MANUAL FOR CULTIVATION OF SESAME

MINISTRY OF AGRICULTURE AND ENVIRONMENTAL PROTECTION OF TURKMENISTAN

TURKMEN AGRICULTURAL INSTITUTE

AGRICULTURAL SCIENTIFIC-PRODUCTION CENTER

MANUAL FOR CULTIVATION OF SESAME

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The manual describes according the results of scientific research in Turkmenistan and Central Asian countries, the types of seeds, their characteristics, the agro technics of their cultivation and the pests of this crop.

The manual is intended for professionals, landlords, and tenants working in the agricultural sector and for teachers, and students of the agronomy and biology faculties of higher, special secondary schools.

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Introduction

«In the Program of Development of the agricultural complex for 2019-2025” in our country volumes of production of competitive agricultural products increase and increase their species. The work to be done under the program is aimed at reducing the volume of agricultural products imported to our country and satisfying the population's demand for food products at the expense of our own products. In this regard, our country of crops grown in agricultural field’s reproduction of species, including oil-bearing plants expanding the arable land of the crops that fall into their category and it has a great importance to facilitate scientific development.

The plants which are taken oil from the seed crops are sunflower, corn, cotton, sesame, groundnut and a number of other agricultural crops. Among the oil-bearing crops sesame seeds differentiate in their taste, aroma, and composition 50% to 65% fat that is easily digested in the digestive system of human body. Also in sesame seeds trace elements beneficial to the human body such as calcium, iron, and phosphorus and contains vitamin E. Sesame oil is also widely used in medicine. Sesame food in scientific data used as a source of blood pressure in the human body and help regulate blood cholesterol levels giving, anemia, asthma, cold, excretion that it is beneficial in diseases of the system, in the health of the teeth noted about. It is advisable to use sesame oil for people who are engaged in mental work, as well as for strengthening memory.

The main homeland of the sesame is Central and South Asia, North Africa. The taste of sesame seeds, the oil derived from it and the existence of several other beneficial properties, in the food industry and because it is used for various other purposes in many parts of the world: India, Pakistan, China, Korea, Japan, Taiwan, Turkey, Ukraine, Russian Federation, Central Asian countries in Uzbekistan, Turkmenistan, Tajikistan and several other countries.

In this manual, in Turkmenistan and the countries of Central Asia varieties, characteristics of the cultivated seed, by cultivating them agro

technics of cultivation and the productivity of this crop research on effective pest control the data obtained based on the results of the studies were described.

BOTANICAL AND BIOLOGICAL FEATURES OF SESAME

Sesame (Sesamum indicum L.) is a perennial plant and sesame belongs to the sesame family, oil-bearing plants. Its root is arrow-shaped and spreads to a depth of 1 meter of soil. The length of the stem averages 80-110 centimeters and grows vertically. It usually forms from 1 to 15 branches. Stem and branches have strong hair. Leaves of different sizes are dark or light green are colored and they fall to the ground as the harvest season approaches. The natural shedding of sesame leaves are important because after the leaves have fallen, the evaporation of moisture from the ground is reduced, and the process of harvesting the ripe crop is made easier. The flower of the sesame is large, up to four centimeters long, purple or light pink in color and self-pollinates (Picture 1). Sesame bees can also be pollinated through insects.

Picture 1. **The leafy and flowering branch of the sesame**

Sesame buds are blue, pale, elongated, 3-5 centimeters occurs in length. 100-130 on average per 1 plant growing normally the number of cotton ball is formed. Up to 80 sesame seeds ripen in one pod.

Sesame seeds flat, egg-shaped, thin-skinned, 1000 the weight of the grain averages 3.0-3.5 grams. The grains are white, black, yellow, and red, brown. Sesame seeds are mainly intended for obtaining oil. Its grain is also used in the food industry to provide confectionery products, i.e. sweets, cookies, dietary breads, to provide a pleasant aroma and sweet taste. (*Pictures 1-2*).

1

2

Picture 2. **1. The bud stem of sesame, 2. seeds of sesame**

The chemical composition of sesame seeds. The seed of the sesame contains up to 50-65% fat, up to 20-25% protein and up to 16% carbohydrates, depending on the variety and the conditions under which it is grown. Unprocessed sesame seeds contain calcium, iron, and phosphorus. It is a primary food raw material that contains trace elements beneficial to the human body, such as fatty acids, amino acids, antioxidants, phospholipids, phytosterols and vitamin E. The taste,

aroma, and light absorption of sesame oil from sesame seeds are considered equal to olive oil. (*Picture 3*).

Picture 3. **1-brown grain, 2-white, 3-black grains of Sesame**

Heat and light requirements of sesame. Heat and light requirements of sesame is very high. It also grows normally in the 45-49 ° C heat and produces abundant yields. An average of 2500-3000°C of active heat is required for seed germination during growth. Lack of heat during sowing reduces its germination. Sesame seeds begin to germinate when the soil temperature reaches 15-16 ° C. When the soil temperature reaches 18-20 ° C, it germinates well. When the temperature drops during that time, the roots of the grass begin to rot and often dry out. If the cloudy weather continues and the temperature drops during the flowering period of the seed, it has a detrimental effect on the formation of its crop tests, causing the resulting crop tests to fall to the ground. Such weather conditions leads to a decrease in the yield to be harvested from the seed. Sesame is a plant that requires sunny warm air throughout the growing season.

The soil requirement of sesame. Sesame must be sown in the underground water is far soil, not salty medium clay in terms of its close, mechanical composition of waters and light sandy, and high yields when grown in fertile soils with nutrients.

The water requirement of sesame. Sesame requires less water than other agricultural crops it is considered a drought-tolerant crop.

However, it yields higher yields when irrigated. If the field planted with sesame is pressed and watered, or the water in it is long if time goes by, it has a detrimental effect on its development.

Sesame requirement for nutrients The sesame is a crop that requires high levels of nutrients during the period. Nitrogen fertilization has a positive effect on the growth of the number of cocoons in the sesame seeds and the seeds in the cocoa, increasing its productivity. Excessive application of nitrogen fertilizers leads to a decrease in the fat content of sesame seeds. Phosphorus and potassium fertilizers, on the other hand, not only have a positive effect on the yield and fall of sesame plants, but also increase the fat content of its seeds.

Varieties of sesame

In production, sesame grows at different times, the weather varieties that are resistant to unfavorable conditions and diseases are cultivated.

The first variety that does not spill grains from sesame seeds founded in 1955, 1958. The corner is now with its selection; mainly on the oilseeds of Ukraine the research institute is engaged. This is the cornerstone of the institute a large number of varieties that mature late and in the intermediate period have been created. The varieties are light-colored, high-yielding grains, and oil-derived used in the production of sesame oil in factories and in the manufacture of confectionery in the food industry. In the Krasnodar Territory of the Russian Federation, in the Rostov Oblast and in the southern regions of Ukraine, white sesame-889, White-81, Kuban-55, Odessa-539 varieties of sesame are grown.

In Uzbekistan and Turkmenistan, sesame seeds were created as a Sarahs-470, as well as Ashgabat-122 varieties are widespread.

According to the scientist N.D. Lunina, the bean varieties that are grown in the countries of Central Asia are distinguished by high yields and high oil yield from grains. The yield of these varieties averages from 1 hectare to 14-16s. The weight of 1,000 grains is 3.5-3.9 grams. Suitable varieties of sesame in the regions of Ukraine and the Russian Federation (WNIIMK-889, WNIIMK-81, Kubanes-55, Odessky-539)

Yield per hectare does not exceed 10-12 s. Of 1,000 grains weighs 2.3-2.6 grams.

Sesame varieties introduced into production in Turkmenistan the characteristic consists of the following.

The Sarahs-470 variety ripens in the interim, with a growth period of 115 days. The fat content is 54-56%, the average yield is 14-16 s per hectare, and the weight of 1,000 grains is 3.5-3.9 grams.

The grains of the Ashgabat-122 variety are brown in color, with an intermediate period ripens. The growth period is up to 110 days, and the fat content is average 55-58%, disease resistant.

Seed of the White Seed-889 variety is white, early-maturing, mature period is 90 days, fat content up to 54-56%, resistant to bacteriosis, suffers from leprosy.

Seeds of the White Seed-81 variety are white, early-maturing, mature the period is an average of 96 days, with a fat content of about 54%, bacteriosis and is less prone to leprosy.

Ynam variety's growth period is 100 days, the plant height is 95 centimeters, one forms 80 coconuts per plant, yield 11 s / ha. The fat content of the grain is 55%. The weight of 1,000 grains is 2.6 grams. It is resistant to leprosy.

The seeds of the Lebap-55 variety are white, early-maturing, and mature 100 days, high yield, disease resistant.

The deshli variety ripens in the intermediate and late stages, the period of growth 120-130 days. The height of the plant is 120-130 centimeters. High-yielding, one 300-320 cocoons are formed in the plant. Fat content is 60% up to 30-32 grams of grains per plant, 1000 grains weighs 2.5 grams.

The boyaly variety ripens late, the growth period is 145 days, the plant 110 centimeters tall, forming 300 pods per plant, the weight of grains in one plant is 30-35 grams, the yield is 12 s / ha. Grain fat content is 59%. The weight of 1,000 grains is 2.6 grams.

Cultivation of sesame

Soil preparation for sowing. When sesame is grown the soil is fertile in a timely manner to get a higher yield to prepare for sowing. Sow the seeds to prepare the sown areas for sowing weeds in the field, plant waste disc tools should carry out crushing work with. The main reason for this is straw, weeds on the ground cause low quality of herds, reduce productivity, and reduce the quality of sowing. The cutters consist of a set of circular knives. The depth of the treatment is about 10 cm they transfer to the horizontal. For this purpose, the LDG-5A, LDG-10A, LDG-15A types as well as John Dir and Case crushers are used.

10-20 tons before sowing per hectare of sown area rotten course, 330 kg of superphosphate, 65 kg of potassium chloride fertilize and transplant at a depth of 22-25 centimeters. Then the area should be leveled in a deliberate manner. Straightening in the sown areas is one of the most important farming measures to lay the foundation for a high yield. If the surface is not flat, the captured water does not spread to the same thickness all over the mouth; spilled mineral fertilizers are washed from a high place and collected in a low place; the irrigated area does not match.

The highest part of the garden comes out of the tap, hardens, the middle low part comes to the bottom, and the lower part does not reach the bottom. This situation prevents high-quality transfer during sowing. The sown seed is the same, does not give the usual germination, the crop does not grow evenly and cannot be harvested high from the ground.

Salinity is high in the highlands, and in the lowlands, the soil is degraded. For these reasons, it is recommended that the ground be leveled properly so that water spreads evenly over it.

Each hectare in saline areas before sowing it is necessary to hold a throne or washing water according to the norm of 2000–3000 m3. To carry out wastewater treatment, it is necessary to divide the area into 0.20-0.25 hectares and release water. Once the soil has reached the bottom, you should draw irrigation ditches with a row width of 60 or 90 centimeters and a depth of 14-20 centimeters. If it is planned to plant the

seed in a flat place, it is possible to hold the table water in combination with washing water. In areas that are not saline and have a large slope, irrigation ditches should be held at a rate of 1500-2000 m3 per hectare. Pre-sowing treatment should be started depending on the nature of the catchment areas of the wash and board waters.

In sandy soils it is necessary to treat it with a chisel, boron-mala complex at a depth of 12-14 centimeters, in clay soils 14-16 centimeters deep. Prior to planting, irrigation is used to irrigate pre-sowing irrigation. The supply of throne water is in the amount of 1500-2000 m3/ha, depending on the mechanical composition of the soil. The ridge is softened with a 6-8-centimeter-deep toothpick after the frying pan has been sealed in non-saline and sloping areas.

Sowing sesame seeds for sowing. Pure varieties for planting, healthy seeds with high germination capacity should be used. One of the main and mandatory conditions for the preparation of seed seeds before sowing is to treat them to prevent diseases caused by seeds. For this purpose, one of the recommended fungicides (for example, Maksim forte) should be used in the prescribed manner and method.

Picture 4. **Seed irrigation**

Sowing and post-sowing agro technical measures. The sesame in early May in the southern districts of the country June 10-25 and in the northern districts June 1-10 between 5 and 8 centimeters deep in the soil at a temperature of 16 to 18°C should be sown with seeders for seed crops.

Distance it is recommended to sow wheat, barley and other early-ripening cereals in the summer, in the southern districts from June 15-25, and in the northern districts from June 20-30. If the seed is sown late from this period, its fruits will not ripen if the autumn months are rainy and cold. From the sesame in a row to get used to the mold 2-3 to 5-8 kilograms of seed per hectare of soil depending on to be planted to a depth of centimeter. The seeds should be spaced 60 or 90 centimeters apart the ridge is planted in rows 2 and 3, respectively. Moist enough when sown in the soil, the seeds begin to germinate after 4-6 days. Early in case of cover formation in the upper layer of the soil by rainfall when planted in time, the cover should be broken with a rotating rake so that the vessels can germinate without interruption. In case of lack of soil moisture in the area where the cover is broken, sprouting water should be provided with a norm of 500-600 m3 / ha from single caches.

After the full germination is obtained, soften the row and weed should be cleaned. When two pairs of true leaves are formed, the plants to adjust the feeding area and to regulate the sun's rays, you should isolate it by placing 1 plant in 5-6 cm. It is then estimated to have 500-650 thousand hectares per hectare depending on the range.

In winter sorghum, from winter wheat, cereals and legumes, planted after melon crops and corn. So that the pests do not appear in public in the corner, it should be planted 6-7 years later. Recommended sowing when cultivated and cultivated within the time limits and norms the crop ripens in 120-125 days.

Growth watering. Moisture during the flowering period requires a lot. In a field planted with sesame in irrigated agriculture growth water is kept at a rate of 800 m^3 per hectare. The first growth water at a time when the sun is shining, the second is its mass flowering and it is recommended to give during the period (picture 5). Seed growth the

waters are heavy and should not be suppressed. Normal after each watering the rows are softened 1-2 times with the help of treatment techniques to provide air exchange and reduce the loss of moisture in the soil.

Picture 5. **The flowering period of the sesame**

Picture 6. **Inter row-preparing of sesame field**

Inter row-preparing. The purpose of this event is land from keeping it soft, from reducing moisture loss, is harmful Suitable for preventing salt build-up, weed control, and plant growth consists in

creating food-water-weather conditions. During the growth of sesame seeds, 3-4 inter-row preparing are performed. The first inter-row treatment should be carried out at a depth of 5-6 cm when transplanting, and the last inter-row treatment should be carried out at a depth of 10-12 cm after growth waters.(Picture 6).

Using of fertilizers. Nitrogen deficiency is the key to growth slows down and reduces yields. Phosphorus and potassium the level of fat content of its grain in the absence of fertilizers decreases. Sowing 10-20 tons per hectare of sown area course, 330 kilograms of superphosphate and 65 kilograms of chlorine potassium fertilizers are recommended. At the same time, it is advisable to give 100 kilograms of urea per hectare at the beginning of flowering and flowering, as well as before planting in the 1st growth water. In the same way, the teaching of the syrup by mixing it with the water of growth ensures a bountiful harvest from this crop.

Sickness and pests of the sesame

There are several types of diseases when growing sesame seeds and pests occur and are detrimental to its productivity affects.

Phytophthora parasitica fungus creates phytophthora of sesame. This sick can occur during the entire period of its growth. When the seed that has begun to sprout is diseased, yellow, brown, and round spots appear on its embryo. Diseased grasses often wither and dry. When adult plants get sick, yellow, resembling round spots form on their stems, leaves, and buds. The spots then merge and turn completely brown, causing the testes to dry out.

The fungus Botrytis cinerea is caused by gray rot. The disease affects the stems, leaves and buds of the seed. On the disease- infected pods, there is dust-like, ash-like substances (fungal spores) appear (Picture 7).

Fusarium vasinfectum fungus can occur during all stages of germ growth when favorable conditions arise on the sesame. Purple, lily-like spots form on the young testicles of the diseased spleen. In the root

neck, stems, and leaves of adult plants, pink, yellowish or colorless glossy substances (fungal spores) appear. The leaves of the diseased plant are twisted, often in part or in part completely dry. Small in dry plants grains are formed.

Picture 7. **The leaves and cocoons of the sesame are covered with gray rot**

In addition on the sesame seeds can occur, ascohytosis (Ascochyta sesame), leukemia (Oidium sesame) fungal diseases and bacteriosis (Bacillus) sesame). Diphenoconazole or carbendazim in the composition of the disease one of the fungicides containing it should be used within the prescribed time and period. In order to prevent diseases, the proposed fungicide is theirs spraying is effective before the symptoms appear. Necessity when it occurs, it is recommended to replace one form of the fungicide with another and spray 1-2 times against the disease.

The main pests of sesame are cotton juice (*Aphis gossypii*), sesame seed (*Acmaeodera ballioni*), cotton seed (*Chlorideaarmigera)* and caradrina (*Spodoptera exiqua*).

In particular, sesame seeds cause great damage to this crop. Its yellow colorless, barefoot, larvae up to 7 millimeters long by feeding on it, it fills the place with the excretions (impurities). The damaged branches are broken and dry. The absorber should be used in the

prescribed manner, one of the imidor or ephedra insecticides, and one of the awaunt, vacant or entovant insecticides, which is supported against rodent insects.

Harvesting of sesame

The time of harvesting the seed is determined by the condition of its leaves. When the leaves of the seed turn yellow and fall to the ground, and when they turn white-brown it should start to reap. The fact that the all sesame seeds do not ripen at the same time is a biological feature. The ripening of sesame seeds is a plant it starts from the lower branches and then gradually moves to the upper branches. Delay in harvesting seeds causes crop losses. A special combine harvester is used to harvest small-grain crops to harvest the seeds. Seed harvest with a combine is collected in two ways. The crop grown in the first method is harvested from the field with a combine harvester. In the second method, it is first harvested and after the bundles are dried, it is given to the combine and the broken grain is taken.

In small areas, the seed is harvested by hand and tied is dried. Once the bundles are dry, the tarpaulin is shaken over the bed or knocked down with a stick and its grains are harvested.

Addendum

Table 1

Rules and deadlines for agro-technical measures to be taken during early cultivation of sesame

№	Agro-technical measures	Norm	Deadlines	
			In the regions Ahal, Balkans, Mary and Lebap	In the Dashoguz region and in the north districts of Lebap region
1	*2*	*3*	*4*	*5*
1	Fertilizer before plowing	Rotting course - 10-20 t/ha Superphosphate - 330 kg/ha Potassium chloride - 65 kg/ha	25.10-01.12	25.10-01.12
2	Plowing	22-25 cm	15.12-15.02	15.12-01.03
3	Aligning	Cross-sectional	01.01-20.02	20.12-05.03
4	Ridging	Intermediate: 60 cm: 14-16 cm deep 90 cm: 18-20 cm deep	20.01-01.03	-
5	Capturing water	1500-2000 m^3/ga	01.03-20.04	01.03-20.04

Continue of table 1

1	*2*	*3*	*4*	*5*
6	Pre-sowing soil treatment: - leveling temporary closures, flat areas in flat areas; - treatment with chisel, rake + cattle set; - soften the ridge with a boron on the slopes;	12-14 cm in light soil, 14-16 cm in clay soil the top of the ridge is 6-8 cm deep	25.03-25.04	01-30.04
7	Seed treatment	In the norm and method prescribed by the recommended fungicides	01-05.05	20-25.05
8	Sowing	Depending on the range Consuming 5-8 kg / ha of seeds	10-25.05	01.06-10.06
9	Activities for growing (lid breaking, wetting)	Rotating rake soften with (motyga) 500-600 m3 / ha	15.05-25.05	05.-15.06
10	Conducting 1st row treatment	5-6 cm deep	20.05-30.05	10-20.06
11	To tug and weeding	500-650 thousand base / ha	25.05-30.05	15-25.06
12	Conducting 2 nd row treatment	10-12 cm deep	01-10.06	20-30.06

Continue of table 1

1	*2*	*3*	*4*	*5*
13	1st growth watering	800-1000 m^3/ga	15-25.06	05-15.07
14	Conducting 3 rd row treatment	10-12 cm deep	20-30.06	10-20.07
15	2 nd growth watering	800-1000 m^3/ga	05-15.07	25.07-05.08
16	Conducting 4th row treatment	10-12 *cm*	10-20.07	01-10.08
17	To weed out	By hand (when needed)	20-30.07	10-20.08
18	Pest and disease control measures	Recommended insectoacaricides and fungicides in the prescribed manner	15.05-01.08	05.05-20.08
19	Harvesting	By combine or by hand	15-25.08	15.09-01.10

Table 2

Rules and deadlines for agro-technical measures to be taken during cultivation in the medium term

№	Agro-technical measures	Norm	Deadlines	
			In the regions of Ahal, Balkans, Mary and Lebap	In the Dashoguz region and in the north districts of Lebap region
1	*2*	*3*	*4*	*5*
1	Plowing	22-25 cm	05.06-10.06	10-20.06
2	Aligning	Cross-sectional	05.06-15.06	10-20.06
3	Ridging	Row 60 cm: 14-16 cm in depth 90 cm: 18-20 cm deep	10.06-20.06	15-25.06
4	Sowing Growth watering	Marked with recommended fungicides by treating the seeds in a regular and methodical manner, 5-8 kg / ha seed per row depending on the row spending 1700-1900 m3/ha	15.06-25.06	20-30.06

Continue of table 2

1	*2*	*3*	*4*	*5*
5	Conducting 1st row treatment	5-6 cm deep	20.06-05.07	25.06-05.07
6	To tug and weeding	500-650 thousand base / ha	20.06-01.07	01-05.07
7	Drawing irrigation caches and 1st time additional feeding	Row 60 cm: 14-16 cm deep 90 cm: 18-20 cm deep Ammonium nitrate - 100 kg/ha	25.06-05.07	15-25.07
8	1 st growth watering	1200-1400 m3/ha	01-10.07	20-30.07
9	Conducting 2 nd row treatment	10-12 cm deep	05-15.07	25.07-05.08
10	2 nd growth watering	1200-1400 m3/ha	15-25.07	05.08-15.08
11	Conducting 3 rd row treatment	10-12 cm deep	20.07-01.08	10.08-20.08
12	To weed out	When the need arises	05.08-10.08	15.08-25.08

Continue of table 2

1	*2*	*3*	*4*	*5*
13	Pest and disease control measures	Recommended insectoacaricides and fungicides in the prescribed manner	15.06-25.08	05.07-25.09
14	Harvesting	By combine or by hand	20.09-01.10	01-10.10

Note: The recommended agro technical deadlines and rules may vary depending on the weather of each agricultural year depending on the growth conditions of the plants or the time of emergence of the pests and the type of new pesticides.

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