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The Bioecological Properties of Medicinalpot Marigold (Calendula Officinalis L) In Soil-Climate Condition of Khorezm Region

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Annotation. This article discusses the biological properties of medicinal cloves grown in the conditions of Khorezm region, the dynamics of flowering and the results of research on growth and development during the season. Based on the results obtained, it was proved that Khorezm region has the potential to expand the crop area due to the successful completion of all stages of ontogeny under the conditions of introduction for the medicinal plant calendula (Calendula officinalis), seed reproduction, pest control.

Keywords. Medicinal plants, soil-climatic conditions of Khorezm region, medicinal calendula, biological properties, dynamics of flowering, growth and development, introduction, ontogeny.

The Actuality of the Issue: According to the World Health Organization (WHO) statistics about 65% of the world's population consumes herbal medicines, with sales of $ 21 billion a year. One of the main reasons for this is the proximity of biologically active substances in medicinal plant products to the human body, the harmlessness of preparations obtained in this way to the body, the possibility of long-term medication that does not cause allergic reactions and chance of culturing of these plants [1].

At present, there are about 500,000 high-yielding plants in the world, of which only 5% is medicinal species with defined pharmacological activity. Although 60% of the available pharmacological drugs are derived from medicinal plants, the source of many species is insufficient. Accordingly, it is of precious scientific and practical importance to identify the resources of promising medicinal species and develop ways to grow them in order to provide the pharmaceutical industry with raw materials [2].

In order to obtain high quality raw materials of medicinal plants, first of all, it is necessary

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to modernize the cultivation of this plants through in-depth study of agro-technical and biological properties, as well as its cultivation regulations, i.e. planting methods, planting dates, norms and timing of mineral and natural fertilizers based on soil and climatic conditions. It is necessary to implement modern agro-technologies to product manufacturing [3].

One of the important directions in the effective use of medicinal plants growing in natural conditions is the development of a long-term scientific program for the conservation and effective use of medicinal plants. In order to implement this program in Uzbekistan and to meet the demand of pharmaceutical companies for raw materials we need to find sufficient reserves with wild medicinal plants of raw materials, to arrange in-depth, scientific study of agro-techniques for their care and cultivation, and expand the existing arsenal of medicinal plants in each region. One of the most relevant and promising directions today is to introduce various biologically active additives, phyto-preparations and herbal teas on their basis and introduce them into production [4].

The flora of the territory of our country is rich in high profitable plant species that are important for the national economy. These plant species include the medicinal the pot **marigold (**Calendula officinalis L.)which is used in traditional and modern medicine. Although this medicinal plant has been studied in different soil-climatic conditions of the republic, the bio-ecological features of the plant in the saline soil-climatic conditions of Khorezm region, as well as from an agricultural and agronomic point of view have not been sufficiently studied until recently.

Experimental research studies on the biology of this species are relevant to include the medicinal *pot* ***marigold*** (Calendula officinalis L.) in the list of cultivated plants, to measure its prospects to culture of the most promising varieties and proper zoning of it in the area. It is important and practical to monitor the growth and development of the plant during the season, to determine the dynamics of flowering, as well as to develop effective agro-technological methods for their cultivation and reproduction to shed light on the biological properties of medicinal cloves during its ontogeny introduced in the soil and climatic conditions of the Khorezm oasis.

The Objectives and Methods of the Research: As mentioned above, the purpose of our research is to determine the biological properties of the medicinal pot marigoldgrown in the natural conditions of Khorezm region during its ontogeny, to study the dynamics of their flowering and their growth and maturation during the season. The research was conducted at the experimental base of the Academy of Mamoon in in Khiva district, Khorezm region. The research has been conducted mainly on a small-scale experiment plots with length (1 to 10 m2). The surface of the area is 200 m2.The observations were made on the timing of the onset of the main developmental phases of plants in the study of seasonal rhythms of development by traditional

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methods. Processing of phenomenological observation data [5] was carried out taking into account the additions by V.N. Nilov (1980). The seed germination is also determined [6]. Fertility analysis was performed in 3–4 repetitions, each containing 25–100 seeds [7]. The seed germination of species was studied according to the method of seed growth, and seed yield was studied according to the generally accepted methodology [8].The variations and repetitions were placed in a series of one or two tiers. The density of the plants was determined by counting the plants twice in all variants, after germination and after harvesting. The methods offered by Borisova (1972), I.N. Beydeman (1974) methods were used in the study of plant ontogenetic cycles [9] and its seasonal development. [10,11]. Flowering biology was implemented on basis of the methods offered by O.A. Ashurmetov and H.Q.Karshibaev(2008) [12]. Statistical processing of the obtained data was carried out according to the method of analysis of dispersion and correlation-regression [13]. The experiments are conducted basing on generally accepted agricultural techniques.

The Research Outcome and Their Analysis. The flowering and seed formationof introduced species in new conditions is an important indicator of adaptation. The plant blooms, produces seeds, and eventually leaves offspring only when the plantadapts to the new conditions and suits to the demand for environmental factors. This has been reflected in many scientific studies. Many scientists have studied the flowering biology of acclimatized plants [14].

The general order of the flower opening sequence is centrifugal among the members of the Asteraceae family. The observations present that flowering in the inflorescence of Calendula officinalis occurs 5-6 flowers in a basket in succession or simultaneously. The pollen of Calendula officinalis is ripened the day before the flower opens. At this time, the pollen grain consists of three cells, two sperm and one generative cell, with a viability of 85-90%.

It was found that the seed was not ready for pollination. After flowering, the seed pod is ready for pollination after 6-7 hours and maintains its viability for 1.5-2.0 days. There are various opinions in scientific sources that the pollen cracking is observed in a closed bud, the phenomenon of autogamy is not observed, as well as dust does not grow in pot marigold(Calendula officinalis L.) seed pods [15].

In order to determine the time of opening of the flower of Calendula officinalis, it was determined that the outer shell of the basket wrap leaf began to crack and three parts of the unopened flower were visible inside the basket in March 2019 in the soil-climatic conditions of Khorezm region. The flowering period of a plant depends on its origin, biological properties, early or late spring season, and the duration of flowering depends on the weather conditions and agro-technical measures in the area where the plant grows.

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The studies have shown that a single flower of Calendula officinalis blooms for 6-8 days, all flowers in a basket for 12-15 days,the flowers in a generative stem and a plant for 30-35 days. In Calendula officinalis, the duration of flowering depends on weather conditions. The number of opened flowers in each bush was calculated to study the dynamics of daily flowering. According to researchall Calendula officinalis tubers pass from the first year to the generative period under the conditions of introduction.The dynamics of diurnal flowering in Calendula officinalis during the second growing season under introduction conditions were studied. Calendula officinalis flowers open only during the day. Air temperature and relative humidity are the main factors influencing the flowering and pollination of a plant. The number of flowers opening increases during the day, as the air temperature rises and the relative humidity of the air decreases.It was noted that the opening of the flowers will last from 7a.m. to 6p.m. In the calendula officinalis bush, an average of 11 flowers opened in the basket during the overall flowering period. It was found in all observations that a large number of flowers open between 10a.m. and 2 p.m.and the highest peak is at 12 p.m. the visit of bees, wild bees and various species of butterflies on the flowers of *Calendula officinalis*was active at the same time.

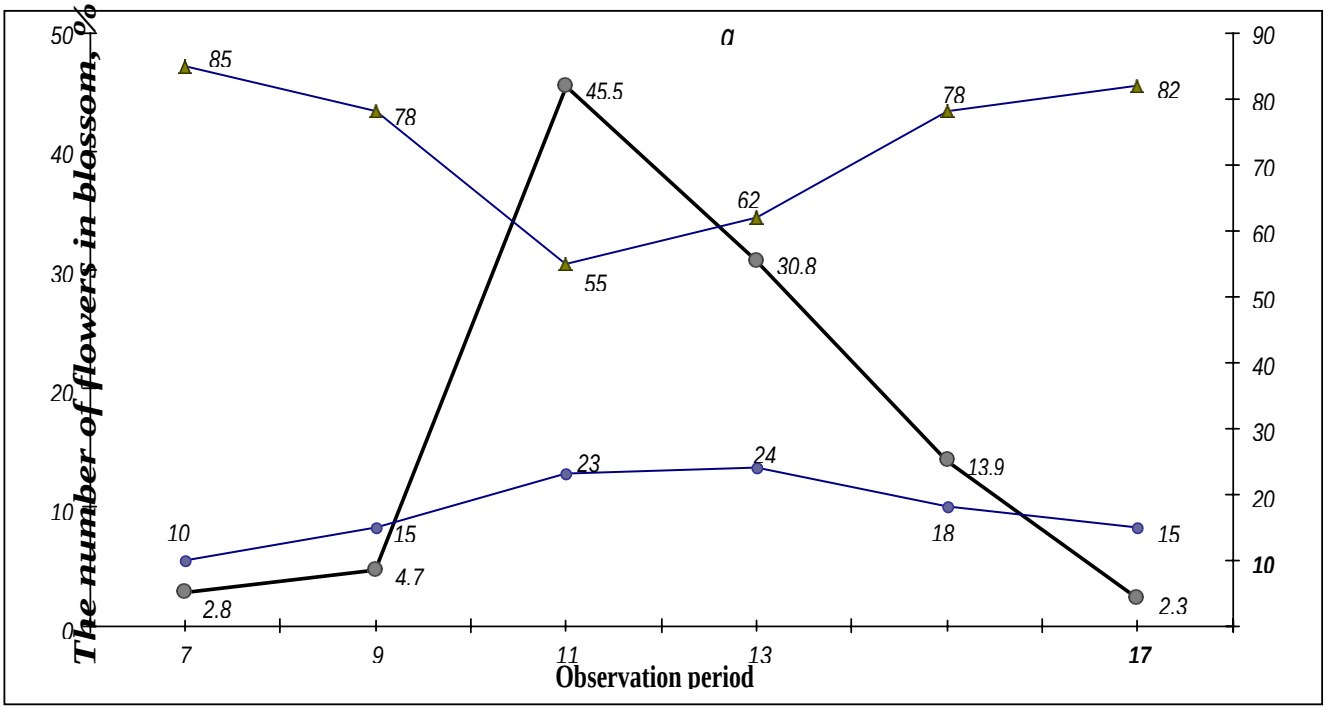

Figure 1: Daily flowering dynamics of *Calendula officinalis*

The number of opening flowers is decreased as the air temperature has decreased and the relative humidity of the air increased. This process was observed between 7-9a.m. and 5-6 p.m. of the day Figure 1).

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The opening of the flowers stopped as the sun set. Thus, in the soil-climatic conditions of Khorezm region, the reduction of the length of the day, the increase in daily air temperature (19-22 ^{0}C) influences on the flowering of pot marigold.

The phases of phenomenological development of *Calendula officinalis*in the soil and climatic conditions of Khorezm region were also studied in the sphere of the current research.

Table 1

The Effect of General and Beneficial Air Temperature on the Germinationand Growthof *Calendula officinalis*

Growth and development stages	Period: 2019 – 2020	
	Overall temperature, ° C	Useful temperature(°C), Date of observation
Vegetation onset	450,7	195,5; 25.02.
Flower budding	542,4	265,4; 19.03.
Flowering	665,2	343,1; 25.03.
Seed ripening	788,5	439,7; 10.05.
Final Vegetation	6302,5	5498,2; 12.10.

Phenomenological observations are one of the most convenient and effective methods in the study of introduced plants and are important not only in determining the phase transitions, but also in determining the resistance of plants and the rhythm of vital processes (Table 1).

The vegetation began on February 25, and budding was observed on March 19. At this time, the total temperature reached 450.7 degrees and the total useful temperature reached 195.5 degrees, respectively. Flowering on March 25 (TT is 665.2 and TUT is 343.1 degrees), seed ripening od the seed is observed on May 10 (TT 788.5 and TUT 439.7 degrees), vegetation end on October 12 (TT 6302.5 and TUT 5498.2 degrees) detected.Thus, the phenospectrum indicates that the onset and duration of plant vegetation, the duration of seasonal budding, flowering, fruit-bearing phases, and seed maturation varied between 2019 and 2020 depending on weather conditions. the vegetation period lasted 229 days in the study year (2019). It should be noted that the adaptation of the plant to local conditions, the passage of developmental phases at different times determines the success of the introduction.

In order to expand the plantation area, *Calendula officinalis* seed-seedlings were transplanted and cultivated in open field brooks. *Calendula officinalis* produced good quality seeds in the first growing year under the experimental base of the KhorezmMamun Academy. The

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ripe seeds in the flower-basket were blown away to the surrounding area by the winds in May-June, and in September-October. Around the bush of *Calendula officinalis*, the seeds spread to an average distance of 5-6 meters by the wind. The seeds that fell to the ground were left under rain and snow in the fall and winter. The seeds were left between 0.4-0.6 cm thick soil, and the seed pods mixed with the soil to keep it firm so that it would not move from one place to another under the influence of wind and rainwater runoff. the air temperature (average ten-day) rose to 20 ° Cin Khiva district at the end of March. Naturally, when the air temperature and moisture in the soil are sufficient, the seeds of the mother plant begin to germinate spontaneously after falling into the soil.

Table 2

The beginning and duration of the phases of *Calendula officinalis* in the Vegetation Period

(Experimental Base of Khorezm Mamun Academy)

Years	Growing period	Budding period		Period From growthto budding (days)	Flowering period (Days)		Duration of flowering, (day)	Ripening of Seeds		Duration of seed Ripening, Days	The End of Vegetation	Vegetation duration(days)
		The beginning	The End		The beginning	The End		The Beginning	The End			
2019-2020	25 II	19 III	25 IV	37	25 III	30 V	65	10 V	30 V	20	12 X	229

This phenomenon can be said to be the natural germination - the germination of plants by the shedding of mature plant seeds into the soil. Young plants that emerged from natural planting grew around the plant in the second and subsequent growing years in the field.

It is estimated that an average of 100-120 germinating seeds fall from a single plant (in the 1st growing season)., 7–9% of the seeds that fell into the soil formed new shoots in late March. Only 8-10% of the germinated seedlings grew and developed. It is obviously seen that the seedlings in the field (first year) were low (18-20 cm) and thin (0.4-0.6 cm in diameter), and the leaf size was also small (4x6 cm) in comparison with that of the second year. A generative period has also been observed in seedlings grown from natural planting, and this phenomenon is called the plant's reproductive strategy.(Table 2).

Attitude of *Calendula officinalis* to Environmental Factors and Introductory Evaluation: The success of plant introduction is assessed by the sum of its characteristics, the

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most important of which is the completeness of the transition of large (ontogenetic) and small (seasonal) life cycles of the plant, which is characterized by the preservation of plant habitus. The assessment of the success of the introduction takes into account the generative development, vegetative reproduction, maintenance of habitus, infestation with diseases and pests, the viability of plants in unfavorable periods of the year. To analyze the results of plant introduction or to assess the prospects, the 5-indicator scale of plant introduction assessment in saline soils proposed by B.Yo. Tukhtaev (2009) is used in experiment [16]. The evaluation of the species is performed according to100-point scale. The sum of scores indicates that the species with 20-39points was considered as unpromising, 40-59 - low-prospective, 60-79 - promising and 80-100 - advanced promising. The ability of *Calendula officinalis*to produce abundant leaf mass under the conditions of introduction is one of the main indicators of its farm value. *Calendula officinalis i*s not affected by disease and pests under the conditions of introduction. An introductory evaluation specific to the conditions of Khorezm region has been developed by the researcher. *Calendula officinalis*is moderately resistant to salinity, low in moisture requirements, moderately resistant to high temperatures, moderately resistant to low temperatures, and naturally prone to overgrowth. Thus, the *Calendula officinalis*plant scored 80 points under the conditions of introduction and was considered as an advanced promising species (Table 3).

Table 3

Introductory Evaluation Scale of *Calendula officinalis*(points)

№	Indicators	Indicator Level						High rating
I	Resistance to salinity	Strong	30	Average	20	Low	10	20
II	Humidity requirement	low	15	Average	10	High	5	15
III	High temperature resistance	Resistant	15	Average	10	irresistant	5	10
IV	Lowtemperature resistance	Resistant	15	Average	10	irresistant	5	15
V	Reproduction naturally	Instant	25	Average	15	Non-breeding	5	25
Total								**80**

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Thus, in the soil and climatic conditions of the Khorezm oasis, the medicinal plant pot marigold (Calendula officinalis) can be recommended as a 1-2-year vegetative plant for the establishment of large-scale plantations in the creation of the raw material base of the local pharmaceutical industry.[17]

Summary

- The following conclusions can be drawn based on the research:

- The medicinal pot marigold (*Calendula officinalis*) plant is characterized as a daytime flowering type, with the peak point of flowering at 12 p.m. and the end of flowering is at 6 p.m. under the influence of a drop in air temperature. Under the conditions of introduction, the opening of flowers lasts from 6 a.m. to 6 p.m., the maximum opening is 800-1000, with an air temperature of + 24 + 25 0C and a relative humidity of 50-55%.

- The introductory success of the medicinal calendula (*Calendula officinalis*) plant was evaluated with 80 points. This medicinal plant has made it possible to consider itself as a very promising species in saline soil-climatic conditions in Khorezm region.

Recommendations to the Production: Based on the results of research on the successful completion of all stages of ontogeny in the conditions of introduction of the medicinal calendula *Calendula officinalis*, taking into consideration of itsseed reproduction, pest control, it is concluded that there are opportunities to expand the crop area of this plant in the soil and climatic conditions of Khorezm region.

In general, the practical significance of the results of the research is explained by the fact that the results are used in farms specializing in the cultivation of medicinal plants in scientifically based propagation, the establishment of large-scale plantations and the supply of raw materials for the pharmaceutical industry.

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