FEATURES OF THE BIOLOGY OF FLOWERING AND FRUITING OF INDIVIDUAL WILD SPECIES OF THE GENUS ALLIUM L. AT INTRODUCTION

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ABSTRACT

This article includes the results of a study of the biology of flowering and fruiting 32 taxa of the genus Allium L. at an introduction in a experimental plot in Genetic Resources Institute of the Academy of Sciences of Azerbaijan Republic. All of wild onions included in the study blossom every year, most of them set the fruits and form good seeds. Late-flowering varieties as A.saxatile, A.woronovii and A. fuscoviolaceum are characterized by irregular seed ripening. A. caeruleum do not form the seeds.

Keywords: Allium L., taxon, introduction, flowering biology, layer.

1. INTRODUCTION

One of the main tasks of the scientists is the introduction of wild species of plants, the study of their beneficial properties and possibilities of practical use [Golubev, 2014].

From the point of view of practical use, species of the genus Allium L. should be very interesting [Hasanov and etc, 2016].

For a long time onions are known as edible and medicinal plants [Aliyev, 1997]. All kinds of onions are good meliferous plants. As ornamental plants, onions are promising [Zhiljavichjus, 1987, Balian, 1990, Gidina, 1997].

More than 80 species of onion are grown as ornamental plants in the world [Fouru, 1986, Zimmer etc. 1985].
The study of flowering biology, fruiting and seed productivity for the input wild plants into a culture is one of the priorities. These parameters are important indicators of the vitality of the species in specific habitat, because they determine the renewal of plants [Ibadli etc. 2004]. Therefore, the study of the reproductive biology of species of the genus also is given serious attention. Flowers bows are surrounded by spathe. Shape, dimensions, spout length veils and ways to break are systematic symptoms [Guliyeva, 2012].

Shape, size, length of cover and ways to divide are systematic symptoms [Guliyeva, 2012]. Flowers are collected in umbrella - shaped inflorescence of various form: spherical, hemispherical (dense or friable) clustered, etc. Flower is proper, proterandrical, in receptacle, the crown, consisted of 6 petals, stamens are arranged in two circles, anthers are yellow, 3-alopecia ovary, upper; each locule contains two seeds - embryos [Cheremushkina et al. 1992].

At the majority of kinds of onions, peduncle (spear) is an elongated stalk without leaves, and therefore it has no nodes and internodes. In some varieties, the flower spike is dressed in the vaginas of leaves up to 1/2 or 1/3 part of the stem.

When leaves formation ends, the floral shoot (spear), bearing the inflorescence, comes out of a false stem.

In ephemeral onions, flower spike, dies immediately after flowering, in other non-rhizomatous onions the flower spike dies in a phase of fructification or shortly thereafter.

In all rhizomatous onions peduncle, coming out of the live parts of the rhizomes, remains green long after the seeds are ripe and spill out.

He dies, starting from the top part [Filimanova 1963]. Flowers of wild onions are small, number of flowers in the inflorescence ranges from 10-30 up to 800 or more [Tuhvatulina, 2013].

Form of the crowns varies from stellar to narrow bell-shaped or egg-shaped. Flower color of onion varieties is various: white, yellow, greenish, pink, red, purple, violet, dark-blue, blue. Anthers’ stamens are also different colour.
This, as well as different length of pedicels, makes inflorescences of onion beautiful and attractive and determines whether they can be used for decorative purposes. The flowers of some species (A. ramosum) have a pleasant fragrance [Tuhvatulina etc. 2012].

2. MATERIALS AND METHODS
The investigation was carried out in an experimental plot of Genetic Resources Institute of the Academy of Sciences of Azerbaijan Republic in 2007-2016. Targets were the individual species of the genus Allium L. reached the generative age. Phenological monitoring of reproductive organs were carried out by the methodology [methodology of phenological observations in the Botanic Gardens. ed. L.I. Lapina, 1972].

3. RESULTS AND DISCUSSION
One of the most important indicators at the plant introduction is sustainable passage plants of phenological phases (flowering, fruiting), because it indicates compliance of type to climatic rhythm of land and sustainability of species in culture.

Flowering of most introduced onions starts in the 2-3-th year of life and is repeated annually. Ephemeral onions blossom on 6-7th year of life.

Size, shape and density of the inflorescence (umbrella) is various in different species. The number of flowers per stalk fluctuates even in plants belonging to the same species, for example, A. porodoxum and A. rubellum from 2 to 4, A. leucantum and A. ursinum from 4 to 11, A. moshatum, A. mariae and A kunthianum from 11- 14, A. pseudoampuloprasum and A. lencoranicum от 15 до 43, A. karsianum, A. pulchellum, A. pseudoflavum, A. stamineum, A. szovitsii, A. victorialis, A. affine and A. albidum from 62 up to 114, A. murianteum, A. atroviolaceum, A. globasum, A. waldisteini, A. viride, A. callidictyon, A. schoenoprasum, A. dictyoprasum, A. woronovii, A. fuscoviolaceum, A. caraleum, A. scabriscapum, A. saxatile, and A. rotundum from 346 up to 384.

According to phenological observations, time of flowering and duration vary at different kinds of onions. Onions can be divided into three groups on the time of flowering: spring-early-flowering, middle-flowering and late-flowering.

More than half of the studied species refers to spring-flowering (late May-early July): A. scabriscapum, A. callidactyon, A. szovitsi, A. rotundum, A. schoenoprasum, A. leucantum, A. pseudoamploplasum, A. caeruleum, A. rubellum etc. Peduncle of onions of this group grows
immediately after regrowth of leaves (in May), basically all species bloom and finish flowering in a short space of time. Seeds ripen in the summer months. In *A. schoenoprasum*, *A. pseudoflavum* and *A. atroviolaceum*, set of seed was recorded 58-68%. In *A. mariae*, *A. szovitsii*, *A. scabriscapum*, *A. rotundum* and *A. callidiction* was recorded low set of seed (6-14%).

The period from the spring regrowth before the start of the bloom is 36-52 days. The total duration of the development of the reproductive organs (from the beginning of the flowering regrowth before the beginning of ripening seeds) is 42-72 days. Duration of flowering of one inflorescence is 12-22 days, in individuals is 21-36 days.

The middle-flowerings (end of June-beginning of August) are: *A. albidum*, *A. globasum* and *A. waldsteini*. Regrowth of stalk observed in late May-early June. For onions of this group is also significant friendly efflorescence of individuals. Period from spring regrowth to the beginning of flowering is 66-92 days. The total duration of the development of reproductive organs is 57-95 days. The flowering of one inflorescence lasts 17-24 days, individuals-17-44 days. Seeds ripen in August-September.

Late-flowering varieties (August-October): *A. kunthianum*, *A. marieae*, *A. viride* and *A. saxatile*. Start the regrowth of arrows was recorded in mid-June to early July. The period, from spring regrowth to anthesis is 97-136 days. The total duration of the development of reproductive organs is 78-132 days. Flowering of individual inflorescences is 9-42 days, individuals-18-88 days. Flowering phase of the most onions of this group is expanded due to diversity of the inflorescence appearances within individuals. Flowering terms affect the set of fruits. The later plants bloom in this group, the often they do not form seeds. Individuals, flowering in October generally fall under the freeze, and the seeds are not set. *A. saxatile* and *A. kunthianum* have a low fruit set (up to 22.6-25.5%). *A. mariae* differs with the latest flowering. The ripening seeds of it is irregular.

The timing of flowering species of onion in years with different weather conditions can shift to the 3-20 days.

The duration of a single bloom flower, inflorescences and species groups generally varies considerably. The duration of flowering of individual inflorescences varies from 7 to 40 days, in one flower-3-14 days, in individuals-15-86 days.
Minimum duration of flowering of 1 flower committed in *A. atreviolaceum* (2-4 days), maximum duration is in *A. marie, A. szovitsii* (9-13 days). The inflorescence at *A. viride* finishes blooming quickly - after 8-11 days, long-blooming is *A. albidum* (28-40 days). Fast and friendly flowering individual is *A. viride* (12-19 days), expanded and unfriendly flowering plant variety is *A. albidum* (45-86 days). *A. schoenoprasum* has secondary flowering of most individuals in August.

The inflorescence of onion is often characterized by multiple-age of flowers and specified order of their blooming in the stalk. Seed maturation occurs in the same sequence, as in blooming.

Onions have multiple-aged flowers arranged in three layers, first top bloom flowers, that forms the first layer, then the middle and, finally, the third layer [Kazakova, 1950].

It is difficult to distinguish layers in wild onions, flowers of different age within the inflorescence in individual varieties are placed variously.

On character of blooming flowers in the inflorescence, researched onions can be divided into the following groups:

a) the first flowers bloom at the top of the inflorescence (*A. schoenoprasum, A. dictyoprasum, A. affine, A. pseudoflavum, A. atreviolaceum*);

b) the first flowers bloom in the lower part of the inflorescence (*A. waldsteini, A. viride*);

c) the first flowers blossom not at the top or bottom of the inflorescence and at the side from it, (*A. globosum, A. pseudoampeoprasum, A. fuscoviolaceum, A. mariae, A. woronovii*);

g) flowering in *A. kunthianum* and *A. caeruleum* happens haphazardly and flowers of different ages are around inflorescence.

Ripening of onion seeds in umbrella occurs in the same sequence, as in bloom. Typically the seeds mature after the end of the flowering stage through a certain duration for each specie.

During flowering, each flower does a series of phases of development of their organs, making the total duration of this process.

Opened flowers of most species of onion progresses on one diagram, some of them have minor deviations. It was decided to provide 5 phases of flower development [Tuhvatulina, 2002]:
I-calyx lobes diverge;
II-develops the first round of the stamens, which rises above the unopened calyx lobes;
III- calyx lobes diverge and 2-nd circle of stamens developing till the size of the 1 circle of stamens, by this time anthers are pollinating;
IV-anthers pollinate on all stamens, pistil regrows and reaches up to 2-2.5 mm;
V-pistil grows and rises above the pollens; stigma can receive pollen, anther stalk will fade.

Disclosure of flowers occurs mainly in the morning.

Passing sequence phases for all conditions is saved, but the total duration of the bloom of a flower varies (period between phases of beginning of blooming flowers and fading of all stamens) among the species and extensively depends on weather conditions.

Terms of flowering, pollination and fertilization influence on seed yield and its quality. It is well known that the bulk onion seeds sets as a result of cross-pollination by insects [Kokareva, 1979]. Flowers of onions unadapted to certain types of insects and are pollinated by the insects of different families (hymenoptera, dipterans, tetrapterous etc.). In sunny weather the main pollinators are bees, bumblebees are more active on cloudy days. The flowers of onions are visited by butterflies blackvein, lesser tortoiseshell, flower flies, ants. More active visit of flowers of onion was observed in the morning and early evening hours. At this time especially secretion of flowers’ nectar is abundantly.

Observation of blooming flowers of onions have shown that they refer to plants with natural type of flowers blooming. Within days, the maximum number of blooming flowers is observed from 11 up to 1:00 pm, then gradually subsides and 6:00 pm flowers don’t burst. Meteorological conditions have significant influence. In cloudy and rainy weather blooming flowers almost stops. With a decrease of relative humidity and rise of temperature, the number of blooming flowers increases gradually. The burst of the flowers affects not only the temperature, also the intensity of the sunlight.

Perennial observation revealed that the time of the flowering of species and length of their blooming range by years and depend on meteorological conditions.

In early spring (2000) and in very dry summer (2015) was observed earlier flowering in the majority of onions (12-30 days sooner than average multi-annual values) and some phenophases were faster, and flowering time was reduced (8-16 days, for example, a phase of
flowering of \textit{A. caeruleum} lasts 25-30 days and in 2015 -15 days). Late flowering of onions was observed in cold and rainy late spring conditions (2002, 2003) and flowering was longer (on average 5-8 days).

4. CONCLUSIONS

Thus, all wild onions, included in the study blossom every year, most of them set fruits and form full seeds. \textit{A. caeruleum} do not form seeds at all. Late-flowering species-\textit{A. saxatile}, \textit{A. woronovii} and \textit{A. fuscoviolaceum} are characterized by irregular seed ripening. \textit{A. caeruleum} do not form seeds. \textit{A. marieae} differs with its late flowering.

REFERENCES


19. (Literature is available in Azeri, Russian and Germany).