LANDSCAPING OF SIBERIAN CITIES

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ABSRACT

One of the land management tasks is an improvement of natural landscape. It is often performed by means of decorating urban areas with flowerbeds. As a rule, flowerbeds decorate squares, access roads, objects of landscaping (gardens, parks, boulevards and woodland parks). They help to regulate transport and pedestrian movement, and from ecological point of view they improve city environment. The aim of the research was to identify the most widespread and original types of flowerbeds in Siberia and to specify the most suitable flower species.

Key words: landscaping, Siberia, city, flower garden.

INTRODUCTION

Traditionally, flowerbeds are created in landscape or regular style (Downing, 2010). Landscape style flowerbeds include groups, blocks, mixed borders, solitaires (single plants), flowering lawns, alpine gardens. They are created out of perennial plants of different forms and sizes. Regular style flowerbeds include geometrical parterres, ridges, borders (Nehring, 2002). A special group is represented by modular flowerbeds which are created by using minor architectural forms and vases, containers or baskets for plants (Container Gardening). Nearly all types of flowerbeds are used in Siberian cities landscaping. As a rule, the central part of the city, where administrative buildings are situated, is decorated with parterres that comprise an assembly of flowerbeds, ridges or borders. Usually, annual plants are used, such as salvia divinorum, China aster, Begonia, Iresine, Cineraria, different forms of Sedum to be used as a background (Pasko, 2012).

MATERIALS AND METHODS

Experiments were conducted in an experimental area of the Siberian Botanical Garden of Tomsk State University. It is located in the fifth agroclimatic region of Tomsk Oblast, refers to the subtaiga (southern) part of the region and is characterized as moderately warm and moderately humid (Evseeva, Romashova, 2011). Winter is long with an absolute minimum temperature of down to -58°C. The length of the frost-free period is about 105—125 days. The sum of temperatures above 10° is 1700°C, the amount of precipitation during the same period is about 180-240 mm, 350—520 mm during a year (Agroclimatic resources..., 1975).
According to the Agrometeorological Bulletin from the Hydrometeocenter of Tomsk Oblast, the average annual air temperature in the area of the experiments is 0.6°C. The number of days per year with temperatures above 5°C is equal to 153, above 10°C - 113, and the sum of temperatures above 10°C reaches 1750°C. The vegetation period is determined by a stable transition of a daily average temperature through +5°C, in Tomsk May begins early. The duration of the warm period with an average daily temperature >0°C is 185 days, frost-free period - 95 days (86 - 148 days). The danger of frost exists until mid-June and increases again from mid-August. Fluctuations in multiyear average temperatures in Tomsk region during the summer months are within 3°C. Autumn and spring on the contrary are characterized by large amplitude fluctuations (up to 20—30°C).
The amount of precipitation falling in summer is relatively significant. The maximum falls in the summer. The average monthly distribution of rainfall is as follows: May — 44, June — 70, July — 75, August — 71 and September — 46 mm. In early periods of development plants often suffer from the lack of moisture but in the end – from over-moistening.
The experimental area of the Siberian Botanical Garden, where the observation took place, is located on gray forest medium loamy soils with the content of humus of about 3-4%, and mobile forms of phosphorus and potassium about 10.5 mg/100 g of soil. The soils are characterized by low water and air permeability and the propensity to crust formation. The reaction of the soil solution is slightly acid (5.9-6.0).
The soil was dug, enriched with organic fertilizers and mulched with sifted peat before sowing the seeds or planting the flowering plants in the ground. The first thinning was performed after germination, the second – after the unfolding of true leaves. Further care of the plants consisted of timely weeding, hoeing, and tying up of climbing plants.
At the end of the experiment, the pericarps were carefully cut and wrapped in paper bags. Ripening was carried out in a dry warm room for a month. The plants were threshed. Seeds were cleaned and put in paper bags, which were stored at a

temperature of 22-24°C. Then the germination was determined.

The objects of study were 45 species of annuals related to five families (Vorontsov, 2011). They were characterized by a great diversity of habitual signs, decorative qualities and rates of development: Summer Pheasant's-eye — Adonis aestivalis L. (Ranunculaceae), Love-Lies-Bleeding — Amaranthus caudatus L. (Amaranthaceae), Chinese Aster— Callistephus chinensis Nees. (Asteraceae), Spreading Marigold— Tagetes patula L. (Asteraceae), Viola Wittrock — Viola wittrockiana Gams. (Violaceae), Treasure Flower — Gazania splendens hort. (Asteraceae), Strawflower — Helychrisum bracteatum (Vent) Willd. (Asteraceae), Annual Baby's-breath — Gypsophila elegans Bieb. (Caryophylaceae), Sweet Pea — Lathyrus odoratus L. (Fabaceae), Rocket Larkspur — Delphinium Ajacis L. (Ranunculaceae), Tall Morning Glory — Ipomoea purpurea (L.) Roth. (Convolvulaceae), Slipper Flower — Calceolaria hybrida L. (Scrophulariaceae), Elegant Clarkia — Clarkia elegans Dougl. (Onagraceae), Golden Tickseed — Coreopsis tinctoria Nutt. (Asteraceae), Flowering Flax — Linum grandiflorum Desf. (Linaceae), Garden Nasturtium — Tropaeolum majus L. (Tropaeolaceae), Scarlet Sage — Salvia splendens Sello ex Nees (Labiatae), Drummond's Phlox — Phlox Drummondii Hook. (Polemoniaceae), Common Zinnia — Zinnia elegans Jacq. (Asteraceae), California Poppy — Eschscholzia californica L. (Papaveraceae).

Some species used in the experiment were represented by the following kinds: Chinese Aster 'Blauer Turm' kind; Spreading Marigold 'Frills' kind; Sweet Pea 'Spenser' group, 'Ambition' kind; Garden Nasturtium 'Feuerball' kind; Scarlet Sage 'Scharlach' kind; Drummond's Phlox 'Atropurpurea' kind; California Poppy 'Mandarin' kind.

Most plants were planted by the non-seedling method of cultivation. Seedling cultivation was used for Chinese Aster, Viola Wittrock, Treasure Flower, Strawflower, Scarlet Sage, and Drummond's Phlox.

Determination of timing of the onset of phenological phases and duration of periods of plant growth and development was carried out according to traditional methods (Beideman, 1974; Voroshilov, 1960). In addition, the sum of effective temperatures (in °C) required for the onset of budding, flowering, fruiting and seed maturation phenophases was calculated (Pasko, 1995).

Experiments were carried out in quadruple repetition in plots of an area of about 10 m2. A random selection of not less than 20 model plants from different points of the plot was used to obtain reliable results. The processing of biometric data was performed by a standard method (Dospekhov, 1985).

RESULTS AND DISCUSSION

Special attention should be paid to flowerbeds compositions in the city of Kemerovo (see Figure 2). They combine tricky geometrical forms made from different color flowers and leaf plants (Sedum, Iresine, Lobelia, China aster, one year Kochia).

Green sculptures of animals, traditionally created in Krasnoyarsk and Barnaul can be of great interest. In Barnaul the streets are decorated with models of a sitting bear, Ivonna horse, peculiar Russian fairy tale character Chudo-Yudo-ryba-kit, etc. The sculptures have steel or wire mesh support frames filled with soil substrate, where the seeds are planted. Germinating crop seeds cover the sculpture surface with a lawn that imitates animal fur. Not far from the building of the Regional Administration on a hill, there is a flowerbed clock which looks like a clock-face, the background and marks are made of flowers and the moving hands are made of golden painted metal.

Krasnoyarsk masters are also noted for their original works. The brand sculptures of the city are big scale realistic models of elephants, bears and giraffes, created on bases of stiff support frames filled with soil substrate and covered with ground covering plants like bluish Sedum (which imitate fur and skin) and purple Iresine (eyes, nose, mouth). Everyone who has visited Krasnoyarsk recollects containers with big palm trees which decorate central alleys of the city – those are the presents from one of the former citizens who moved to Krasnodar. Tomsk special features are cachepots with begonias fixed on lamp posts and rectangular vases on the handrails of street barriers. Lately, in several places of the city flower “fountains” have been installed – steel constructions coming out of the center of the composition and having round cachepots with flowering plants on ends.

In Tyumen and Tobolsk flowerbed compositions are diverse. The main accent is made on trimmed lawns and landscape style flowerbeds, which harmonize naturally with old churches. In modern parts of these cities we can point out flower pyramids 2.5-3.0 m high. They look like square containers with soil substrate put into one another and covered with exuberant begonias.

Traditionally, a wide variety of flowerbeds can be found in Omsk. Among them there are large scale flowerbeds in parks and small flower compositions in Japanese, Scandinavian and Russian styles that attract cafes customers.

The analysis of species and variety diversity of flowers allows one to conclude that mainly annual flowers are used for the city landscaping. Perennial flowers like peonies, roses, irises, tulips, narcissus bloom impressively in Siberia but for a very short time. That is why the emphasis is laid on annual flowers which decorate the environment with bright colors and diverse forms, create a feeling of an open air celebration and make the area very attractive.

According to our data the period of annual flowers vegetation in open air is limited by 5 months, the period of flowering – by 2 months (see the figure 3).

The obtained data allowed us to define the most suitable species for efficient landscaping of Siberian cities and to widen their range to at least 50 species.

Thus, the current research allowed the authors to find out species suitable for the creation of compositions for continuous flowering, species suitable for field-seed growing, as well as to consider the most widespread and original types of flowerbeds in Siberia.

a b c d

Figure 2. Examples of annual flower plants in landscaping - Siberian cities.
a, b - Krasnoyarsk, c - Tomsk, d - Barnaul (Source: Photo by the author, 2009-2012)

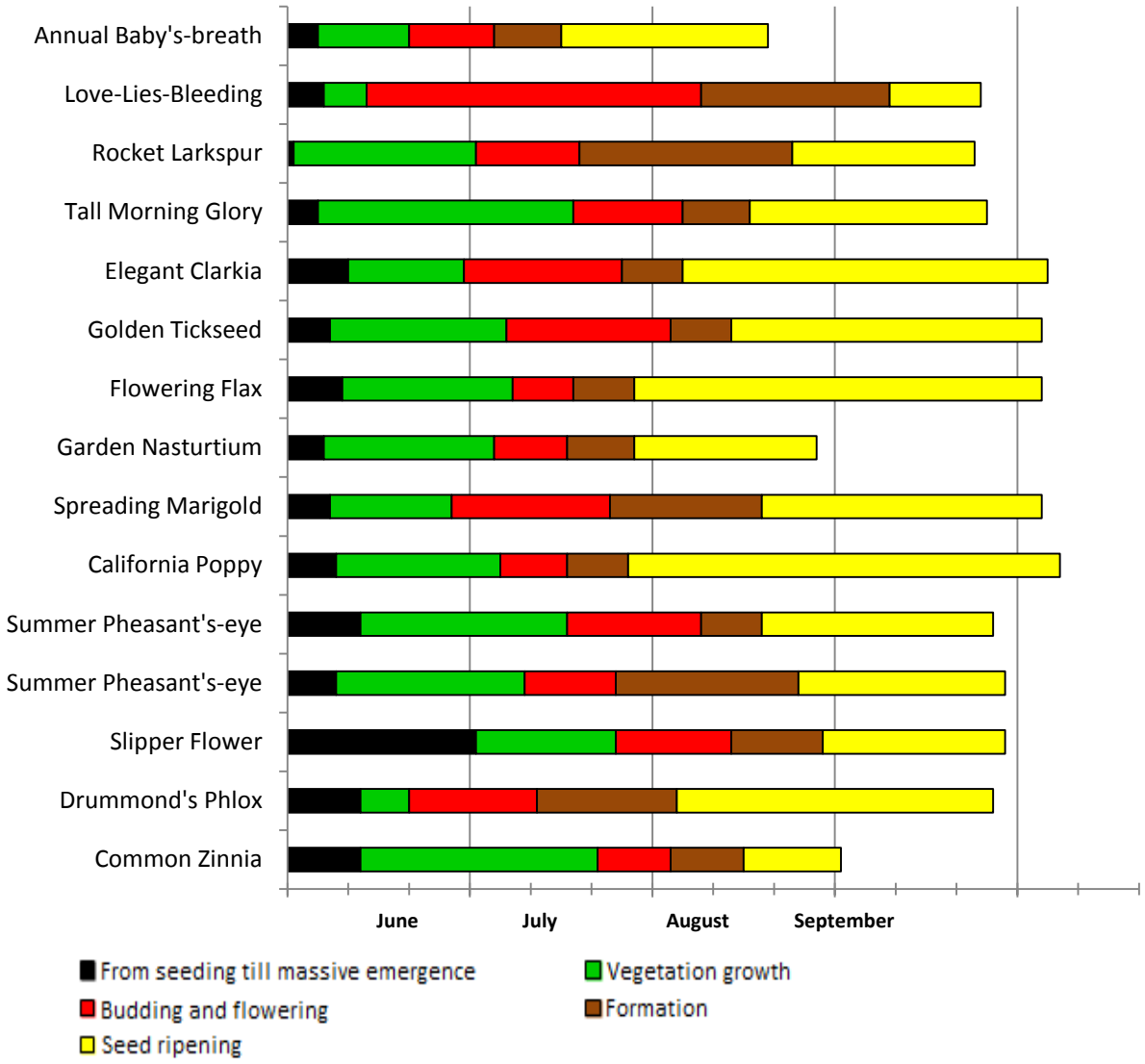

Figure 3. Phenological spectrum of one year flowers development in Tomsk
(as of five years of research by the author)

CONCLUSIONS

The decorative effect of plants is not only restricted to the non-seedling method. In spite of significant difference in duration of the initial phases, 46% of the species are characterized by simultaneous mass flowering and 38% of them – by almost simultaneous flowering. The remaining introducents with a long period of vegetative growth (Treasure Flower, Giant Blue-Eyed Mary) differ significantly in terms of flowering. The difference reaches 50 days. It is natural that they can achieve the phase of mass flowering only with the seedling cultivation method.

The maximum percentage of annuals with rapid development was observed in Novosibirsk, the minimum — in Yakutsk and Tomsk. In Tomsk plants , which unvaryingly give mature seeds, but do not complete the life cycle are primarily used for landscaping. In Irkutsk their use is insignificant. The difference in species sets of annuals of the third and fourth groups in the above mentioned geographic areas is insignificant.

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