# BIOLOGICAL PROPERTIES OF SOYBEAN

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One of the main problems of agriculture in Uzbekistan is the lack of plant protein in human nutrition and the feeding of farm animals. This problem can be solved by multiplying the seeds of legumes and, first of all, soybeans, which are the most important protein-oil crops. The reason why soy is grown in large areas in different countries is that its grain and green mass are nutritious and can be used in food, fodder, technical and medical fields. Depending on the navigation and growing conditions of the soybean, its grain contains 30-48% protein and 17-26% fat. Soybeans contain 20-25% of carbohydrates, 4-5% of ash elements (including calcium, phosphorus, potassium, sodium, iodine, molybdenum, etc.), vitamins (E, V1, V2, V6, pantothenic acid, choline, folate, biotin and b.) occur. More than a thousand products are obtained from the soybean. Soy is one of the main crops in the production of feed protein, oil, sorghum, mixed fodder [1,2].

Obtaining high and high-quality soybeans requires solving complex problems. The main thing is to develop regional agrotechnical soybean cultivation and select soybean varieties suitable for specific soil and climatic conditions. This, in turn, requires determining the biological characteristics of soybean varieties and taking into account the soil-climatic characteristics of a particular region. Lack of knowledge of the biological characteristics of soybean varieties leads to incorrect timing of planting and agro-technical measures, which ultimately leads to a sharp decline in crop yields.

**Botanical description of the soybean plant.** Soybean (*Glicine hispida L.*) is an annual plant belonging to the soybean family (*Flicaceae*) and is one of the most common ancient crops in the world. The soybean plant is native to Southeast Asia and was reportedly planted in China 6,000 years ago. Today there are more than 2,500 varieties. The navigation of the soybean plant is low or tall, depending on the soil and climatic conditions in which it is grown. The soybean is a mainly upright plant, with both horizontal and creeping forms. Just as the height of the soybean plant (30-200 cm) varies, so does the thickness of the stem. In some varieties, the thickness of the stem is 3-5 mm, in others, it is 9-11 mm, in some varieties, it is even 20-22 mm. The hypocotyls of the seedlings of the newly grown Soybean plant are green or purple. Most often, if the green colour of the stem is strong (dark), the flowers of the soybean plant are white, if the stems are light purple, the flowers are purple. The stems of most soybean varieties are covered with light brown feathers. If the feathers on the stem are sparse, they will be more resistant to disease and pests. The feathers mainly serve as protection for the plant. The lateral branches of the main stem are formed differently - in the range of 3-15 cm. Typically, the location of the first and second-order side branches depends on the genotype of the plant and growing conditions. The first order is that the side branches form a lot of pods, but most of them are shed until the pods at the top of the stem are ripe. Depending on the location of the side branches, the hairs of the soybean plant stem are also scattered, semi-scattered, and without folds. The pods are also bushy or scattered depending on the location of the side branches. In some varieties of soybean stems the growth stops after the highest single flowers have formed legumes; in some varieties, it grows until the pods begin to ripen.

The stems of the soybean come incomplete, intermediate and unfinished forms, depending on the nature of the growth of the neck. At the top of the unfinished stem are leaves, under the leaves are pods. In the intermediate stem, small leaves are formed along with the pods. On the finished stem, the large leaves are placed at the same height as the pods. When the pods begin to ripen, the plant stem turns yellow, light brown or brown [3,4].

The thickness and length of the stem of the soybean plant and the size of the joint spaces and their number vary. It varies depending on the genotype of the plant (navigation) and the natural-climatic conditions in which the soybean is grown (temperature, light, moisture and soil fertility, nutrient content, planting times, etc.) [5-11].

The root system of the soybean is well developed, the arrowroot is a plant that penetrates the soil to a depth of 1-1.5 meters. The root of the plant develops mainly in the tillage layer of the soil, forming a large number of side roots. 8-12 days after germination of soybean seeds, the first shoots begin to appear on the main root. The amount and size of tubers depend on the genotype of the plant, the microflora in the soil and its fertility,

as well as nitrogenization before sowing soybean seeds. Tuganak bacteria absorb molecular nitrogen from the air, satisfying the plant's need for nitrogen and enriching the soil with nitrogen compounds.

The leaves of the soybean plant are intricate, with three petals arranged on a leaf band, which are arranged alternately at the base. The shape of the leaves varies — lanceolate, heart-shaped, oval, and round in appearance. The shape and size of the leaves depend on factors such as temperature, light, humidity and nutrition. The length of the leaf is 5-10 cm depending on the navigation and growing conditions of the soybean, and the width is 3-10 cm, the length of the leaf varies in different varieties: 9-25 cm, thickness 0.2-0.6 cm. A single plant can have 20-40 or more leaves. Whether the leaf surface is flat, thick or thin, soft or hard depends largely on the genotype of the plant. Another characteristic feature of soybean leaves is that as the pods ripen, they turn yellow and shed one after the other naturally [12-19].

The flowers of the soybean are very small and are located in the axils of the leaves. The ball flower of the shadow is in a single appearance. The number of flowers in the leaf axils is 20-24, the size of each flower is 5-6 mm. There are 5 flower pots, two of which grow together, and the lower three develop separately and are longer than the flower pots that grow together.

The petals are white or purple, the upper petals are called the rudder, the two lateral petals are winged, and the two lower petals are called the boat. The colour of the rudder petals is darker than the wings and boat petals, and the size is also larger. The boat leaves grow together and the middle is slightly bent. The paternal pollinators were 10, of which 9 were added, and one grew separately. Dust mites 3-4 cells, they crack longitudinally. The pollen is sticky, yellow, the seeds are elongated [20-24].

The flowers of the soybean are small, unsightly, and cannot attract insects. The flowers of the soybean are self-pollinating, first pollinating and then opening. The flowering of plants begins with the formation of 6-10 leaves. Soybean is a self-pollinating plant. The flowering period of the plant is long in soybean varieties, lasting 17-30 days in early soybean varieties and 60-80 days in late varieties. The shape of the pods of the soybean plant varies: straight, curved, sickle-shaped, blistered, 3-7 cm long and 0.5-1.5 cm wide. In legumes, the seeds are 1-4, often 2-3. The number of pods can range from 10 to 200-350 per bush. The number of pods depends primarily on their genotype as well as natural conditions. Soybean pods are light yellow, greyish-yellow, light brown, dark grey, and dark brown when ripe. The height of the location of the lower pods on the plant stem also varies depending on the characteristics of the soybean variety and climatic conditions. The number of pods in the leaf axils ranges from 1-3 to 8-12 [25-29].

The colour of soybeans is yellow, light green, light brown and black. The size of the seeds also varies, with an average weight of 1000 seeds ranging from 80 to 250 g. The seeds of the soybean are round, oval, oblong, bubble-shaped. Soybeans consist of the seed coat, seed pods and apricots.

**The ontogenesis of the soybean.** The germination of the soybean plant begins with the germination of the seeds: the seeds absorb up to 50% of their weight in water. Excess moisture, on the other hand, reduces germination and adversely affects seed respiration. The minimum temperature for soybean seeds to germinate should be around 6-8 ℃. When the optimum temperature in the room is 20-24 ℃, in 2-3 days the seeds germinate 90-100%. Grasses appear for 5-7 days when the necessary conditions for seed germination in the soil are sufficient. Field fertility is high, reaching 70-80%.

**Virginil period.** Lawn stage. The initial developmental stage of a soybean plant can be 15-25 days or more, depending on air temperature, soil moisture and temperature, and varietal characteristics. After 3–4 days after germination of seedlings (grasses) are formed in opposite-seeded leaves. The first leaf is formed 10-12 days after germination, one leaf is formed every 3-5 days. It takes 10-12 days for a leaf to fully form. The seeds are stored in the plant until 3-6 leaves are formed or bloom, after which they are shed. When the air temperature is high, the leaves fall off quickly. In periods of high humidity and low temperature, the seeds are stored for a long time. Also, in late soybean varieties, the seeds of palla leaves are stored longer than in early varieties.

**Juvenile phase.** In the soybean plant, the rapid growth of the stem begins only after the formation of 3-5 leaves, because by this time the root system is much more developed. The immature phase of development begins with the appearance of lateral branches on the plant. The lateral branches are formed in the leaf axils, even from the side of the seed pod. In slender varieties with thin stems, the lateral branches grow very low, the stems are vigorous, and in late varieties 15-25 cm above. Side branches begin to appear 17–25 days after the emergence of grass. Side branches are formed in 30-50 days, depending on climatic conditions and planting

dates, as well as varietal characteristics. The flowering and fruiting phase begins 30-65 days after soybean seeds germinate. This phase is the longest period in the ontogenesis of the soybean plant. The flowering phase begins at different times depending on the soybean navigation. When the air temperature is high, ie above 35 °C, the flowering of the soybean accelerates. With the onset of flowering of the soybean plant, rapid growth also begins.

Observations show that during 30-35 days, when the flowering phase lasts, the plant grows an average of 1.5-2.5 cm per day, and during this period the plant has 8-16 leaves. In this phase, not only do the surface organs of the plant grow rapidly but also the growth of roots. Additional lateral roots are formed in the roots, which also form a large number of nitrogen-fixing nodules [27-30].

The flowers of the soybean plant are located in the axils of the leaves in the form of clusters, and the flowering process of a cluster lasts 6-11 days. Always the first flower opens from the second or third leaf axil. Along the main stem, the flowers open in the fifth, sixth leaf axils, and again in the first leaf axil of the first lateral branch. In the early stages of the flowering phase, the flower opens individually in the leaf axils. It should be noted that in some varieties of soybean, neither growth nor flowering ends until the end of the vegetation, the pods formed in the lower and middle tier ripen and the leaves begin to fall off. Eventually, when the growth process is complete, the pods at the top of the plant remain raw without ripening. Planting time, seedling thickness, heat and light regime greatly affect the flowering of plants and the number of pods.

This effect also varies depending on the biological characteristics of the soybean variety. The fruiting phase begins 12-18 days after the first flowers open. In general, the flowering and fruiting phases of a soybean plant occur at the same time. At the top of the plant, when flowering is over, legumes of different sizes are observed. By this time, the pods at the bottom of the plant will begin to turn yellow and ripen. Observations show that the development of a legume in early maturing varieties of soybeans is 14-17 days, in medium ripening varieties 20-25 days, and in late-ripening varieties 25-30 days.

The ripening phase of the soybean plant is the final phase and begins with the filling of the seed. The accumulation of organic compounds in the pods at the beginning of the filling period is accelerated. At this time the vegetative growth in the plant stops, the dry weight of the leaves, stems and roots decreases. Many early soybean varieties stop vegetative growth and leaf formation also stops 2-3 weeks after flowering. Therefore, it is recommended to sow the earliest and late-ripening soybean varieties as a repeat crop and in the field. The dry mass of the plant decreases when the middle ripening soybean varieties stop growing 4-5 weeks after flowering and the late-ripening varieties 6-7 weeks after flowering.

In most soybean varieties, the pods ripen at this time and the leaves begin to turn yellow (there are also soybean varieties that almost do not shed their leaves).

In the soybean plant, the full ripening period of the seeds after the milk and wax ripening periods lasts 8-12 days, which is the shortest period between developmental phases. In legumes, the seeds enter their varietal characteristics and the shells become flat and smooth. The importance of natural and climatic conditions for the ripening of soybeans is evenly distributed.

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