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Некоторые результаты изучения вида очитка обыкновенного (*Sedum telephium* L.) в условиях интродукции ботанического сада

Some results of studies of *Sedum telephium* L. under cultivation in the botanical garden

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Реферат. Очиток обыкновенный (*Sedum telephium* L.) семейства Толстянковые (Crassulaceae DC.) представляет собой многолетнее травянистое растение, высотой от 30 до 60 см (Grubov, 2008). В статье представлено изучение биологических особенностей адаптации семян и корневищ очитка обыкновенного к окружающей среде. Вид хорошо адаптируется, стабилизация фазы роста наблюдается в возрасте 4–5 лет. Было показано, что это растение в ботанических садах имеет большие размеры, чем натуральные травы. Продолжительность активной вегетации очитка обыкновенного в условиях интродукции ботанического сада составляет 136–146 дней. Основываясь на оценке интродуктивной способности, ему присвоено 14 баллов. Это является показателем полной интродукции.

Summary. The article presents the results of study of *Sedum telephium* of the family Crassulaceae under cultivation in botanical garden. The species is perennial herbaceous plant in height from 30 to 60 cm (Grubov, 2008). *S. telephium* is very well adapted to the environment and very good for seeds and rhizomes formation. It is observed that the growth phase stabilizes in 4–5 years. It has been shown that this plant in botanical gardens increases the size and height than natural herbs. The duration of the active vegetation of *Sedum telephium* is 136–146 days in the Botanical gardens. Based on the assessment of the ability to introductive, there are 14 points. This is an indication of a full introduction.

Mongolian flora includes about 3000 species of vascular plants belonging to 618 genera and 103 families. Of these, about 91 families from 745 species belong to medicinal, decorative plants and plants important for economic. Scientists have found that 75–80 % of medicinal plants in Mongolia do not have sufficient natural resources (Ligaa et al., 2006). More than 100 species of plants are currently used for medicinal purposes and more than 200 species are used for pharmaceutical purposes. (Davgatseren, Narantsetseg, 2005). For example, in a year, *Sedum purpureum* preparing includes 2 tons for pharmaceutical purposes (According to the report in 1999 year).

On the other hand, based on ground and satellite data it is seen that Mongolia has a tendency to expand the desert and desert steppes. But in recent years, due to the impact of climate change, 78.2 percent of Mongolian land has deserted at medium to high intensity desertification, and the temperature increases during warm-up periods from the 1990s.

It is necessary to study the biological features of adaptation to the cultivation of these plants and to investigate rhizomes and seeds, to study the yield of seeds and biomorphology against natural plants.

Scientific materials and methodology

Sedum telephium L. is perennial herbaceous belonging to the family Crassulaceae DC. (Jamiyandorj et al., 2011). We planted 10 stock plant material of this species from the Mongol Dagur (Terelj) in the practical area of botanical garden.

During the growth period, the plant was observed once every 3 days, at other times, every 7 days, at the beginning of each stage of vegetation (Beideman, 1960) by recording the periods from spring to the second

year, leaves of shoots, cones, flowering roots, smoothness, graduation, seeding, maturation and the upper part of the earth.

Vegetative organs: sprout (se), seedling (p), juvenile (j), immaculate (im) and virginyl (v).

Generative organs: budding, 10 % flowering (young-aged generative), 50 % middle-aged generative, old-aged generative, sub-senile plant and senile plant by G. N. Zaitsev (1985). ANOVA JMP 10.0 releases growth rates for the year, month and 10 days.

The choice of potential cultivation and adaptation is estimated by three assessments.

Seed growth rate

Using the daily quantitative data of the census for 10 days:

$$E = \frac{H_1 Y_1 + H_2 Y_2 + \dots + H_n Y_n}{H_1 + H_2 + \dots + H_n}$$

E –Average rate of seed multiplication (by days), H –Number of seeds multiplied by day (by numbers), Y –Number of days of multiplying seeds, n –Number of the last account day

Suitable temperatures for germination of seeds

The temperature is determined by the temperature thermostat of the germination rate of the seeds.

Research result

In the first two years of desalination, it can grow and grow in the soil for the third year to flourish.

According to the forecast of the Botanical Garden, the average annual temperature in April–May (2014–2016) was 8.2–8.8 °C when the vegetation was 10.7–31.8 mm (2014–2017).

The most favorable temperature was July (2014–2017) with 16.6–20.2° C while the amount of precipitation (2014–2017) was 55.1–118.5 mm.

The following figure 1 shows, that plant growth is not normal since the water temperature is low and the precipitation is low, but the constant irrigation and maintenance area is negative (table 1).

Table 1.

Indicators for monthly scenarios

Year of research	Re-grown	Bud flowering	Flowering	Seeding	Duration of the growth
2013	V/10–VI/18	VI/26–VII/12	VII/15–VIII/20	VIII/15–IX/25	137
2014	V/05–VI/10	VI/24–VII/08	VII/05–VIII/15	VIII/20–IX/25	142
2015	IV/28–VI/04	VI/20–VII/02	VII/03–VIII/15	VIII/20–X/05	144
2016	IV/25–VI/06	VI/24–VII/02	VII/05–VIII/15	VIII/25–X/08	144
2017	IV/25–VI/08	VI/25–VII/05	VII/05–VIII/18	VIII/28–X/10	146

S. telephium increases rapidly in the middle of May and are dying in the middle of September in natural conditions (Volodiya et al., 2010). However, *Sedum telephium* grown in the botanical garden was restored as a result of the phenomenon of 2013, observed in May, 10 and disappeared in September, 25. However, 4.5 years after breeding, plant growth is caused in late April and in autumn – early October. The plant is directly connected with irrigation and maintenance. The cultivation of the cultivated *Sedum telephium* in Kherlen was very good for 2–3 years (Jamiyandorj et al., 2011).

S. telephium, which is cultivated in the botanical garden, grows on average 6–7 cm and grows to 4–5 cm wide, the growth of shoots increases with the growth of the normal age of 3–4 years.

However, if growth is normal, it is necessary to reproduce immediately and if the plant does not breed, the plants will become old and the above parts of the earth will be susceptible to this.

In 2016, 8 bushes with the height of 20 cm were divided into rhizomes which weredivided into 3-5 parts per bush and 90 % of them continued to grow after transplantation (table 2).

Table 2.

Some biomorphology features of *Sedum. telephium* L.

Plant name		Bush width /cm/	Plant height / cm/	Shooting numbers		Flower bags		Flower diameter /cm/
				Growing shootings	Breeding shoots	Number of flower packs	Number of flowers in the packs	
<i>S. telephium</i> L.	2013	12.3 ± 0.54	24.6 ± 1.35	4 ± 0.70	2 ± 0.32	3 ± 0.82	15 ± 1.17	0.5 ± 0.43
	2017	35.2 ± 0.82	60.8 ± 1.44	11 ± 0.70	7.2 ± 0.32	8 ± 0.82	51 ± 1.17	0.5 ± 0.21

The yield of seeds of *Sedum telephium*

Sedum telephium seeds are very small, thin and light, and the weight of seeds is 0.06 g. The total seed area is 7.35s with 0.09, and 0.49 seeds are deviation from 1.34 ± 0.04 deviation 0.22, and its width is 0.33 ± 0.01 deviations of 0.07.

On average, 11 shoots of the plants has continued 7 shoots where 408 seed plants per bush, 155 seeds per plant, 63.240 seeds per plant, 50375 seed plates per plant and yield of seeds is 85%. This shows that the plants can be planted in a normal botanical garden (table 3).

Table 3.

Seed growing study (2016)

No	Specifications	Name of plant
		<i>Sedum telephium /purpureum/</i> L.
1	Number of flowers in a bush /piece/	408
2	Number of seed blossoms in a bush plant /piece/	325
3	The number of seeds in a pack/piece/	155
4	The number of actual seeds in a bush /piece/	50375
5	The number of possible seeds in a shrub bush/piece/	63240
6	% of yields and seed yields	85 %

The number of seeds multiplied by cell of *Sedum telephium*

The laboratory showed seed sowing on the 5th day and half of the seeds were completely sprouted after 85 days of sowing. 85 % of seed germination was found in greenhouses and open fields. Sowing is easy to grow, and there is no need to take care of it. *Sedum telephium*, which was planted with seeds, is comparable to the biometrics of 2016 with the width of plants, the height of plants, the growth of plants and the number of breeding shoots.

In the first year of propagation by seeds, its height, width and shoots from the first year of growth of germination of seeds and breeding shoots were arose, and seeds can be sown further.

In accordance with the evaluation of the degree of simplicity, *Sedum telephium* was evaluated as 14 or further promoted further cultivation.

Discussion

Sedum telephium is a perennial herb that grows with the height of 30–60 cm (Ligaa, 2006). *Sedum telephium* is cultivated in the botanical garden, has a height of 40–65 cm and the highest is 72 cm. It can be seen from the study that the plants compared to the growing from natural plants are relatively higher than in the nature.

Growth in 2–3 years after the rhizomes in the Kherlen region is normalized and flowering is good. (Jamiyandorj et. al., 2011). In the second year of planting by the rhizomes in the botanical garden, the growth was satisfactory and the reproduction of seeds was successful and some biomorphological indicators were increased.

Conclusion

After the planting the *Sedum telephium* in the botanical garden, some of the bio-morphological factors increased and the growth time stabilized and it adapted well to the environment.

Individual rhizomes can be divided into 3–5 shrubs and 90 % could survive after transplantation.

The seeds are very small, but the seeds yield is 85 %, 70 % survival rate and 14 yields.

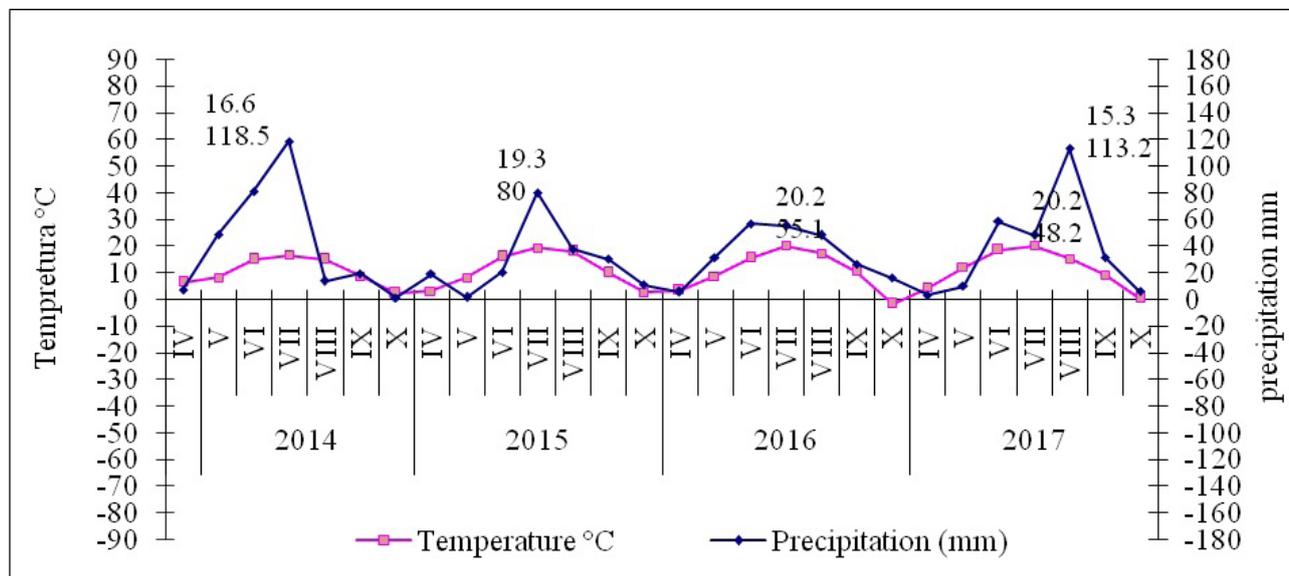


Figure 1. Meteorological news of the Botanical Garden in 2014–2017 (Meteo-station in Amgalan).

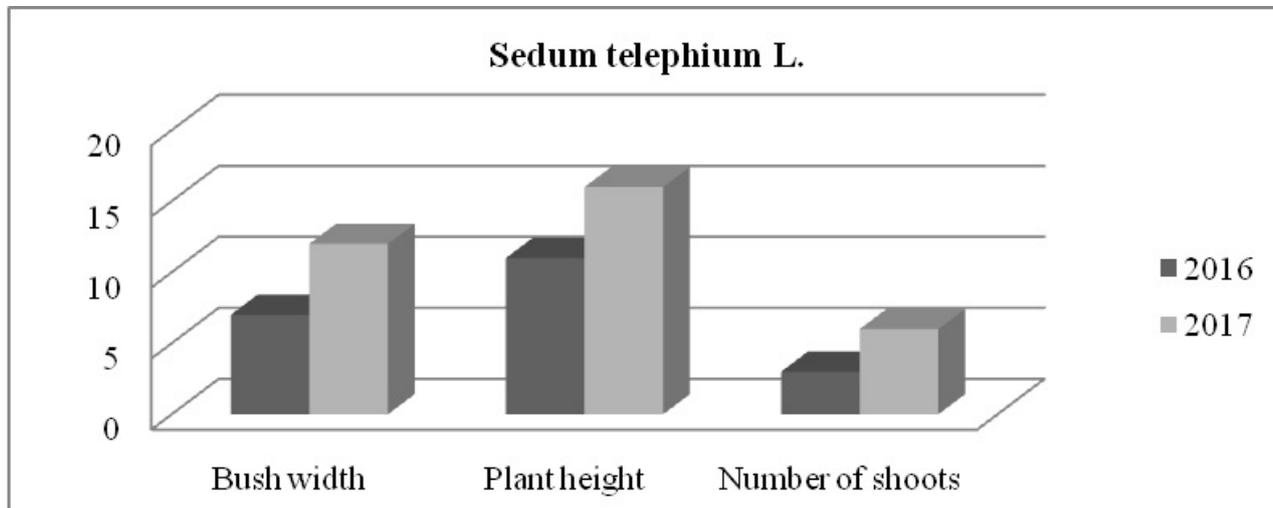


Figure 2. Growth of the seed-planted *Sedum telephium*.

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