



Ministry of
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Guide on the cultivation technology of strawberry in Uzbekistan.



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Introduction

- **Strawberry Rosaceae B.Jues belongs to the *Fragaria L* genus of the rose family. It is a perennial herbaceous plant with a short taproot. At the base of each bud, additional rootlets are formed.**
- **Strawberry (*Frugaria L.*) ranks first among berries grown in Uzbekistan. Great importance is attached to the cultivation of strawberries in the republic. They are a very tasty food and are also a good raw material for processing. Strawberry is characterized by fast and early harvest.**
- **Growing strawberries in the conditions of Uzbekistan has great prospects. When irrigation is combined with existing natural and economic factors, it is possible to obtain a high and high-quality harvest of strawberries.**



CULTIVATION OF STRAWBERRIES IN OPEN FIELDS

- ***Land selection.*** Establishing a good plantation is one of the necessary conditions for strawberry to grow well and bear fruit. Plantation - a strawberry field should be established in a place with good light, shelter from the wind, well-supplied with water. For this crop, areas are chosen that are relatively flat or slightly more sloping, where the seepage water is at least one meter below the surface of the earth.
- An area with a slope to the south is allocated for the cultivation of early crops, and for evening crops - a more sloping area to the north. It is important to remember that the crop on the southern slope is threatened by blueberry, if it is not watered in time in the summer, the leaves of strawberries will be damaged by the sun. The best slope for strawberries is a south-west and north-west slope, where the soil does not dry out quickly.
- Strawberries can be placed in a place where trees have not been planted or between young seedlings. Do not forget to apply additional fertilizers when crops are sown in a denser manner. Garlic is planted next to strawberries.



Preparing the land for planting.

- Strawberry is a perennial herbaceous plant that grows in one area from 3 to 10 years. During these years, as a result of frequent watering, the land is overgrown with grass, the soil becomes compacted, and diseases and pests accumulate. Therefore, it is necessary to keep the land on which strawberries are grown soft, porous, rich in nutrients and free from weeds with strong roots, such as sorghum and sedge.
- After harvesting the next vegetable crops, the field is cleaned of crop residues and weeds, watered, and fertilized. Depending on soil fertility, 20 to 50 tons of local fertilizers can be mixed with 600-1000 kg of superphosphate per hectare of land. Fertilizer is applied to a depth of 30-40 cm, in gravel soils to a depth of 25 cm.
- It is necessary to level the soil before planting. When growing strawberries in the place where alfalfa is planted, it is necessary to take into account the fertility of the land when applying superphosphate..



Reproduction

- Strawberry is propagated by vegetative and generative (seed) methods. It is propagated from seed in order to create new varieties. After picking the fruit, the seeds are separated from the flesh, washed, slightly dried and planted in small boxes 8-10 cm high.
- The main and most common method of propagation is vegetative propagation. In this case, the root of the strawberry is separated and planted in another place. Such seedlings retain all the characteristics of the variety. When the plant blooms, a thin whisker-like branch grows in the axils of the lower leaves, touches the soft and moist ground and takes root. A two-three-year-old plant gives more such branches.



Planting period and technique

- In Uzbekistan, strawberries can be planted in spring, summer and autumn. Seedlings are sown in the spring in regions with low snowfall and unstable snow cover and rapid frosts in the fall (Korakalpakistan, Khorezm), and in the summer in areas with a long fall. Plants planted in summer develop well until autumn, the above-ground part, i.e. stem, leaves develop well, flower buds are formed, and they are prepared to pass the winter normally and produce next year's crop.
- In Uzbekistan, planting strawberry seedlings in one row is more common. Seedlings are planted with 70-80 cm between rows and 20-25 cm between plants, so that 500-714 bushes per 100 m² of land or 50-70 thousand seedlings are placed per 1 hectare.
- When the distance in the row is narrowed to 10-15 cm, next year's productivity will increase by 1.5-2 times compared to planting in the scheme of 80x25 cm, as well as the yields for planting will be more.



Care of newly planted seedlings. If the strawberry field is not worked on time, weeds will overrun it, depriving the crop of light, moisture and nutrients. 20-30 days after planting, it is necessary to work between the rows and rows, remove weeds, and soften the roughness caused by frequent watering. When cultivating the soil and opening irrigation ditches, the roots should be cut and the plant should not be buried with soil.

Care of a harvested strawberry garden. In the spring, the straw in the field is harvested, and the fertilizer applied in the fall is buried in the soil. Productivity mainly depends on the time of softening of the soil. The earlier the first softening is carried out, the higher the yield, the later the yield decreases. In the conditions of Uzbekistan, there is a need to soften the soil earlier in the years when spring is hot and humidity is unstable. Therefore, in the end of February - beginning of March, until it is possible to work in the strawberry field, it is necessary to soften the soil between the rows to a depth of 10-12 cm and cultivate the soil around the plant.



Watering

In the experience of berry growing in Uzbekistan, strawberries are irrigated 13-24 times during the growing season, with each irrigation consuming 300 to 800 m³ of water per hectare. Gravel lands of the Fergana Valley are irrigated frequently and in small quantities, similarly in the regions of the south of the republic (Bukhara, Kashkadarya, Surkhandarya regions) water is given during harvest. It is irrigated sparingly but satisfactorily in the heavy soils of the north of the republic, in the Tashkent region, in the Republic of Karakalpakstan.



Fertilization

- **Most of the mineral fertilizers are absorbed by the plants in the spring and used for the formation of new leaves, flowers and fruit-bearing organs. When the yield of strawberries bearing fruit in the first year is 53.24 centners per hectare, the following amounts of nutrients are consumed per hectare: 59.28 kg of nitrogen, 36.24 kg of phosphorus, 63.09 kg of potassium; and in the second year, 57.25 per 93.03 centners respectively; 34.28; 51.95 kg; in the third year-41.38 for 58.9 centner harvest; 24.0; 46.92 kg.**
- **In this case, before planting, strawberries in the fields where 240 kg of phosphorus and four and a half tons of humus were mixed per hectare and 180 kg of nitrogen was given twice a year grew well and gave a relatively high yield for three years.**
- **Taking into account the soil fertility, 20-40 tons of semi-rotted manure and 600-1000 kg of superphosphate mixture can be applied to each hectare of land before plowing.**
- **During the growing season, 180 kg of nitrogen and 90 kg of phosphorus are applied to each hectare of land two to three times, i.e., during cultivation, after fruit picking and in autumn, additional feeding is given. In the fall, it is good if 100 kg of potassium salt is added to the ground per 1 ha.**



Mulching

- To improve the quality of the product, to protect the crop from rotting in rainy spring and rapid watering, and to control weeds, strawberry fields (soil) are covered, this is called mulching. For this, you can use polyethylene film, straw husk, shavings, paper. It is mulched in early spring, after cultivating the land, applying fertilizers, and taking egat. Mulch is covered in early spring with a width of 5-7 centimeters along the length of the ditch. However, freshly cut grass and dry leaves are not suitable for bedding, because they rot the fruit.
- In the experiments, the fruits of the fields covered with polyethylene film ripened 5-8 days earlier, the sugar content increased by 1.76%, the product quality improved, and the growth of weeds decreased. It was found that during the harvest period, 3 weeds appeared under the film, and 28 weeds appeared in open ground.



GROWING STRAWBERRIES UNDER FILM

Under the film, the product is fast. Soil and air temperatures are much higher than in open ground. In the spring, the temperature rises, the demand for water increases, and the soil moisture decreases. By this time, water is given and the film is removed. On cold days, the film is closed again in the evening so that the spring frost does not damage the flowers. If there is no air, the flowers will not be fully pollinated, and the fruit will be of poor quality. In order to speed up flowering and fruiting, the period of covering the film in autumn and spring is of great importance. By following the rules of high agrotechnics (irrigation, weed control, allowing pollination to pass normally), the yield will increase, flowering and fruiting will be accelerated.



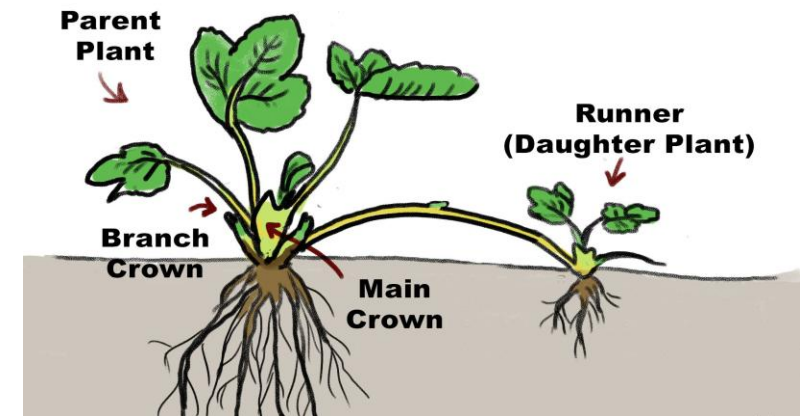
Harvesting

- Fruit picking begins depending on weather conditions, but the difference does not exceed 8-10 days. Usually, the first fruits ripen 25-30 days after flowering. In the southern districts of Surkhandarya and Kashkadarya regions and early spring, mulberry ripens at the end of April, and in the mountainous and northern districts at the beginning of May. The entire month of May and early June is the harvest season.
- For fruit picking, baskets with a capacity of 2-2.5 kg of fruit or 40x25, 50x30 cm boxes are suitable. Diseased and damaged (crushed) fruits are picked in a separate container. If the fruit cannot be eaten or processed on the day of picking, it can be stored in the refrigerator for two or three days.



Final care from the harvest

- Excessive compaction of the soil during the harvest, lack of moisture and nutrients, exhaustion of the plant due to the increase of whiskers, damage from diseases and pests - all this leads to rapid aging of the plant and a decrease in the next year's harvest. Therefore, after picking the fruit, it is necessary to deepen and soften the rows immediately, plant and fertilize.
- It takes many strawberry seedlings to plant every year. Therefore, it is not possible everywhere to cut the mustache of the upper part of the land suitable for seedlings. However, whiskers left on the bush will thin the plant and delay the harvest. Thus, when the mustaches were removed, 127 kg of fruit were obtained from each 100 m² area, and when 10-12 branches were left on each bush, 109 and 91 kg of fruits were obtained from the respective plants.
- When 5 whiskers were left on each bush, the next year's yield decreased by 9% compared to plants with whiskers and branches removed, and when 10 were left - 13.9%; 19.8 with 15 left; 28.5% less fruit was obtained when 20 were left.



STRAWBERRY DISEASES AND PESTS AND METHODS OF FIGHTING THEM

White spot disease

Basically, small reddish-brown round, open-bordered spots with a flowing center and reddish-brown edges are formed on the leaves of the plant. Infected leaves slowly dry up and fruit bunches also wither. *Ramularia tulasnei* Sacc. type causes. This fungus develops in stages of conidia and sclerotia, sac (*Mycosphaerella fragariae* Sacc.).

Countermeasures: In order to fight the disease, it is necessary to collect and burn the infected plant parts. It is advisable to carry out these activities in early spring, before the flowering of the plant. During the growing season, strawberry plants should be treated 3 times with 1% bodro liquid. The first treatment is carried out 10 days after flowering. When planting seedlings, special attention should be paid to the spacing of seedlings. Planting disease-resistant varieties also reduces disease damage.



Infection of strawberry leaves with white spot disease.

Brown spot disease



**Brown spot disease of
strawberry leaves.**

The disease mainly affects the leaves of the plant. Large, brown, reddish-brown or black spots appear on infected leaves. Dark pads form on the surface of these spots, and the leaves dry up. Such spots are also formed in leaf bands and veins. The causative agent is *Marssonina potentillae* Magn f. *fragariae* Ohl., is the type. The fungus reproduces as conidia on infected leaves. The conidia are colorless, two-celled, and the sac stage is called *Fobrea fragariae* Kleb.

Leaf disease increases in wet weather, especially during fruit ripening. The causative agent overwinters on old leaves, wintering buds, and spreads anew by means of conidia formed in early spring. Brown spot disease infects 60-100% of plants in the conditions of our Republic. In order to fight against the disease, it is necessary to collect and remove the old leaves and plant residues from the field, where the source of infection is kept. Infected plants should be treated with 1% Bordeaux liquid. When planting seedlings, it is necessary to correctly determine the crop interval, remove old leaves from the bushes in early spring.

Powdery mildew disease

- This disease affects all above-ground organs of strawberries. The first symptoms of the disease are formed in the form of white spots that are not noticeable on the back of the leaf. Later, such leaves twist in the shape of a boat, turn bronze and dry. The indicated characters are also manifested in the bud, flower and fruit. *Sphaerotheca macularis* f. *fragariae* Jacz. caused by fungus. During the growing season, the fungus reproduces several times and spreads by means of conidia. In the second half of the vegetation, the bag stage of the fungus - cleistothecium is formed.
- *Countermeasures*: it is necessary to destroy plant residues, remove weeds in time, cut leaves after harvest, fight against weeds in time, not to compact the cultivated areas. When the first signs of the disease appear, the mulberry is dusted with sulfur powder (2 g per 1 m²) or sprayed with 1% colloidal sulfur. This is done every 15-20 days, but at least 20 days before the beginning of fruit picking. At the same time, it is necessary to treat with Topaz, Bayleton, Topsin-M fungicide, plant disease-resistant varieties.



Infection of strawberry fruits and leaves with powdery mildew.

**Certain fungicides approved for use in agriculture of the Republic of Uzbekistan
in the fight against strawberry diseases**

Name of the drug	Consumption rate, ha/kg or ha/l	Type of disease	Shelf life method and recommended restrictions	How long before the harvest, the processing is completed, day	Number of applications per season
TOPAZ 10% emulsion powder	0,3-0,5	Powdery mildew disease	During the plant growth period	20	2
BAYLETON, 25% powder (250g/kg)	0,24	Powdery mildew disease, gray rot	It is sprayed in the form of a 0.04% suspension before the flowering of the plant and after harvesting, it is not limited in breeding places and nurseries.	-	2

White rot disease

- It usually appears as a white fluffy powder with black, irregularly shaped sclerotium on ripe berries. The disease develops strongly in the berries that touch the ground on rainy days or when there is a lot of dew. The harvested berry becomes juicy and quickly rots. White rot sometimes develops in leaves and roots in the form of watery tissue rot. The causative agent of white mold is *whetzelinia sclerotiorum* (dVu) korf.et Dumont. bag mushroom. The pathogen spreads by haltaspores and mycelium, overwinters in infected plant parts and soil in the form of sclerotia.

Gray rot disease

- The disease is characterized by the softening of berries and the formation of brown spots. Later on the spots, a gray mold develops, which consists of the formation of conidial spores of the pathogen. The causative agent of the disease is *Botrytis cinerea* Fr. fungus. In addition to berries, it also damages leaves, buds, flowers and fruit bunches. Dark gray rotting spots with weak gray dust are formed on them. During the vegetation period, the fungus spreads by conidia. The pathogen hibernates in the form of sclerotia in the soil and in the damaged parts of the plant. They grow in the spring and produce conidial spores. Gray rot develops strongly in oil and hot weather.
- **Countermeasures:** Control measures: timely harvesting of fruit, removal of diseased ones, not dense planting, tillage, weeding. In spring, spray with 1% bordeaux liquid twice before flowering and until the formation of nodes, during harvesting, pick and bury affected fruits separately.



Infection of strawberry fruits and leaves with gray rot disease

Black rot disease



**Infection of strawberry fruits
with black rot disease**

The disease first causes the berry to become brown hairy, then a black felt-like powdery mildew appears on them with sporangia containing sporangiospores of slimy black balls. Ripe fruit becomes juicy. The causative agent is saprophytic fungi belonging to the order Mucorales. During the growing season, they produce abundant asexual spores in the form of sporangia, which are formed in the sporangium. Sporangiospores are spread by wind. In addition to them, the fungus forms dark purple, spherical zygosporangia, which tolerate low winter temperatures well. Strong development of the disease is observed especially strongly in mechanically damaged and rotten berries. Such fruits completely lose their quality.

Verticillium wilt

At first, the leaves of the infected plant turn yellow, spots appear on their edges, and they expand to cover the entire leaf. Younger leaves lag behind in growth and become small. The bush is small. Heavily infected plants die by the end of summer. Infected plants do not bear fruit.

Control measures: healthy seedlings are planted, diseased plant residues and weeds are collected and destroyed in time.

Strawberry mite

- Infected plants stop growing, leaves do not swell. The plant does not bear fruit, as soon as the whiskers appear, the mite moves to them and spreads over the entire area.
- *Control measures:* only healthy seedlings are planted on the field. For recovery, a heat treatment measure is used, which consists in keeping seedlings in water with a temperature of 48° for 15 minutes. In this case, mites at different stages of development die. After harvesting, the leaves of the affected plants are harvested, immediately removed from the field and burned.

Strawberry-raspberry long nose

- It damages the buds of strawberries and raspberries: they are cut off from their petals and fall off. The beetle hibernates under the leaves remaining in the upper layer of the soil.
- *Control measures:* it is necessary to collect and destroy the fallen leaves and the material covering the plant, soften the soil around the plant in autumn.

Strawberry leaf eater

- A small dark-brown beetle, 3-4 mm long, hibernates under fallen leaves, among wild grasses. Beetles appear in early spring, but most of their spread occurs during the budding period of the plant. The beetle feeds on the soft part of the leaf: when it gnaws, holes are formed, leaving a curved mark.
- *Control measures:* during the budding period of the plant, it is necessary to spray it with 0.15% Paris blue (4 g per 1 m²) with the addition of double slaked lime. The leaf eater damages the leaves of strawberries, blackberries, and raspberries. Infected leaves are covered with blisters, do not swell or curl up. Young caterpillars feed on buds and leaves in early spring. In home gardens, leaves that do not bud are collected by hand and disposed of.

WEEDS OF STRAWBERRY CROP GROWN IN OPEN AREAS AND MEASURES TO CONTROL THEM

Annual dicotyledonous weeds

Atriplex (*Atriplex hastata* L.) is an annual dicotyledonous weed, a family of plants belonging to the family of sorghums, the leaves are alternate and less opposite. Annual species of oleander, such as salt oleander, white oleander, white sedge, are very harmful weeds. It germinates in March-April, mainly in irrigated lands and sometimes in dry lands. It reaches 30-90 cm in height, it mainly pollutes the soil with its seeds, one bush gives up to 7600 seeds, 1 sq.m. On average, 3-5 pieces are found on the site. The main control measures are plowing the land before the seeds have ripened, cultivating the cultivated fields, cleaning the seeds well, keeping the manure in manure pits until the seeds in it rot, and so on.

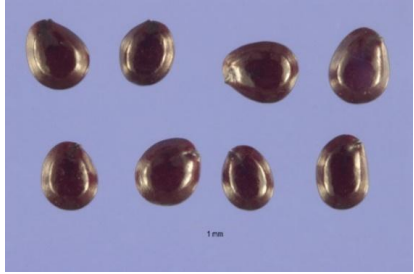
Sticky grass (*Lappula squarrosa*) is an annual dicotyledonous weed, reaching a height of 60 cm, with straight roots and erect stems. The leaves are located in a row, the flower is in the shape of a broom, and the fruit is egg-shaped. Sticky grass is found in all cultivated areas.



Atriplex (*Atriplex hastata* L.).



Sticky grass (*Lappula squarrosa*).



Amaranthus Hybridus L.

Amaranthus Hybridus L. an annual dicotyledonous weed. Belonging to the family of marigolds, it is found mainly in irrigated lands, germinates in April and flowers and sets seeds in July and August. It grows up to 30-120 cm in height, has a branch, has strong roots, and can produce 100,000 to 7 million seeds in one bush. Found in all irrigated lands, 1 sq.m. an average of 5-7 pieces are found on the site, which can cause great damage to crops if the weed is not dealt with in time.

Setaria glance is an annual grain weed that germinates after temperatures rise above 14°C. Height 40-50 cm. grows up to The ability of the seed to germinate reaches 10-15 years. The dog guest mainly pollutes the soil through its seeds, 1 sq.m. On average, 3-5 pieces are found on the site. It germinates after the air temperature exceeds 15°C. The rhizome is vigorous, one plant produces up to 5,000 seeds, and the seeds are shed quickly after ripening.



Setaria glance.

Strawberry cultivation in vitro

In vitro propagation of strawberry (*Fragaria × ananassa*) — is a technique of plant tissue culture used to multiply plants under sterile conditions. This method is widely applied in breeding programs, for obtaining virus-free plants, and for rapid mass propagation of seedlings.

Main stages:

1. Explant selection

- **Commonly used explants: apical meristems, nodal segments, or young leaf blades.**
- **Taken from healthy, virus-free mother plants.**

2. Sterilization

- **Explants undergo surface sterilization:**
- **Washed in running water.**
- **Immersed in 70% ethanol (30 seconds).**
- **Treated with 0.1–0.2% HgCl₂ or NaOCl solution (5–10 minutes).**
- **Rinsed several times with sterile distilled water.**

3. Culture medium

- **Typically based on Murashige & Skoog (MS) medium.**
- **Additives:**
- **3–5% sucrose**
- **0.7% agar**
- **Vitamins (B1, B6, nicotinic acid)**
- **Plant growth regulators:**
- **Cytokinins (BAP, kinetin) – for shoot induction and multiplication**
- **Auxins (IAA, NAA, IBA) – for root induction**



4. Induction and multiplication phase

- Sterile explants are placed on the medium.
- Incubated at 25 ± 2 °C with a 16-hour photoperiod.
- Shoot initiation occurs within 3–4 weeks.
- Subculturing is performed to promote further multiplication.

5. Rooting phase

- Shoots are transferred to media with higher auxin concentration.
- Well-developed root systems form within 3–4 weeks.

6. Acclimatization (transfer to ex vitro conditions)

- In vitro-derived plantlets are delicate, so they are first transferred to sterile mixtures of peat, perlite, or sand.
- Maintained under high humidity and diffused light, then gradually adapted to external conditions.



Advantages

- Production of virus- and pathogen-free plants.
- Rapid mass propagation (thousands of plants from a single explant).
- Year-round production possible.

Challenges

- Requires strictly sterile conditions.
- Needs specialized laboratory equipment.
- High mortality risk during transfer to soil substrates.

Thank you for your attention!

