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CHARACTERISTICS OF THE SUNFLOWER PLANT, ITS IMPORTANCE IN AGRICULTURE AND ITS ROLE IN FOOD SECURITY

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Annotation: Sunflower (Helianthus annuus lot.) Belongs to the family Asteraceae, the genus Helianthus contains 65 species and is a domesticated oil crop for about 3000 years. Sunflowers were first cultivated by indigenous peoples living in eastern North America. Europeans, who first immigrated to the Americas, began growing sunflowers in areas from southern Canada to Mexico and Spain. Sunflowers were first introduced to Europe via Spain, where they were easily adapted and even reached the Russian fields, where the climate was slightly colder in the late 1800s and achieved significant results in the cultivation of sunflowers by Russian farmers. To date, sunflower is used as an ornamental plant, medicinal, food, raw material, fodder, dyes for the textile industry, body dyeing, decorations, and so on. In addition, the sunflower is well known for its phytoremediation potential, its good tolerance to toxins, and at the same time its ability to effectively remove contaminated soil and water from harmful substances. Some scientists say that sunflower was cultivated before wheat. Its demand for moisture consumes 2,000-5,000 m3 or more of water per hectare. The transpiration coefficient changes to 400-700. Depending on the level of salinity, sunflower can be planted in the saline soils of Uzbekistan. Sunflower absorbs 25% of required nutrients after flowering. During the flowering period, it absorbs most of the nutrients. Absorbs the main part of from weeding to the time of basket formation; absorbs nitrogen - from basket formation to the end of the flowering period, and potassium - from basket formation to the ripening period.

Keywords: Asteraceae, basket formation, cotyledon, Helianthus annuus, Helianthus tuberosus, lateral oilseed, medicinal plant, phytoremediation, , phosphorus, ornamental plant.

Introduction. Sunflower (*Helianthus annuus lot*.) Belongs to the family *Asteraceae*. Helianthus is an annual plant with 65 species. The name *helios* (sun) and *anthos* (flower), which derives their name from Helianthus, have the same meaning as the English name sunflower, so they follow the sun throughout the day and are always directly related to it.

Sunflowers are thought to have been domesticated by indigenous peoples who inhabited eastern North America 3,000-5,000 years ago, using them primarily as a source for edible seeds. They were then introduced to Europe in the early 16th century and traveled to Russia. In Russia, where oilseeds are grown, the plant is industrially developed and cultivated. Russia then reintroduced the process of growing these oilseeds to North America in the mid-20th century; The commercial era of growing and propagating sunflowers began in North America. A species called Helianthus spp. began to appear more and more in new geographical areas. In addition, Jerusalem artichoke (Helianthus tuberosus) is grown in temperate regions and some tropics as a food crop and ornamental plant for humans, cattle, and poultry [4]. Helianthus tuberosus usually grows in summer and early autumn, with the peak of growth in mid-summer.

The geographical history of these species takes into account their evolutionary history, with the level of genetic variability in their gene pool increasing with the creation of new hybrids, both for

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commercial purposes and in the wild. After that, sunflower species are also experiencing glass neck effects in their gene pool as a result of selective breeding for industrial use.

Botanical and morphological definition.

Sunflower - (*Helianthus annuus lot*.) Belongs to the family Asteraceae. Identified by Linnaeus, this species is composite in the current classification and is divided into two independent species: the cultivated sunflower. While cultivated sunflower includes all cultivated forms and varieties, it includes all wild forms that are not important in the production of wild sunflower (Figure 1).

According to the sum of morphological and biological characteristics of cultivated sunflower, there are two subspecies: Sativa-field sunflower or truly cultivated sunflower. Ornamentals-beautiful sunflower. A beautiful type of sunflower is characterized by the presence in the form of a basket, which is very diverse, with a multi-lined inflorescence, and is irrelevant for planting.

The sunflower stem is a coarse-haired annual herb with a stem of 1-4.5 m, 7.5-30 cm long coarse-toothed coarse leaves in a spiral shape, attractive heads, flowers 7.5-15 cm wide in wild specimens and often 30 cm or more common in crop species [3].

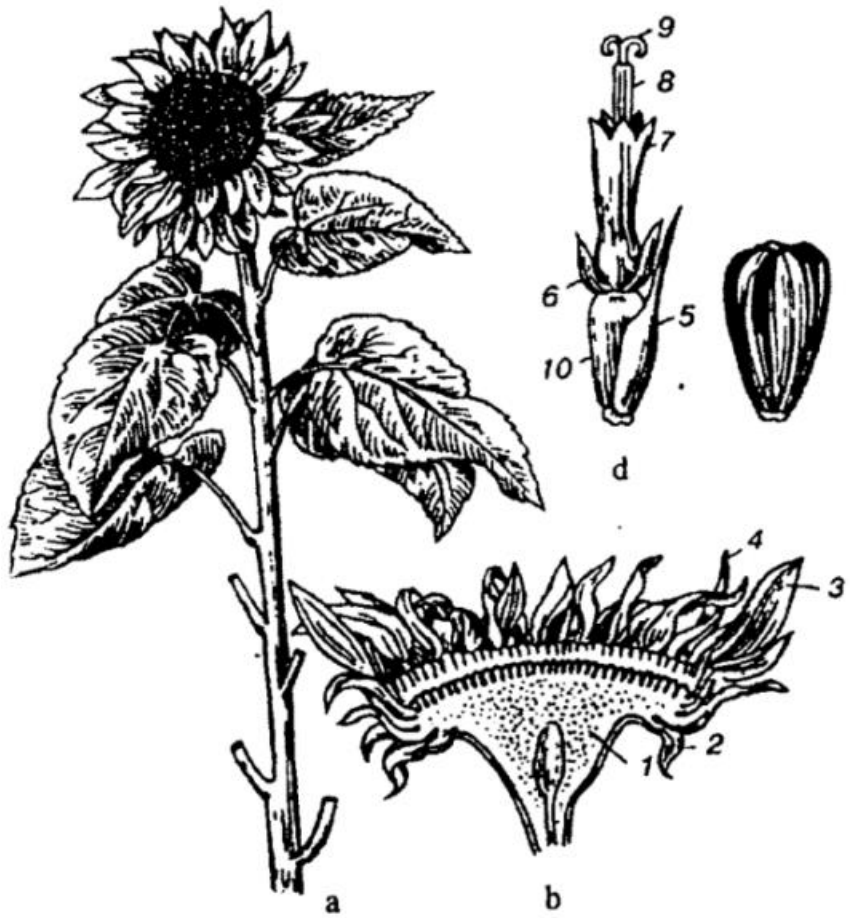

Figure 1. **Sunflower***:* a - flowering plant; b - basket; d - flower parts.

The leaves are large, banded, 20-40 cm long, oval-heart-shaped, with a sharp tip, thickly covered with hairs. The edges of the leaves are serrated. The lower two or three pairs of leaves are opposite the stem, the rest are solitary. The leaves in the middle are the largest. The number of leaves per plant can range from 14 to 50 and more. Early maturing varieties produce fewer leaves and late-maturing varieties produce more leaves.

Vegetation period.

Sunflower is a broad-leaved plant that emerges from the soil with two large seed pods (cotyledons). Appears when planted at a depth of 2–3 cm in

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warm soil, it takes four to five days, but in colder soils or when planted deeper, it takes a few more days. Sunflowers grow quickly and form large and broad leaves. Currently, sunflower varieties reach an average height of 183 cm, varying between 153 cm and 213 cm depending on the date of planting and soil conditions. The growth of the sunflower is directly related to its genetic composition [6]. In addition, the planting season affects its development; these seasons usually occur in mid-summer and early fall. The development of the sunflower is divided into vegetative and reproductive stages, which can be identified by identifying the heads or main branches of a single or branched head. After reaching full height and flowering, the heads of the sunflower are turned down to make it difficult for the birds to eat the seeds. Sunflowers have self-sustaining flowers for pollination, meaning they do not require pollinating insects, but some studies have shown that bee pollinators slightly increase productivity Sunflower is an annual, erect, broadleaf plant with a strong taproot and prolific lateral spread of surface roots. Stems are usually round early in the season, angular and woody later in the season, and normally unbranched. Sunflower leaves are phototropic and will follow the sun's rays with a lag of 120 behind the sun's azimuth. This property has been shown to increase light interception and, possibly, photosynthesis. In temperate regions, sunflower requires approximately 11 days from planting to emergence, 33 days from emergence to head visibility, 27 days from head visibility to first anther, 8 days from first to last another, and 30 days from last anther to maturity.

Figure 2. **Sunflower Field**

Cultivar differences in maturity are usually associated with changes in vegetative period before the head is visible. Its total growing period ranges from 125 to 130 days. The sunflower head is not a single flower (as the name implies) but is made up of 1,000 to 2,000 individual flowers joined at a mutual receptacle. The flowers around the circumference are ligulae ray flowers without stamens or pistils; the remaining flowers are perfect flowers (with stamens and pistils). An thesis (pollen shedding) begins at the periphery and proceeds to the centre of the head. As many sunflower varieties have a degree of self-incompatibility, pollen movement among plants by insects is important, and bee colonies have generally increased yields. [2].

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2. Methods. Choosing the right variety is one way to ensure high profits at a low cost. Since sunflowers are not prone to major diseases and pests, the varietal selection is usually based on yield and yield reliability. The effectiveness of varieties tested in several environments is the best basis for selecting sunflower hybrids. The selection should take into account the yield, high-fat percentage, seed size (for non-fat markets) and habitat, and resistance to birds.

Sunflower is an annual, erect, broad-leaved plant with strong roots and many lateral roots. The stem is usually round at the beginning of the season, angular and woody at the end of the season, and is usually unbranched.

Sunflower leaves are phototropic, observing sunlight at 1200 azimuth. This property has been shown to retain light and possibly enhance photosynthesis. Sunflower seeds germinate at 5 ° C, but a temperature of at least 14 to 21 ° C is required for satisfactory germination [9]. Sunflower grows in a wide variety of fertile soils with a pH of 6.0 to 7.5. The planting density of sunflowers varies from 25,000 to 35,000 plants per hectare, depending on the yield of the area. Row width can range from 90 to -100 cm, compared to grain crops, sunflower makes very good use of soil nutrients. The main reason for this is a thinly branched and broad root system. The roots come in contact with nutrients that are not used by other crops. The method of irrigation will depend on the availability of water and the available irrigation equipment. The pH of irrigation water should be slightly neutral [10].

In most cases South African sunflower is cultivated under dry land during the summer rainfall season (November to March). In areas with low rainfall, water supply can be supplemented with irrigation in order to increase yield. The method of irrigation will depend on the water availability and the available irrigation equipments. The pH of the irrigation water should be slightly neutral.

Mechanical weed cantrol can be very effective, provided it is done in time and with care not to damage the crop. Chemical weed control can be applied successfully together with mechanical methods and cultivation practices to bring about better weed control. The following tips are given for mechanical control:

- Cultivate before the sunflower is too tall for equipment, or the plants will be damaged easily.
- To prevent damaging the sunflower roots, cultivation should be shallow (less than 75 mm).
- Throw loose soil onto the row—this will assist in suffocating weeds which sprout in the row.
- Smaller weeds die-off easily when dry soil is hoed.
- Hoe during the hottest part of day when the sunflowers are wilted—this reduces stem damage.

The use of herbicides has many advantages, of which the most important is that effective weed control can be applied during wet periods when mechanical weed control is impossible. If sunflower is cultivated in crop rotation with maize, weeds can be controlled more effectively in both crops as grass and broadleaf herbicides can be used in continuous succession.

These potential risks require that growers follow integrated pest management (IPM) practices. IPM means using a combination of pest control methods to maintain pest populations below levels which result in unacceptable losses to crop quality or yield. IPM includes biological, cultural, physical and chemical control. Resistance to insects can be improved by the presence of a dark-colored “armor” layer on the seed coats.

Resistance to midges has been suggested, however, it is not presently effective. Only currently approved insecticides should be used for control of insects. Birds can be major pests in sunflowers, especially blackbirds, goldfinches, doves, grosbeaks and sparrows. Many approaches to feed disruption have been tried, including scarecrows, fright owls, aluminum strips that flutter in the wind and carbide exploders. No technique is 100% effective, as birds will adapt to many of these techniques. Currently, no chemicals are approved for bird control in sunflower.

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3. Results. 1) Effective control of weeds is a prerequisite for high yields of sunflowers. This is achieved through a combination of mechanical and chemical operations. Young plants are very sensitive to strong weed competition and cannot grow fast enough to form a complete shady cover that can suppress weed seedlings. Therefore, the first 6 weeks after planting is a very important period for the harvest. During this time, weeding the fields can significantly increase yields.

2) The most serious diseases of sunflower are caused by fungi. The main diseases include Rust, Verticillium, Sclerotinia, Phoma, head rot, black stem, and leaf spot.

Production.

Worldwide sales of sunflowers begin on January 1 and end on December 31 of the calendar year. Seeds can be used for multi-purpose processing (e.g., biodiesel and as a raw material/oil product). Countries with the largest production of sunflowers in the world (Table 1)

When economical, whole sunflower seeds can be used as a source of energy and protein in beef cattle diets (Table 18). Fat levels can be quite high in whole seeds; consequently, amounts fed should be restricted based on fat content of the seed. Typically, no more than 4% supplemental fat should be added to cow diets to reduce the potential for any detrimental effects on fiber digestion. This will result in inclusion levels of approximately 10% of the diet (Table 2).

PRODUCTION VOLUME OF SUN OWER SEED IN MAJOR PRODUCER COUNTRIES IN 2022/2023 (IN MILLION METRIC TONS)

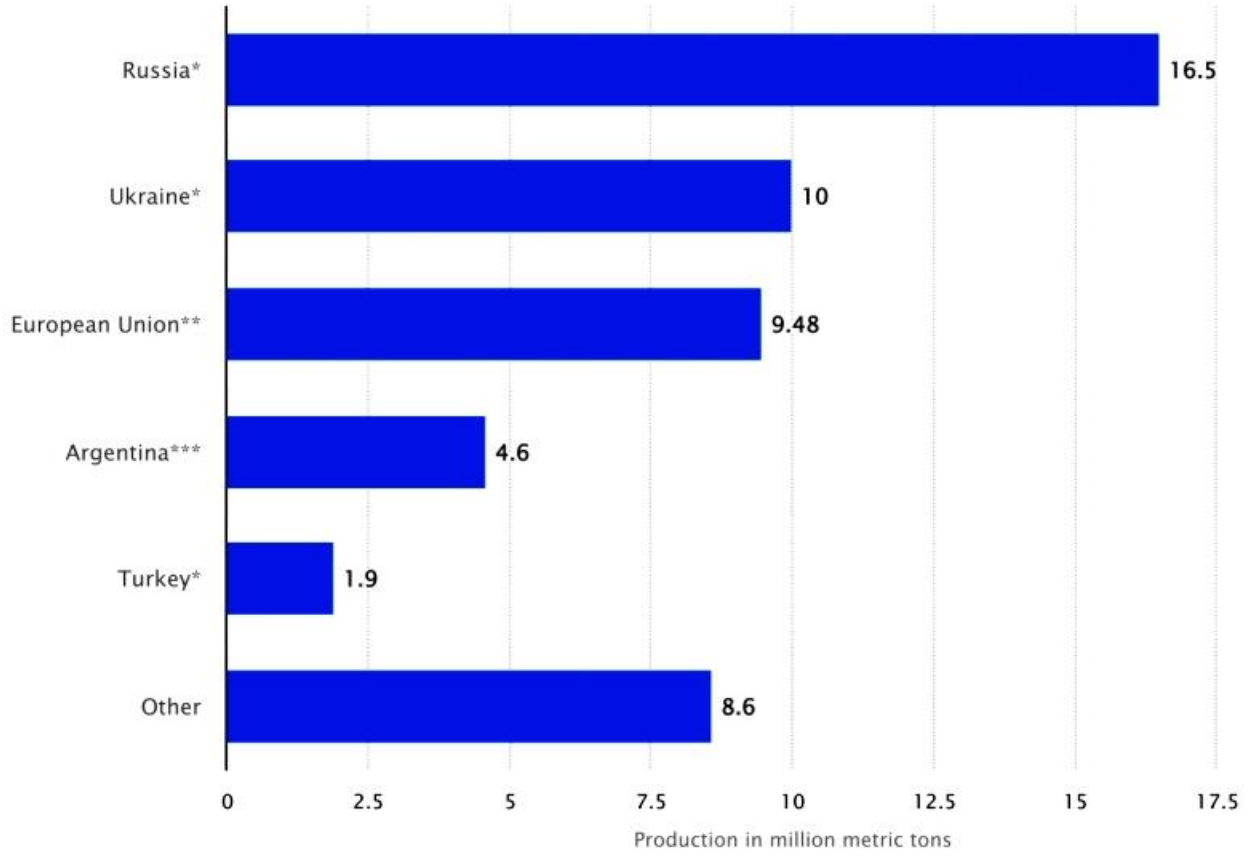

Table 1. **Countries with the largest production of sunflowers in the world**

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	DM, %	TDN, %	NEm, Mcal/lb	NEg, Mcal/lb	CP, %	ADF, %	Ca, %	P, %
Sunflower Hulls*	90.0	40.0	0.41	0.00	5.0	63.0	0.00	0.114
Sunflower Screenings*	87.0	64.0	0.66	0.39	11.1	29.0	0.72	0.42
Sunflower Seed, Confectionary*	94.9	83.0	0.93	0.63	17.9	39.0	0.18	0.56
Sunflower Seeds, Oil Type*	94.9	121.0	1.42	1.03	17.9	39.0	0.18	0.56
Sunflower Silage, Low-oil Variety**	30.0	61.0	0.61	0.69	11.1	42.0	0.8	0.3
Sunflower Silage, High-oil Variety**	30.0	66.0	0.35	0.42	12.5	39.0	1.50	0.3

*Adapted from Lardy and Anderson, 2003.
**Adapted from Park et al., 1997.

Table 2. **Nutrient content of sunflower products.**

In Brazil, a unique production system called the sunflower system is used: first sunflowers are planted, then soybean crops reduce idle time and increase the overall production and profitability of the sunflower. sunflowers are usually planted in the extreme southern or northern regions of the country. Often in the southern regions, sunflowers are grown at the beginning of the rainy season, and then in the summer can be planted in the shade [7]. Researchers have found that changing the use of fertilizers can improve the shade of sunflowers. The current method has been shown to have a positive effect on the environment [8].

In temperate regions, the overall growth period is 125 to 130 days [11]. The head of a sunflower is not a single flower (as the name suggests), it consists of 1000 to 2000 individual flowers combined in a reciprocal pot. Because many sunflower varieties have a degree of spontaneous incompatibility, pollen movement between plants by insects is important, and bee colonies typically have increased yields. Below are the incomplete names of the available varieties.

4. Discussion. Below are the varieties of sunflowers grown in different climates and soil conditions. These varieties differ from each other in early ripening, yield index, and in which regions they adapt well.

1) *Krasotka*. French selection hybrid. A simple hybrid. The leaves are medium, heart-shaped, bright green. The basket is medium to large, dense, sloping down. The average height of the plant is 150-160 cm. The average weight of 1000 grains is 83.0-90.0 days. Early ripping. The average growing season is 77-90 days. It belongs to the group of high-fat hybrids, the fat content of the seed kernel is 60.0-65.0%. The hybrid can be planted as a secondary crop after cereals and cereals.

2) *HS—8506 (M PK—8506)*. The breeding hybrid of the Moldavian Field Crops Research Institute. Simple inter-line hybrid. Plant height 160-170 cm. The weight of 1000 grains is 66.0-74.0 gr. Resistance to falling and spilling 5.0 points. The vegetation period is 100-115 days. The average grain yield in 20000-2004 was 21.6-27.6 quintals per hectare. The fat content of the kernel is 48.9-52.0%.

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3) *Sembred—254*. American selection hybrid. Simple linear hybrid. Plant height 160-170 cm. The leaves are medium-sized. The basket is medium in size, dense, 450 bent. The weight of 1000 grains is 74.5 gr. The vegetation period is 102-105 days. The average grain yield is 20.4-30.2 quintals per hectare of farms. Resistant to falling and spilling. It belongs to the group of high-fat hybrids with a fat content of 63.0-65.0% in the seed kernel.

4) *Luchaferul*. The breeding hybrid of the Moldavian Field Crops Research Institute. Plant height 140-160 cm. The leaves are medium-sized, heart-shaped, green. The weight of 1000 grains is 60.0-75.0 g. Resistant to lying down and spilling. The vegetation period is 100-110 days. The average grain yield is 22.5-24.1 sentner per hectare. HybridLMR (*ложнаямучнистая роса*), white and gray corrosion resistant.

5) *Jahangir*. Selection variety of the Uzbek Research Institute of Botany. The average height of the plant is 140-160 cm. The average weight of 1000 grains is 70.0-78.0 g. Medium Early ripping. The seeds are dark gray to medium in size. The vegetation period is 98-108 days. The average yield during the test years was 19.2-22.0 quintals per hectare. The fat content of the grain is 58% and the protein content is 19% [1,12,13,14,15,16-22].

5. Conclusion. Sunflower is the most important industrial plant and is mainly grown as an ornamental plant, medicinal, food, raw material, fodder, dyes for the textile industry, body dye. Valuable oil is extracted from the seeds. Sunflower is grown as an oilseed crop in arable lands around the world and is also used to make food crops (silage with good stems). Sunflower is very resistant to salt and has a high yield of green mass, so it is of great importance in irrigated agriculture as a crop grown on saline soils.

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