

B. Winterholler¹, A.K. Auelbekova², D.K. Kyzdarova²

¹Niedersachen, Hannover, Deutschland;
²Ye.A.Buketov Karaganda State University
 (E-mail: a-aelbelova@mail.ru)

Ontogenesis *Delphinium elatum* L. in natural conditions Karaganda region

This article contains a study on the impact of the ecological status of the territory and surrounding area of Ontogenesis of *Delphinium elatum*, a perennial grassy plant is studied. Four periods (latent, virgin, generative, senile) and eight age states are allocated. The general duration of ontogenesis of *Delphinium elatum* makes from 22 to 42 years. In this article shows the study of ontogenesis of *Delphinium elatum*, perennial herbaceous plant. It highlights four periods (latent, virginal, generative, senile) and eight age-related conditions. of ontogenesis *Delphinium elatum*. The total duration of the high ranges from 22 to 42 years old. The results are the basis for the planned organization of the natural populations.

Key words: ontogenesis, *Delphinium elatum*, age periods, age states, Central Kazakhstan.

Since ancient times humanity have used various herbs and resources of mineral and animal origin for the treatment of diseases of different etiology and maintenance of health. If we consider the results of the folk and traditional medicine, we can note a large variety of recipes for almost all types of diseases, ranging from skin diseases to cancer. One of the most promising groups of biologically active substances are alkaloids. One promising genera containing alkaloids, is a genus of Larkspur — *Delphinium* L. (Ranunculaceae) [1–3].

The use of local herbs is important in the development of medical and pharmaceutical industry in Kazakhstan. Flora of Karaganda region includes more than 200 types of pharmacopoeia and folk medicinal plants [1], of which a small portion finds its application.

The important species for practical application are plants of the genus *Delphinium* L. — *Delphinium elatum* L.

The height of branching juicy root is up to 150 cm. The height of the stem, depending on the type, ranges from 10 cm in some alpine species to 3 m and more from the timber. The leaves *palmate-divided* are often deep, multiply dissected into pointy or toothed lobes. *Delphinium* flower with five blue sepals and with white eye. Irregular flowers are composed of five colored sepals. The peculiarity of flower structure is the presence of spur, conical appendage of the upper sepals. *Spur* is from 5–6 mm in primitive types and up to 45 mm in length at the African species *Delphinium Leroy*. *The spur* contains two nectaries, it is divided into two small petal. In the center of the flower nectaries form the eye, often characterized in color from the sepals. The flowers of most plants are blue or purple colored, but there are also other types and colors.

The inflorescence: panicle, brush. Many species of larkspur honey, pollinated by butterflies and bumblebees, and two American species by hummingbirds.

Plants of this kind accumulate alkaloids in overground and underground organs in significant quantities, showing a stimulating, anti-inflammatory and antiarrhythmic activity [4–6].

In medical purposes harvested overground parts larkspur containing various alkaloids are *kurarepodobnymi* means and having a therapeutic effect (*delsemin*, *melliktin*, *elatin*, *kondelfin*) [2, 3]. Grass and underground organs have diuretic, analgesic and anthelmintic action, so they are recommended for the treatment of rheumatism, seizures, severe pain, certain blood diseases and malignant tumors [4, 5].

Our task was to determine the characteristics of ontogenesis larkspur high in conditions of the Karaganda region (Central Kazakhstan).

Materials and methods

Investigations were carried out in 2014–2015 years. on natural areas Karkaraly district of Karaganda region. The age structure of the communities wa studied using the methods R.Rabotnova [7]. Plant Assignment to one or another of age — on the basis of a set of qualitative morphological characters freshly recent dug-out plants and herbariums. Let's take into account the peculiarities of development of overground and underground vegetative organs (leaf structure, the presence of vegetative propagation organs, the structure of the rhizome, the intensity of branching adventitious roots), the degree of development of the generative sphere (number of generative shoots, height and thickness of the generative shoot, number of

flowers on them). Measuring quantitative traits (leaf number, petiole length, average leaf area) was carried out in late June — early July, when the leaves of the spring-summer generation had finally formed lamina. All habitats for plants in general take into account the number of generative shoots, number of flowers on them.

Conclusion and consideration

We have studied a period and status of ontogenesis larkspur high and larkspur dictyocarpous in its natural habitat. The initial periods were studied in the laboratory. In the life cycle of larkspur high we distinguish the following age periods, and states:

- 1) The latent period presented dormant seeds.
- 2) Virginal period consisting of seedling status, juvenile, immature plants and state of adult vegetative plants.
- 3) Generative period presented young state, middle-aged and old generative plants.
- 4) Senile period presented subsenile plants.

The latent period. This period of high larkspur represented single-seed — leaflet (Figure 1). The duration of its life from a few weeks to a year. In natural conditions, the seed shedding occurs in late August — early and mid-September. Seed germination can occur in different ways. In favorable years, with a long and warm autumn seed germinates until mid-late October. In years with an early onset of winter, there is sprouting in the spring of next year, in April and May. The duration period is from 1 to 5 years.



Figure 1. The appearance of the seed larkspur high

Virginal period. Status of seedlings. Germination larkspur overhead. This period is about 2 to 3 weeks. We observed the existence of two seedling cotyledons, oval or elliptical in shape, 4–5 mm wide and 9 mm long (Figure 2, Tables 1 and 2).

Table 1

Formation of the leaf plates in the early stages of ontogenesis larkspur high (virginal period)

Ontogenesis Phase	Leaf type	Form of leaves	Number of leaves, pieces
Seedlings state	Cotyledon	Oval, elliptical	2
	Regular	Three-palmate-dissected	2–3
Juvenile	Regular	Three-palmate-dissected	4–7
Immature plant *	Regular	Three-palmate-dissected	8–12
Generative adult plant	Regular	Three-palmate-dissected	14–20

* Observed extinction cotyledons

Table 2

Duration age of periods and state of larkspur high in natural habitat

Age period	Period state	Duration
Latent	-	1–5 years
Virginal	Sprouts or seedlings	2–3 weeks недели
	Juvenile plants	1–1,5 years
	Immature plants	3–5 years
	Generative adult plant	3–7 years
Generative	Young generative plants	2–4 years
	Middle-generative plants	5–8 years
	Older generative plants	4–6 years
Senile	SubSenile plants	3–5 years
Total:		22–42 years

The first regular leaf develops on top of the epicotyl, petiole 2–2.5 cm and three-palmate-dissected plate, 2–4 cm long and 4–5 cm long. The length of the root system represented a major root of 5–6 cm.



Figure 2. Sprouts or seedlings larkspur high

Status juvenile plants comes from larkspur high with the appearance of the 1st stalks 1st order. The number of true leaves is 4 to 7 pieces, 4–5 cm long and 5–5.5 cm wide, petiole length of 3–4 cm form of regular leaves. Three-pinnatisect.

In plants, preserved hypocotyl, root system is extended to 10–12 cm, there are lateral roots of the 1st order. The duration of the juvenile state 1 to 1.5 years.

In individuals in the immature state a dying cotyledons, formed elongated with shortened base shoot height from 10 to 18 cm. Regular leaves are three-palmate-dissected, larger in size — up to 6 cm in length and width. The outline broadly ovate leaves. The system includes the underground organs in some cases is the main root, and at the same time there is an active formation of a system of adventitious roots. Plants form a well-defined rosette of leaves. In the immature state of the plant is from 3 to 5 years.

Vegetative adult state of larkspur is formed by 1 to 3 branched axes shoots 2nd order. Plant height in this state, is from 20 to 30 cm, diameter -15–25 cm. All leaves - three-palmate-dissected, large, 10–12 cm in diameter, the largest observed at the base of plants. By the beginning of this stage is completely destroyed the main root and hypocotyl, clearly manifested system of underground rhizome orthotropic bodies **kisternevogo**-type, characteristic of mature plants; is extended to a depth of 18–20 cm The length of the ontogenetic state - 3–7 times over the years.

Generative period. Status of young generative plants. The appearance of the generative organs of plants indicates the transition to the generative period, which is accompanied by the increasing complexity of the structure of the overground and underground organs, increase in size. Plant height is 35 to 55 cm and a diameter is 40–45 cm, the root system is extended to 25–35 cm, there are lateral roots of the 2nd and 3rd order.

The first flowers are often underdeveloped generative organs, but even fully developed flowers usually in the first year not form fruit. **Rhizoma** (rootstock) grows mainly in thickness, sometimes taking a pear shape and reaching a length of 2–3 cm and a diameter 0.8–1 cm. B in some cases, underground shoot can begin to branch. System of underground bodies takes the form of an orthotropic-**kistekornevogo** rhizomatous type, which is stored in ontogenesis. The young generative state of larkspur high specimens are 2–4 years.

Middle-generative plants are characterized by considerable complexity of the system of shoots (Figure 3).



Figure 3. Plants larkspur high in the adult generative state (Karkaraly Mountain)

Considerably increasing the number of generative shoots, from 5 to 30 (40), on each shoot is formed to 5–7 axes of order 2, which, in turn, form a 3–6 shoot 3rd order. Generative shoots form the maximum num-

ber of flowers (diameter — 3–5 cm), and fruits. Rhizome strong branches. The duration of middle-aged generative state is 5–8 years.

The individuals of larkspur high in the old generative period decrease the number of generative shoots, and there is more vegetative shoots. On the generative shoots of 2–3 cm in diameter flowers develop only on the axes of the first order, often poorly implemented flowers, do not form a full seed. Number of elongated with shortened base overground shoots up to an average of 5, and their height is about 30–35 cm. Observe the process of particulation of the root system. Rhizome separate *particul* becomes thin, with fewer new adventitious roots; there are long breaks in bloom. Duration of state is between 4 to 6 years.

Senile period. Subsenilne age status. The period comes in larkspur high after complete cessation of the formation of generative plants. Individuals are presented as such clones generated as a result the particulation of adult generative plants. *Particul* Rhizomes are short and have 7–15 thin adventitious roots. Duration of the period is 3 to 5 years. Senile plants in natural conditions have not been revealed.

Thus, the total duration of ontogenesis larkspur high ranges from 22 to 42 years. It highlights 4 age periods and ages 8 states. larkspur plant is high on features of of ontogenesis characterized as a perennial rhizomatous root-plants.

References

- 1 *Задорожный А.М., Кошкин А.Г., Соколов С.Я., Шретер А.И.* Справочник по лекарственным растениям. — М.: Экология, 1992. — 419 с.
- 2 Растительные ресурсы СССР: Цветковые растения, их химический состав, использование; семейства *Magnoliaceae–Limoniaceae*. — Л.: Наука, 1984. — 460 с.
- 3 Растительные ресурсы России. Дикорастущие цветковые растения, их компонентный состав и биологическая активность. Т. 1. Сем. *Magnoliaceae — Juncaginaceae, Ulmaceae, Moraceae, Cannabaceae, Urticaceae*. — СПб.; М.: Изд-во КМК, 2008. — 421 с.
- 4 *Куженов М.К., Грузинская Л.М., Беклемишев Н.Д. и др.* Лекарства из растений. — Алматы: Кітап, 2002. — 208 с.
- 5 *Грузинская Л.М., Гемеджиева Н.Г., Нелина Н.В., Каржаубекова Ж.Ж.* Аннотированный список лекарственных растений Казахстана. — Алматы, 2014. — 200 с.
- 6 *Носов А.М.* Лекарственные растения официальной и народной медицины. — М.: Экспо, 2008. — 800 с.
- 7 *Работнов Т.А.* Жизненный цикл многолетних травянистых растений в луговых ценозах // Тр. БИН АН СССР. Сер. 3 Геоботаника. — М.–Л.: Изд-во АН СССР, 1960. — Вып. 6. — С. 77–204.

Б. Винтерголлер, А.К. Ауельбекова, Д.К. Кыздарова

Қарағанды облысы табиғи жағдайындағы *Delphinium elatum* L. онтогенезі

Мақалада көпжылдық шөптесін өсімдік *Delphinium elatum* онтогенезін зерттеу нәтижелері келтірілген. Төрт кезең (латентті, виргинильді, генеративті, сенильді) мен алты жастық күйі анықталған. *Delphinium elatum* онтогенезінің жалпы ұзақтығы 22-ден 42 күнді құрайды. Авторлардың пікірінше, жұмыс нәтижелері табиғи популяцияның жоспарлы түрде ұйымдастырылуы үшін негіз болып табылады.

Б. Винтерголлер, А.К. Ауельбекова, Д.К. Кыздарова

Онтогенез *Delphinium elatum* L. в природных условиях Карагандинской области

В статье рассмотрено онтогенеза живокости высокой — многолетнего травянистого растения. Выделены четыре периода (латентный, виргинильный, генеративный, сенильный) и восемь возрастных состояний. Отмечено, что общая продолжительность онтогенеза живокости высокой составляет от 22 до 42 лет. Результаты работы, подчеркнута авторами, являются основой для планомерной организации природных популяций.

References

- 1 Zadorozhnyy A.M., Koshkin A.G., Sokolov S.Ya., Schreter A.I. *Handbook of Medicinal Plants*, Moscow: Ecology, 1992, 419 p.
- 2 *Plant resources of the USSR: Flowering plants, their chemical composition, the use of: family Magnoliaceae–Limoniaceae*, Leningrad: Nauka, 1984, 460 p.
- 3 *Plant Resources of Russia. Wild flowering plants, their composition and biological activity*, vol. 1. Sem. *Magnoliaceae–Juncaginaceae, Ulmaceae, Moraceae, Cannabaceae, Urticaceae*, Saint Petersburg; Moscow: Publ. House of the KMK, 2008, 421 p.
- 4 Kukenov M.K., Grudzinskaya L.M., Beklemishev N.D. et al. *Drugs of the plants*, Almaty: Kitap, 2002, 208 p.
- 5 Grudzinskaya L.M., Gemedzhieva N.G., Nelina N.V., Karzhaubekova J.J. *Annotated list of medicinal plants in Kazakhstan*, Almaty, 2014, 200 p.
- 6 Nosov A.M. *Herbs official and folk medicine*, Moscow: Expo, 2008, 800 p.
- 7 Rabotnov T.A. *Proceedings of the Botanical Institute of the USSR Academy of Sciences*, Ser. 3 *Geobotany*, vol. 6, Moscow-Leningrad: Publ. House of the USSR Academy of Sciences, 1960, p. 77–204.