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Decoration Period of Flower Species in Urban Environmental Conditions

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Abstract The aim of this paper was to analyze the decoration period of 3 flower species (*Salvia splendens*, *Tagetes patula* and *Gazania rigen*) under urban environment conditions. The paper was carried out in the green areas of Găești town, Romania (44°71'90"N; 25°32'06"E). The results show that time duration and period of decoration are different, which requires special attention when choosing the species for green areas, for maximum and long-lasting decorative effect.

Key words

Salvia splendens, Tagetes patula, Gazania rigen, decoration period

Floral compositions in the green spaces are not randomly made, but taking into account some general principles of composition applied in the design of the green spaces: the principle of functionality, the principle of compatibility, unity, harmony, proportionality, originality. The influence of environmental factors on phenology in different species has been proven [4-8]. At the same time, the pursuit of beauty of people is getting increasingly higher and landscaping of and design of gardens has been widely pursued by people [10]. The results of a study conducted by Rahnema et al. (2019) on preferences and emotion perceptions of ornamental plant species for green space designing among urban park users in Iran, support the assumption of similarity in preferences and requirements of citizens of large cities and despite great diversity in geography, culture, and ethics, people in large cities exhibit similar emotion perceptions. The choice, association and arrangement of the flowering species must be based on a series of criteria regarding the ability to adapt the plants to different environmental conditions, the life cycle duration, the flowering period, the colour and fragrance of the flowers, the size and aspect of plants and so on [12]. The various species of *Salvia* produces spikes of red, purple, pink, salmon, white or bicolored flowers and they are used in landscaping design [1]. Regarding ecotoxicological effects on ornamental plants, African marigold (*T. erecta*) was the least sensitive, and scarlet sage (*S. splendens*) was the most sensitive to Cd [18]. *Tagetes* species, popularly known as marigold, are grown as ornamental plants and thrive in varied agro-climates [17]. Several species are grown in gardens for ornamental purpose. Successful exploitation of *Gazania* in landscaping ~~of parks and gardens~~ is due to the decorative qualities that plants have [16]. In terms of flowering duration, climatic factors effects on the phenology of ornamental plant in urban area [3, 12]. The flower species through habitus, leaves and flowers make up a temporary decoration of vegetation season, being the main element of daily variety of a green space. Temperature significantly influences the onset of spring phenological phases and their duration [4]. The paper aim is to study the decoration period of some floricultural species under urban environment conditions.

Material and Method

Materials. The evolution of vegetation phenophases was analyzed in 3 flowering species: *Salvia splendens* (Red salvia), *Tagetes patula* (French marigold) and *Gazania rigens*. *Salvia splendens* (fam. *Lamiaceae*) is a perennial herbaceous plant, cultivated in Romania as annual plant. It branches well from the base and can have heights of 20-60 cm. The leaves are elliptical, green colour. The flowers grow at the top of the flower stalk, in the form of an ear, red colour. Propagation is done through seeds. *Tagetes patula* (Fam. *Compositae*) is an annual plant, with a height of 40-60 cm. The stem is strongly branched from the base, dark green coloured, with shades of brown or purple. The leaves are alternate, slightly tapered. The flowers, with shades of yellow, orange, brown, are arranged in solitary capitula, simple or involute; they have a diameter of 5-7 cm and bloom from April until late autumn, depending on climatic conditions. Although they are not very demanding plants, they grow and flower beautifully on medium, fertile, sunny, moist soils. They well semi-shade. *Gazania rigens* (Fam. *Compositae*) is a perennial plant, which, under the climatic conditions of Romania, behaves as an annual plant. The plant forms a rich rosette of leaves, with a height of 10-30 cm. The leaves are sessile, oblong lanceolate, dark

green on the upper side and silvery green on the lower side (appearance due to pubescence). The flowers are grouped in large calatidia, similar to daisies, coloured in shades of white, yellow, pink, red, cream, orange; they bloom from June to November, only in sunny weather.

Obtaining the planting material. The species used in the study are propagated by seeds. The sowing was done in February, in greenhouses, in boxes; it germinates in two weeks, at 18-20°C. Plants were transplanted once, in pots of 7 cm in diameter. Planting in open field was done in April-June, depending on climatic conditions.

Place of research. There were established, for planting and observations, two locations in the parks of Găești town: area 1 Central Park (44°71'90"N; 25°32'06"E; 190 m altitude), area 2 "Roses square" (44°72'03"N; 25°30'88"E; 190 m altitude). The planting was carried out in the second half of April, in stage 6.1. for *Salvia splendens* and *Tagetes patula*, when 10% of flowers were open, and in mid-June for *Gazania rigens*, when the first flowers were open (stage 6.0).

Method. Phenological observations (BBCH-scales) were used to identify the stages of phenological development of the plants under study; the main stages of phenological development are presented in Table 1. A randomized complete blocks design was used with four replicates.

Table 1. Main growth stages of the studied flower species

Code	Description
6.0	First open flowers
6.1	10% of open flowers
6.3	30% of open flowers
6.5	Over 50% of open flowers
6.7	Decoloured flowers
6.8	Drying of first flowers
6.9	Over 50% of dried flowers
7.1	Growth of ovary, seeds development
7.3	Maturity of seeds
9.2	Beginning of leaves decolouring
9.3	Beginning of leaves drying
9.7	All leaves dried

Results and Discussions

Table 2 presents the duration of obtaining the propagating material, for green areas, in *Salvia splendens*, *Tagetes patula*, *Gazania rigens* species. Under greenhouse conditions, the seeds rose at 10-14 days from sowing, from sowing to planting the average time being 74 days in *T. patula*, 79 days in *S. splendens* and 127 days in *G. rigens* (table 2). Tables 3 and 4 show the development stages of the 3 flower species, in the green areas of Găești town, under climatic conditions of the year 2019. The studied flowering plants are used in the decoration of green areas. The duration and productivity of flowering in annual flowers is one of the most important indices that define their ornamental value [16]. Regarding the duration of vegetation period, from planting (stage 6.0./6.1.) until the end of vegetation period (stage 9.7), it was 183 days in *Gazania*, 214-217 days in *Salvia* and *Tagetes*. The flowering rate was primarily controlled by the mean air temperature, but there was an interaction with mean photosynthetic daily light integral [13]. The maximum decoration period can be considered from stage 6.5. (full flowering) at 6.9. (over 50% of dried flowers), that is, on average, between 132 (*Gazania*) and 176 days (*Tagetes*). The flowering has spread over a fairly long period, about three to five months (June-October), depending on the species. French marigold are not demanding plants, they grow and bloom nicely and have a rather long decoration period, all summer long until late autumn will be flowering. The scarlet sage is a typical flowerbed species and is frequently planted in the company of many other annual plants. Regarding the duration from planting to full flowering (6.5), the results are different, varying between 13 days in *Gazania rigens* and 18 days in *Tagetes patula* (table 3). Investigating cv. 'Red Torreador' of *S. splendens*, Nowak (2007) observed the first flowering 31.6 days after the seedlings had been planted [2]. *Gazania* is a plant appreciated for the spectacular colouring of petals, very different shades of yellow, white, pink, red, cream, orange. *Gazania* is an ornamental plant that is cultivated on a large scale in gardens and landscapes [14]. The flowers bloom in sunny days and stay dormant in foggy weather and nights [19]. Phenological differences between the two areas studied are insignificant, for several days, probably due to the fact that area 2 is in the peripheral area of the town, where at least one vegetation factor, the temperature, is different from the one recorded in the central part of town (area 1). Therefore, depending on suitability of the temperature combination with the period of illumination, the growth of plant is similarly furthered or hindered [9].

Table 2. Duration of obtaining the planting material (no. of days) in species *Salvia splendens, Tagetes patula, Gazania rigens*

CODE / OPERATION	Sowing date (0.0)	No of days: sowing (0.0) – rising (0.1)	No of days: rising (0.1) - / transplant (1.0)	No of days: transplant (1.0) - the first open flowers (6.0)	No of days: the first open flowers (6.0) - planting
Salvia splendens	10.02	12	6	58	3
Tagetes patula	10.02	10	16	33	15
Gazania rigens	10.02	14	6	107	5

Table 3. Development stages of the 3 flowering species, in green areas of Găești town

Species/code	Area	6.0	6.1	6.3	6,5	6.7	6.8	6.9	7.1	7.3	9.2	9.3	9.7
Gazania rigens	1	15.06	20.06	23.06	28.06	28.09	25.10	07.11	12.11	20.11	30.11	10.12	15.12
	2	17.06	22.06	25.06	30.06	30.09	27.10	09.11	14.11	21.11	01.12	12.12	17.12
Salvia splendens	1	27.04	30.04	03.05	15.05	20.09	30.09	30.10	12.10	28.10	10.11	15.11	30.11
	2	29.04	01.05	04.05	17.05	22.09	01.10	01.11	15.10	30.10	12.12	17.11	02.12
Tagetes patula	1	01.04	15.04	22.04	03.05	30.09	10.10	05.11	20.10	05.11	25.10	20.11	28.11
	2	04.04	17.04	25.04	04.05	01.10	12.10	07.11	22.10	07.11	27.10	22.11	30.11

Table 4. Decoration duration (no. of days) in species *Salvia splendens, Tagetes patula, Gazania rigens* under urban environment conditions

Species / code BBCH	Area	Date of planting	No of days: planting (6.1) - full flowering (6.5)	No of days: full flowering (6.5) - drying of first flowers (6.8)	No of days: drying of first flowers (6.8) - over 50% of flowers are dried (6.9)	No of days: over 50% of flowers are dried (6.9) - removal of culture (9.7)
Salvia splendens	1	20.06	15	138	30	31
	2	22.06	17	137	30	31
Tagetes patula	1	30.04	18	150	26	23
	2	01.05	17	149	25	23
Gazania rigens	1	15.04	13	119	13	38
	2	17.04	13	119	13	38

Conclusions

In conclusion, regarding the decoration period of some flowering species under urban environment conditions, it is found that this is different, which requires a special attention in choosing the species destined to the green areas, for a maximum and long-lasting decorative effect.

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