

Development pattern of the endemic of Baikal Siberia - *Dracocephalum popovii* T.V. Egorova et Sipliv. (*Lamiaceae*).

Gulnora Denisova^{1*}

¹Central Siberian Botanical Garden SB RAS, 630090 Novosibirsk, Russia

Abstract. The structure and development pattern of endemic of Baikal Siberia *Dracocephalum popovii* T.V. Egorova et Sipliv were studied in Buryatia. The base of the shoot system of adults is made up of branched and unbranched bi-tricyclic root-elongated and monocyclic elongated monocarpic shoots. Ontogenesis of individuals of *D. popovii* - full, difficult also consists of ontogenesis of a seed individual and the reduced ontogeneses of affiliated individuals. Individuals of a vegetative origin are represented by partial branched and unbranched shoots with an adventitious root system. Every year, the aboveground part of the individual completely dies, the shoot formation occurs due to the kidneys of the geophilic part of the bi-tricyclic rhizome-elongated shoots.

Of particular interest is the study of endemic and rare plants in ecology. Most often, these plants are limited by a rather narrow area. Due to the locality of distribution, such species are most interesting. The study of shoot formation, life form formation and development of individuals creates the prerequisites for understanding the mechanisms of their development of specific habitat conditions and the principles of population formation, due to which plants survive.

Among representatives of the genus *Dracocephalum* L., a significant part of the species is endemic (59%). Most of these species grow in highlands in inaccessible places, which creates difficulties for their study. *Dracocephalum popovii* T.V. Egorova et Sipliv. - endemic of Eastern Siberia with a low natural number, is listed in the Red Book of the Irkutsk region [1]. The biology of the species has not been studied. The purpose of the work is to study the structure and development pattern of the endemic of Baikal Siberia *D. popovii*.

D. popovii - petrophyte. It grows in highlands on gravelly slopes, stony-gravelly talus (often carbonate) and coastal gravels [2]. According to N.V. Stepansova [3], *D. popovii* is a pioneer plant, found separately or as part of small-sized unclosed plant groups [1].

To date, only seven localized occurrences of this species have been noted: six in the Irkutsk region on the Baikal ridge [4] and one isolated site on the Tunkinsky ridge in

* Corresponding author: gulnoria@mail.ru

Buryatia [2]. Known coenopopulations of *D. popovii* in the Irkutsk region are protected on the territory of the Baikal-Lensky Reserve [3].

Material for the analysis of individuals of *D. popovii* was collected at the bottom of a steep slope of the right tributary of the Kyngargi River of the Tunkinsky Ridge in Buryatia in a community with *Dryas crenulata* Juz., *D. popovii*, *Thymus mongolicus* (Ronn.) Ronn., *Pentaphylloides fruticosa* (L.) O. Schwarz, *Juniperus davurica* Pall., *Salex saxatilis* Turcz. ex Ledeb. on a moving talus. The slope is formed by fragments of limestone, ranging in size from 5 to 25 cm or more (steepness of slope 30-35°). The community is sparse. The total cover reached is 20%, the projective cover of *D. popovii* is 7%.

The life forms of mature individuals of *D. popovii* were identified according the ecological-morphological concept [5] and systematization of plants by type of biormorph [6]. The concept of phases of morphogenesis was applied in the work [6]. The ontogenesis of plants was described in accordance with the concept of discrete ontogenesis, proposed by T. A. Rabotnov [7] and A. A. Uranov [8].

A study of the structure of adult individuals revealed that *D. popovii* is the longrhizomatous-taproot herbaceous polycarpic related to explicit polycentric biormorph. Branched and unbranched anisotropic bi-tricyclic rhizome-elongated and monocyclical elongated monocarpic shoots form the basis of the shoot system of adult *D. popovii*. Geophilic sections of rhizome shoots (6–15 cm long) grow monopodially underground from a year to two years and become a communicative hypogeogenic rhizome. Each annual growth of the rhizome consists of 4–7 metameres, the first 1–2 of which are short, the rest are long. The adventitious roots are formed at the nodes and internodes of the metamers of the geophilic part of the shoot. In the second or third year the closed apical bud of a growing rhizome unfolds in an aboveground annual anisotropic elongated shoot. The aboveground part of monocarpic shoots can reach 11–22 cm. The root system is mixed.

The analysis of the structure of coenopopulation of *D. popovii* shows that it consists mainly of individuals of vegetative origin (ramet). Three individuals of seed origin were found in it, which grew in gently sloping areas. The low content of seed individuals is most likely due to the washing off of seeds and young plants from a steep slope. In this regard, only ramet has studied morphogenesis. In the ontogenesis of ramets, a complex system of branched and unbranched partial shoots connected by communication rhizomes is formed; as a result, of *D. popovii* individuals grow out. Ontogenesis of ramet may be expressed by a sequence of the following morphogenesis phases: partial shoot - a system of branched and unbranched partial shoots - a partial shoot. The ontogenesis of individuals of vegetative origin is depicted in the figure.

Ontogenesis ramet begins with an immature state (Fig.). Immature individuals are a monopodially growing vegetative bi-tricyclic rhizome-elongated partial shoot of the n-th order. Its underground part is formed by 1-2 annual growths. In the second or third year, the aboveground vegetative part of the shoot develops. The apogeotropic part of the shoot is represented by short metameres with a pair of scaly and transient leaves, the orthotropic part consists of 5–6 metameres bearing green leaves. Shoot branches in the underground part. At a three-year cycle of development, the buds of the first annual growth become dormant (a small part of them is realized later). Shoots of n + 1 order are formed from the bud of the geophilic part of the second annual growth. One or two new rhizome-elongated shoots and 1–2 monocyclical elongated vegetative shoots develop. After the growing season, the aboveground part of monocyclical and rhizome-elongated shoots dies. The geophilic, apogeotropic parts and the first metamer with green leaves remain alive in the rhizome-elongated shoots; 2-3 metameres of the basal part with scaly leaves remain in monocyclical shoots. The buds of the basal part of monocyclical shoots become dormant and eventually die. Few adventitious roots develop on the rhizome.

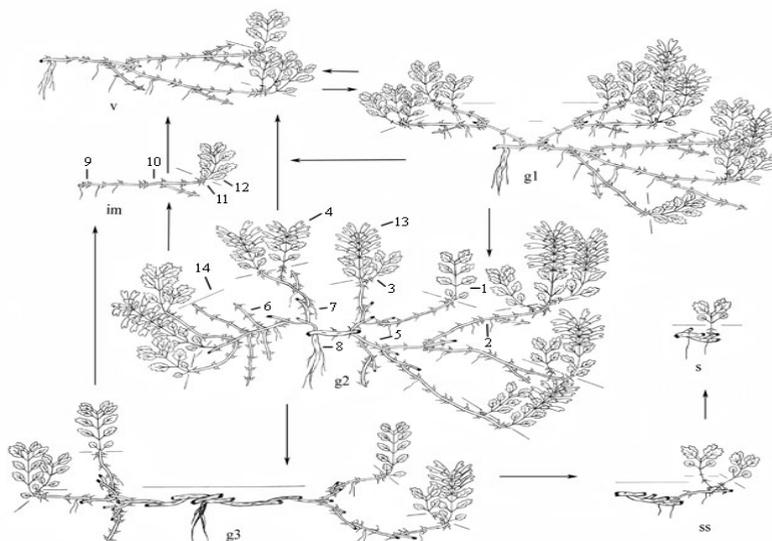


Fig. Ontomorphogenesis *Dracocephalum popovii* T.V Egorova et Sipliv. im–immature, v–virginal, g1–young generative, g2–mature generative, g3–old generative, ss–subsenile, s–senile; 1 – unbranched bicyclical rhizome–elongated shoot, 2 – branched tricyclical rhizome–elongated shoot, 3 – monocyclical vegetative elongated shoot, 4 – monocyclical generative elongated shoot, 5 – communication rhizome, 6 – growing rhizome, 7 – adventitious root, 8 – secondary taproot, 9 – shortened metamer with a scaly leaves, 10 – elongated metamer with a scaly leaves, 11 – shortened metamer with transient leaves, 12 – elongated metamer with true leaves, 13 – synflorescence, 14 – soil level.

The geophilic part of the rhizome–elongated n-th shoot is actively branching, 2–4 new rhizome–elongated vegetative shoots are developing. Individuals become virginal. The branching of the geophilic part of new rhizome–elongated shoots occurs similarly to the maternal one. However, in some shoots from the buds of the apogeotropic part, n + 2 monocyclical vegetative shoots are developed; a system of branched and unbranched partial shoots is formed. The buds located in the nodes of the transient leaves move to growth. Due to the development of a large number of rhizome–elongated and monocyclical shoots of n + 2 orders, the volume of the photosynthetic surface of *D. popovii* increases. Individuals grow out, capture the territory. The implementation of the bud is stretched over time. Asynchronous development of the buds of the rhizome part of the shoots during ontogenesis contributes to the elongated formation of rhizomes. A communication rhizome begins to form. One of the adventitious roots can dominate its development, which leads to the formation of a secondary taproot.

Young generative plants consist of 2–8 branched and unbranched partial shoots. 1–2 rhizome–elongated and 1–2 monocyclical elongated shoots bloom. The shoots of enrichment unfold from the buds laid in the nodes of the first green leaves of the orthotropic part of the shoot and die off in the same year. The inflorescence is frondose open spikelike thyrsi 3.5–4.2 cm long, consisting of 3–4 opposite dichasia. The underground sphere of individuals is formed by geophilic parts of rhizome–elongated shoots of different orders. The diameter of individuals can reach 20 cm. At the end of the young generative state, decay of perennial sections of rhizomes leads to the formation of ramet of a different ontogenetic states (from im to ss). Vegetative reproduction continues to the old generative state.

In the polycentric system of mature generative individuals, there are from 8 to 13 generative and 5–9 vegetative shoots. The length of the thyrsus is from 8.1 to 12.5 cm. The number of dichasias in the thyrsu can reach 10. Tricyclic shoots are rarely formed. Individuals, due to the development of new rhizome shoots at the periphery, increase in diameter up to 30 cm. Some rhizome-elongated shoots in this state actively branch, almost all the bud of the geophilic part start growing. Due to this, up to 6 growing rhizome shoots with their own adventitious system can form on one shoot. Growing rhizome are lighter than communication ones.

The diameter of the old generative individuals practically does not change. In their central part, a large number of dead shoots accumulate. New shoots are deployed mainly from buds of regeneration zona located in the nodes of short metamers in the basal part of any rhizome shoot of the previous order. The shoot system of individuals is represented by bicyclic rhizome-elongated shoots (one generative and 1–4 vegetative), often unbranched. The shoots of enrichment in this state do not develop. The length of the thyrsus decreases to 1.8–3 cm. The number of dichasia also decreases to 2–3. The underground sphere is formed by two (rarely one) long, up to 15 cm, thickness up to 0.4 cm and practically without adventitious roots by communication rhizomes. New adventitious roots are formed only on young growing rhizomes.

The ramet of the subsenile state consists of 2–4 vegetative monocyclical shoots that develop from sleeping buds. Buds located on the previous annual growth of rhizome shoots. Individuals lose the ability to form rhizome shoots and vegetative reproduction. Communication rhizome 6–13 cm long, with a small number of old adventitious roots. Rhizomes die off from the basal end.

Senile individuals represent a small area of preserved thickened perennial rhizome with a small number of sleeping buds. One of them starts to grow. One monocyclical vegetative shoot is deployed. On the rhizome, 1–2 adventitious roots are preserved.

Thus, *D. popovii* has the longrhizomatous-taproot herbaceous life form in the conditions of Buryatia. Ontogenesis of individuals is complex. The intensive formation of vegetative progeny reduces the number of generative shoots, and as a result, individuals of seed origin. The regeneration of coenopopulation occurs as a result of the appearance of rejuvenated ramets. The individual development ramet may be expressed through successively replacing each other morphogenesis phases: partial shoot - a system of branched and unbranched partial shoots - a partial shoot. The viability of partial formations is provided by a fast-growing system of adventitious roots on young geophilical areas of shoots.

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