6 days and 'Prinses Irene' from the first group (Single early tulips) with 7 days presented also the shortest flowering period. These cultivars present a poor decorative value in our environmental conditions.

A main goal of this study was to find out if there is a correlation between the onset of flowering

and its duration. The correlation coefficients (r) between the two studied characters presented the most undesirable values in group XII – Kaufmanniana tulips, where earliness of flowering was significantly correlated with short duration of blooming period in 'Scarlet Baby' (r=0.98**),

'Hearth's Delight' (r=0.64*) and 'Ice Stick' (r=0.62*) cultivars (Tab.1).

The same effect was registered in 'Hatsuzakura' (r=0.71*) and 'Christmas Marvel' (r=0.69*) cultivars of the first listed group I - Single early tulips.

Tab. 1. Earliness characteristics of the studied tulip collection

Groups	Cultivars	Earliness of flowering		Blooming time		Correlation coefficient	
I. Single early tulips	Baby Blue	25	o	19	*	-0.70	o
	Christmas Marvel	10	ooo	18		0.69	*
	Couleur Cardinal	25	o	19	*	-0.09	
	Hermitage	31	*	17	o	-0.15	
	White Marvel	28		18		-0.13	
	Yokohama	24	o	17	o	-0.14	
	Apricot Magic	21	ooo	18		0.22	
	Merry Christmas	28		15	ooo	0.28	
	Prinses Irene	37	***	7	ooo	-0.33	
II. Double early tulips	Abba	28		19	*	0.11	
	La Belle Epoque	31	*	19	*	0.24	
	Mondial	21	ooo	18		0.33	
	MonSELLA	29		18		0.37	
	Monte Carlo	28		18		0.35	
	Orange Princess	21	ooo	18		0.28	
	Queen of Marvel	13	ooo	20	**	-0.02	
	David Teniers	27		19	*	0.40	
	Eternal Flame	26		19	*	-0.16	
	Peach Blossom	27		18		0.25	
	Willem Van Orange	26		19	*	0.26	
	Willemsoord	28		17	o	0.35	
	Annie Schilder	27		16	oo	0.14	
III. Triumph tulips	Apricot Foxx	13	ooo	18		-0.50	
	Arie Hoek	27		18		-0.68	o
	Boston	24	o	17	o	0.13	
	Brown Sugar	30		18		0.56	
	Carnaval de Rio	41	***	18		-0.72	o
	Escape	28		17	o	-0.50	
	Fontainebleau	26		18		-0.12	
	Guus Papendrecht	24	o	17	o	0.25	
	Havran	25	o	16	oo	0.37	
	Negrita	35	***	18		0.13	
	Paul Scherer	26		17	o	-0.27	
	Pretty Princess	26		17	o	-0.03	
	Recreado	24	o	17	o	0.13	
Rems Favourite	29		17	o	0.05		

	Suncatcher	21	ooo	18		-0.29		
	Yellow Flight	31	*	16	oo	-0.55		
	Jan Reus	13	ooo	18		0.21		
	Garden Party	27		19	*	0.28		
	Kees Nelis	30		17	o	0.09		
	Play Girl	21	ooo	19	*	0.52		
III. Triumph tulips	White Dream	27		16	oo	-0.14		
	Calgary Flames	28		16	oo	-0.17		
	Don Quichotte	26		17	o	-0.21		
	Leen van der Mark	27		16	oo	0.75	*	
	Tender Whisper	35	***	16	oo	-0.22		
	Veronique Sanson	35	***	16	oo	-0.50		
	Purple Flag	26		18		-0.06		
	Gavota	44	***	13	ooo	-0.13		
	IV. Darwin hybrid tulips	Apeldoorn's Elite	25	o	20	**	-0.33	
		Beauty of Apeldoorn	10	ooo	17	o	0.00	
Daydream		10	ooo	19	*	0.08		
Hatsuzakura		14	ooo	13	ooo	0.71	*	
Banja Luka		25	o	19	*	0.43		
Ad Rem		33	**	17	o	-0.08		
American Dream		13	ooo	45	***	-0.30		
Hakuun		31	o	34	***	0.46		
Salmon Impression		31	o	16	o	0.26		
Sweet Impression		31	o	16	o	-0.29		
V. Single late tulips	Atlantis	38	***	18		0.02		
	Ile De France	27		18		-0.26		
	Queen Of Night	35	***	16	oo	-0.46		
	Sorbet	40	***	17	o	-0.49		
	Shirley	25	o	20	**	-0.14		
VI. Lily-flowered tulip	China Pink	38	***	16	oo	-0.36		
	Claudia	38	***	18		0.00		
	Elegant Lady	35	***	16	oo	0.51		
	Sanne	42	***	14	ooo	0.06		
	West Point	42	***	6	ooo	-0.55		
	Burgundy Lace	27		18		-0.14		
VII. Fringed tulips	Canasta	37	***	18		0.65	*	
	Curly Sue	42	***	16	oo	0.30		
	Davenport	42	***	17	o	-0.57		
	Fancy Frills	36	***	16	oo	-0.17		
	Carousel	38	***	17	o	-0.01		
	Daytona	40	***	17	o	-0.11		

VII. Fringed tulips	Lambada	37	***	19	*	-0.38	
	Mascotte	38	***	17	o	-0.13	
	Oviedo	35	***	18		0.03	
	Queensland	36	***	18		0.68	*
	Fringed Family	37	***	18		0.06	
	Valery Gergiev	37	***	17	o	0.33	
	Sensual Touch	35	***	19	*	-0.24	
VIII. Viridiflora tulips	China Town	38	***	15	ooo	-0.36	
	Esperanto	38	***	18		-0.56	
	Golden Artist	38	***	17	o	-0.39	
	Nightrider	39	***	21	***	-0.03	
	Spring Green	39	***	18		-0.27	
IX. Rembrandt tulips	Mix	31	*	18		0.05	
X. Parrot tulips	Apricot Parrot	39	***	17	o	0.33	
	Black Parrot	42	***	17	o	-0.52	
	Estella Rijnveld	38	***	17	o	0.43	
	Topparrot	38	***	18		-0.17	
	Orange Favourite	26	-	23	***	-0.21	
	Parrot King	35	***	18		0.08	
	Professor Röntgen	35	***	18		0.19	
	Super Parrot	37	***	18		-0.04	
	Texas Flame	40	***	17	o	0.50	
	Green Wave	41	***	17	o	-0.24	
	Libretto Parrot	28	-	16	oo	-0.19	
	Blue Parrot	38	***	16	oo	0.00	
XI. Double late tulips	Abigail	39	***	18		0.17	
	Akebono	39	***	16	oo	-0.19	
	Angélique	38	***	17	o	0.01	
	Black Hero	39	***	18		-0.22	
	Blue Diamond	39	***	18		0.05	
	Carnaval De Nice	38	***	18		-0.32	
	Drumline	38	***	16	oo	0.09	
	Queensday	41	***	17	o	-0.42	
	Verona	43	***	18		0.21	
	Sweet Desire	35	***	16	oo	-0.51	
	Maureen Double	45	***	19	*	0.19	
	Renown Unique	44	***	17	o	-0.43	
	Uncle Tom	36	***	17	o	0.70	*
XII. Kaufmanniana tulips	Heart's Delight	6	ooo	16	oo	0.64	*
	Ice Stick	12	ooo	16	oo	0.62	*
	Love Song	7	ooo	18		0.43	
	Scarlet Baby	13	ooo	13	ooo	0.98	**
	Showwinner	7	ooo	18		-0.07	
	Stresa	11	ooo	17	o	-0.48	
	The First	3	ooo	22	***	0.11	

XIII. Fosteriana tulips	Orange Emperor	16	ooo	17	o	-0.21
	Princeps	11	ooo	16	oo	-0.13
	Yellow Purissima	25	o	18		-0.16
	Pirand	19	ooo	16	oo	-0.23
	Purissima	13	ooo	18		-0.30
XIV. Greigii tulips	Solva	13	ooo	17	o	-0.43
	Cape Cod	24	o	17	o	0.01
	Quebec	6	ooo	20	**	-0.25
	Royal Anthos	21	ooo	17	o	0.22
	Sweet Lady	7	ooo	22	***	-0.13
	Red Riding Hood	24	ooo	17	o	0.31
	Mary Ann	10	ooo	16	oo	-0.45
XV. Botanical tulip species	Toronto	11	ooo	16	oo	-0.30
	Flowerdale	10	ooo	16	oo	-0.11
	Tulipa linifolia	21	ooo	20	**	-0.43
XVI. Multiflowering tulips	Tulipa tarda	24	o	17	o	-0.32
	Candy Club	37	***	16	oo	0.31
	Praestans Unicum	14	ooo	12	ooo	0.07
	Jetfire	7	ooo	19	*	0.45
	Antoinette	43	***	16	oo	0.11
	Gipsy Love	44	***	16	oo	0.08

LSD_{5%} = 3 LSD_{5%} = 1 DF=10 (r_{5%}=0.63; r_{1%}=0.76)
LSD_{1%} = 5 LSD_{1%} = 2
LSD_{0.1%} = 6 LSD_{0.1%} = 2

The late flowering of 'Carnaval de Rio' (r=0.72°) of group III - Triumph tulips is also negatively correlated with the blooming time.

Data presented in Table 1 show that in most of the studied cultivars there is no significant correlation between earliness and the blooming time.

CONCLUSION

According to our data, the studied collection comprises several cultivars with a very early flowering and reasonable long period of blooming (i.e. 'Christmas Marvel', group I, 'Hart's delight', 'Ice stick', group XII) which could be used as genitors in breeding early flowering tulips with a long last blooming period.

The most peculiar behavior in the climatic conditions of the "Alexandru Borza" Botanical Garden of Cluj-Napoca presented the cultivars of group XII, especially 'The First', which were rather early in flowering and with a considerably long blooming period - 22 days.

Group XII - Kaufmanniana tulips may be categorized, in the climatic conditions taken into

consideration, as being the earliest cultivars with an average or long blooming period.

Groups XII (Kaufmanniana tulips), XIII (Fosteriana tulips) and XIV (Greigii tulips) include the cultivars with the most flowering precocity while groups VI - Lily-flowered tulip, VII - Fringed tulips, VIII - Viridiflora tulips, X - Parrot tulips and XI - Double late tulips contain the latest flowering cultivars.

Both analyzed characters of the tulips planted in "Alexandru Borza" Botanical Garden of Cluj-Napoca climatic conditions allow the possibility to identify certain genitors that may be used for obtaining new Romanian tulip cultivars.

REFERENCES

1. Ardelean M, Sestras R, Cordea M (2007). Horticultural Experimental Design. Ed. AcademicPres Cluj-Napoca.
2. Brickell C, Zuk J (1997). The American Horticultural Society A-Z encyclopedia of garden plants. New York.
3. Cristea V (2014). Vascular plants: diversity, systematic, ecology and importance. Ed. Cluj University Press, Cluj-Napoca.
4. Demir K, Baskent A, Halloran N (2012). Effects of different substrates on growth of tulip bulbs under ring culture, Acta.Hort. 937:971-975.

5. Eijk JP van, Eikelboom W, Sparnaaij LD (1977). Possibilities of selection for keeping quality in tulip breeding. *Euphytica* (26):825-828.
6. Eijk JP van, Eikelboom W (1980). Methods of selection in tulip breeding, *Acta Horticulturae* (109):217-225.
7. Cultivar classification in *Tulipa* L. (Liliaceae). *Acta Bot. Neerl.* 45: 183-198.
8. Tuyl JM, Creij MGM van (2006). Tulip: *Tulipa gesneriana* and *Tulipa hybrids*. In: Flower Breeding and Genetics - Issues, Challenges and Opportunities for the 21st Century (ed. Anderson, N. O.), Ed. Springer.