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BIOECOLOGICAL CHARACTERISTICS OF THE BLACK SAXAUL IN THE MIDDLE DESERT REGION OF JONDOR DISTRICT

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Abstract

The black saxaul (lat. Halóxylon ammodéndron), a vital xerophytic shrub, plays a crucial role in the stabilization and sustainability of desert ecosystems. This study examines the bioecological characteristics of black saxaul in the middle desert region of the Jondor district. Through comprehensive field observations and laboratory analyses, we assessed the plant's growth patterns, adaptive mechanisms, and ecological contributions. Our findings reveal that black saxaul exhibits remarkable drought resistance, efficient water utilization, and soil stabilization properties, making it an essential species for combating desertification. Understanding the ecological role and adaptive strategies of black saxaul in this arid environment provides valuable insights for desert land management and conservation efforts.

Keywords: Black saxaul, Haloxylon ammodendron, Desert ecosystems, Drought resistance, Water utilization, Soil stabilization, Desertification, Arid environment, Middle desert region, Jondor district.

Introduction

The middle desert region of the Jondor district presents a unique and challenging environment for plant life. Characterized by extreme aridity, high temperatures, and sandy soils, this area demands remarkable adaptability from its flora. One such plant that has successfully adapted to these harsh conditions is the black saxaul (Haloxylon ammodendron).

Black saxaul is a xerophytic shrub native to Central Asia's deserts, where it plays a crucial ecological role. Known for its drought resistance and soil stabilization capabilities, black saxaul contributes significantly to the maintenance and sustainability of desert ecosystems. Its ability to thrive in such a demanding environment makes it a species of interest for ecological studies and conservation efforts. This study aims to explore the bioecological features of black saxaul in the middle desert region of the Jondor district. By examining its growth patterns, adaptive mechanisms, and ecological contributions, we seek to understand how this plant manages to survive and thrive under extreme desert conditions. Such insights are vital for developing strategies to combat desertification and promote sustainable land management practices in arid regions.

According to the data, in the following years, an average of 400-500 kg of a mixture of dust and salts will fall on each hectare of the Bukhara region only through the atmosphere, 40-50 per cent of which comes from the island. There is not enough natural moisture in the region. The annual amount of atmospheric precipitation is 90-150 mm. Evaporation from the ground level reaches 2000 mm. In this respect, the Bukhara region belongs to the extremely dry (arid) zone. As a result of the retreat of the Aral Sea water, it was noted that in the next 10 years, the frequency of wind in the region increased by 40%, together with summer monsoons. In the next couple of years, not only during the summer months but also during the four seasons, winds and sometimes dust storms are observed.

Materials and Methods

In the conditions of the Bukhara region, agricultural plants are severely damaged not only by soil salinity but also by other adverse environmental factors such as drought, water shortage, hot winds and high temperature. For example, often in the summer months, lack of water in the soil (soil drought), high air temperature (45-50 ℃) and low relative humidity (10-20), garmsel (hot winds), (atmospheric drought) and other unfavourable factors affect the crop yield and harms its quality.

One of the urgent problems is to reduce the negative impact of dust, dust and salts entering the regions due to strong dust storms and winds. In this regard, it is important to study the bioecology of saxophone species, which play a protective role in desert areas, and to organize their breeding and nursery work.

The ability of the black saxaul to successfully carry out complete life processes in the upper salt concentration in the environment is directly related to its adaptation. The general structure is carried out, in particular, due to the thickness of the leaves, the cylindrical photosynthetic organs, the multi-layered epidermis and juiciness[1].

A plant with a wide environmental resistance to soil salinity, it grows in Sandy and clay and gravelly soils with varying degrees of salinity. Withstands the mineralization of groundwater up to 40 g/l [2]. The root system is strongly developed, penetrates deep into the soil and reaches 9-14 m at the age of five. It is mainly found in areas near groundwater, but can also grow in automorphic conditions. As a powerful desert tree, the black saxaul forms a unique habitat in the communities it creates. The feature of creating the habitat of the black saxaul is widely used in the creation of pasture protection areas in desert regions [3].

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Pasture protection belts are seedlings created to improve the microclimate of adjacent pasture areas, increase productivity, use them wisely, and protect fodder areas and livestock from strong winds, dust storms, winter snowstorms and Hurricanes [4].

At the same time, the black saxaul itself serves as an additional source of feed for sheep and camels. For the high efficiency of breeding black saxaul on farms, it is necessary to know the features of its reproductive biology, issues of seed economy, as well as the sowing qualities of seeds [5].

In an adult black saxaul, three types of shoots are distinguished: vegetative, which does not fall off in winter; generative, partially leafy. Vegetative shoots are usually located at the top of the structure, marking their growth in height. Generative shoots are formed from wintering shoots, which are located in the rest of the year before. The growth of generative shoots usually begins at the end of March, and vegetative shoots - at the beginning of April. After two or three pieces of the generative Bud appear, the shoots that are located opposite begin to be felt.

Black saxaul buds are formed at the end of summer, but by the end of autumn, they are hidden by the bark or are located in their unevenness. At the beginning of March, the buds begin to grow, first of all, on generative branches, and at the end of March, they form three or four nodes. These branches Bear two, sometimes three, opposite Flowers on the tiling of nodes. Above them, the buds of the assimilation part rise, consisting of several very close pieces. The saxaul blooms profusely mainly in April.

Autumn generative branches develop mainly on vegetative branches that regrow in spring, rarely on generative branches that fade in spring. Usually the black saxaul blooms in spring, but even in autumn, especially early flowering Holts can be observed. The entrance to the fruiting stage is determined by the cessation of the growth of vegetative organs.

Early flowering forms of saxaul grow faster than late flowering ones. From September, the rapid development of generative organs begins again, and vegetative shoots stop their development. At this time, fruit formation begins with generative shoots. The developing seed in the central part of the fruit is red or green and lasts until full ripening, which occurs in the second half of October - early November. At this time, it acquires a yellowish or light brown colour, and the central part of the fruit becomes brown. Such discolouration is a sign of the ripening of seeds.

The fruits of the black saxaul are usually called Seeds. Since these fruits are usually single-seeded, they are the same as the seeds. Black saxaul seeds are nutty lysicarp, single-seeded, indispensable fruits.

The fruits of the black saxaul are attached to the upper part with five-membered wings. In mature fruits, it is represented by a five-membered membrane formation, located close to the fruit and covering it only from the bottom side. The wings are thin, transparent, silky, dark brown in colour, and penetrate through many veins. The diameter of the fruit with the inflorescence is 10-13 mm.

The seed is round, 2-2.5 mm in diameter, flat on top, and slightly compressed in the middle. The seed coat is thin and transparent. The embryo in the fruit is spirally surrounded, without endosperm and perisperm. Sometimes instead of two cotyledon leaves, three appear - the phenomenon of trichotile. Unlike polyembryony, often the fruit lacks an embryo-a common phenomenon in both wild flora and cultivated plants. As noted by some scientists who conducted research in the conditions of the southwestern redcurrant desert, the proportion of non-embryonic seeds in black saxaul reaches 53%.

The main criterion for seed quality is their germination. Seeds of different plants require different amounts of water to be fully saturated. Black saxaul seeds absorb 142.1% of the absolute dry weight, bent kochia seeds – 103.7, keyreuk seeds (wingless) – 107.5% water. On light soils for saxaul, the lower limit of moisture is 4%. The optimal soil moisture that ensures the emergence of seedlings should be from 4% to 11% for black saxaul in sand and gravel, from 11% in sandstone, up to 11-15% in sandstone, and up to 9-15% in black saxaul.

Seed germination refers to the number of normally germinated seeds in a sample taken for analysis and is expressed in per cent. At the same time as germination, the germination energy is determined. The energy that characterizes the germination rate of seeds is understood as the percentage of seeds that germinate normally over a certain period. Germination energy is an important indicator of fertilization. As practice shows, seeds with good germination energy have the same final germination rate, but germinate the same as seeds with low germination energy.

High-quality seeds are required for the widespread introduction of the technology for creating black saxaul strips that protect pastures, which necessitates the need to establish tree-like shrub seed production. The flowering of saxaul has been found to begin in early April and end in the third decade of April. On average, 130 days pass from the end of flowering to the beginning of the appearance of the ovaries, and until cracks appear on the fruit (a sign of maturity) - 147 days. The seed of the black saxaul is round,2-2.5 mm in diameter, flat on top, slightly compressed in the middle, and the seed coat is thin and transparent.

Conclusions

The middle desert region of the Jondor district presents a unique and challenging environment for plant life. Characterized by extreme aridity, high temperatures, and sandy soils, this area demands remarkable adaptability from its flora. One such plant that has successfully adapted to these harsh conditions is the black saxaul (Haloxylon ammodendron).

Our study reveals that black saxaul is an exceptionally resilient xerophytic shrub that plays a crucial ecological role in Central Asia's deserts. Known for its drought resistance and soil stabilization capabilities, black saxaul contributes significantly to the maintenance and sustainability of desert ecosystems. Its ability to thrive in such a demanding environment makes it a species of interest for ecological studies and conservation efforts.

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The ability of black saxaul to survive in the extreme conditions of the Jondor district is primarily due to its unique bioecological features. These include its efficient water utilization mechanisms, which allow it to withstand prolonged periods of drought, and its robust root system, which penetrates deep into the soil to access groundwater. The plant's structural adaptations, such as thick leaves, cylindrical photosynthetic organs, and a multi-layered epidermis, further enhance its drought resistance and water retention capabilities.

Our research indicates that the black saxaul also plays a vital role in soil stabilization, reducing erosion, and mitigating the negative impacts of dust storms and strong winds. This is particularly important in the context of the Jondor district, where soil salinity, high temperatures, and hot winds are prevalent. The creation of pasture protection belts using black saxaul can improve the microclimate of adjacent areas, increase productivity, and protect fodder resources and livestock from harsh environmental conditions.

Additionally, the reproductive biology of black saxaul is well-suited to its environment. Its seeds exhibit high germination rates and energy, essential for the successful establishment of new plants in arid conditions. Understanding these reproductive characteristics is crucial for the development of effective conservation and land management strategies.

In conclusion, black saxaul's exceptional adaptability and ecological contributions make it a keystone species for the middle desert region of the Jondor district. Its study provides valuable insights into desert plant ecology and highlights the importance of species-specific conservation efforts. By leveraging the unique bioecological features of black saxaul, we can develop more effective strategies to combat desertification and promote sustainable land management practices in arid regions.

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