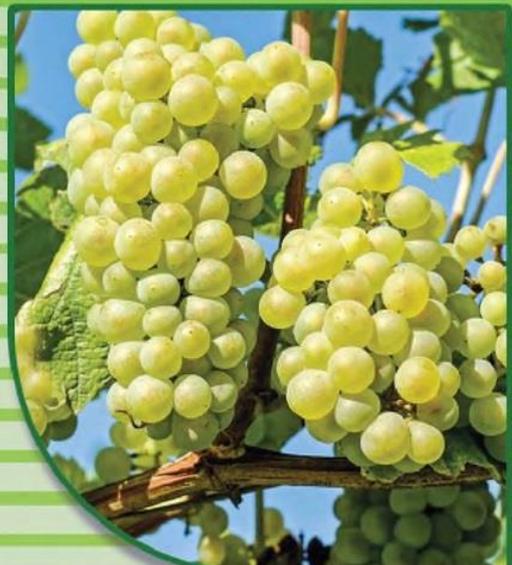
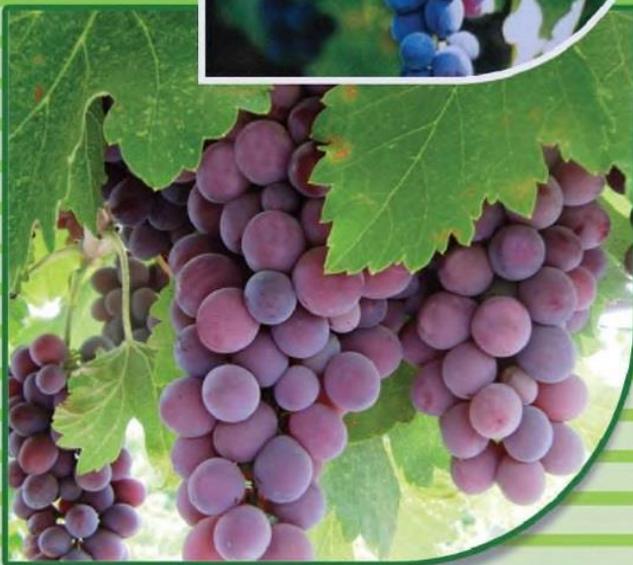
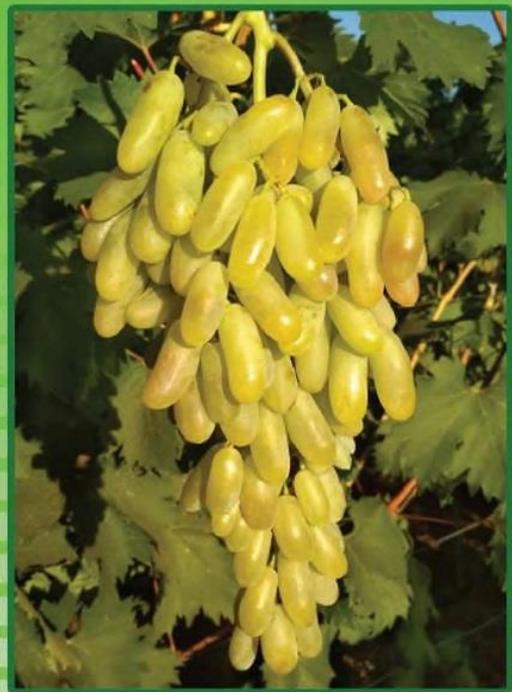
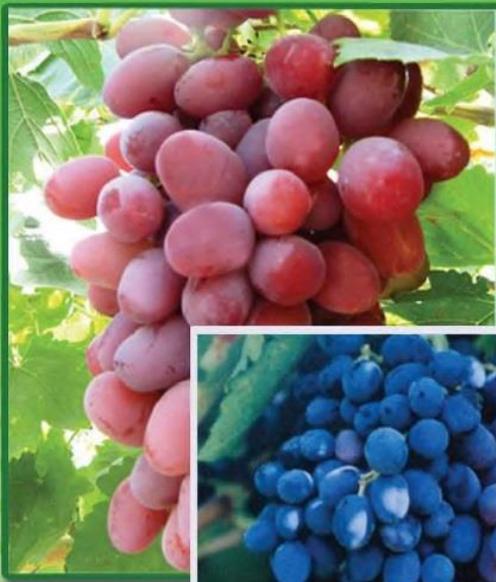


MANUAL OF GRAPE CULTIVATION



**MINISTRY OF AGRICULTURE AND ENVIRONMENTAL
PROTECTION OF TURKMENISTAN**

TURKMEN AGRICULTURAL INSTITUTE

AGRICULTURAL SCIENTIFIC-PRODUCTION CENTER

MANUAL OF GRAPE CULTIVATION

Ashgabat

Turkmen State Publishing Service

2021

UOK

M

M Manual of grape cultivation.- A.: Turkmen State
Publishing Service, 2021.

The manual provides advice on growing grapes based on the results of research conducted at the Agricultural Research and Production Center and the experience of leading manufacturers. It summarizes the timing and norms of agrotechnical measures in the cultivation of grapes depending on the soil and climatic conditions of the regions of Turkmenistan.

The manual is published for agricultural professionals, private landlords, tenants, teachers and students of higher education institutions, as well as the general public.

TDKP № 2021

KBK

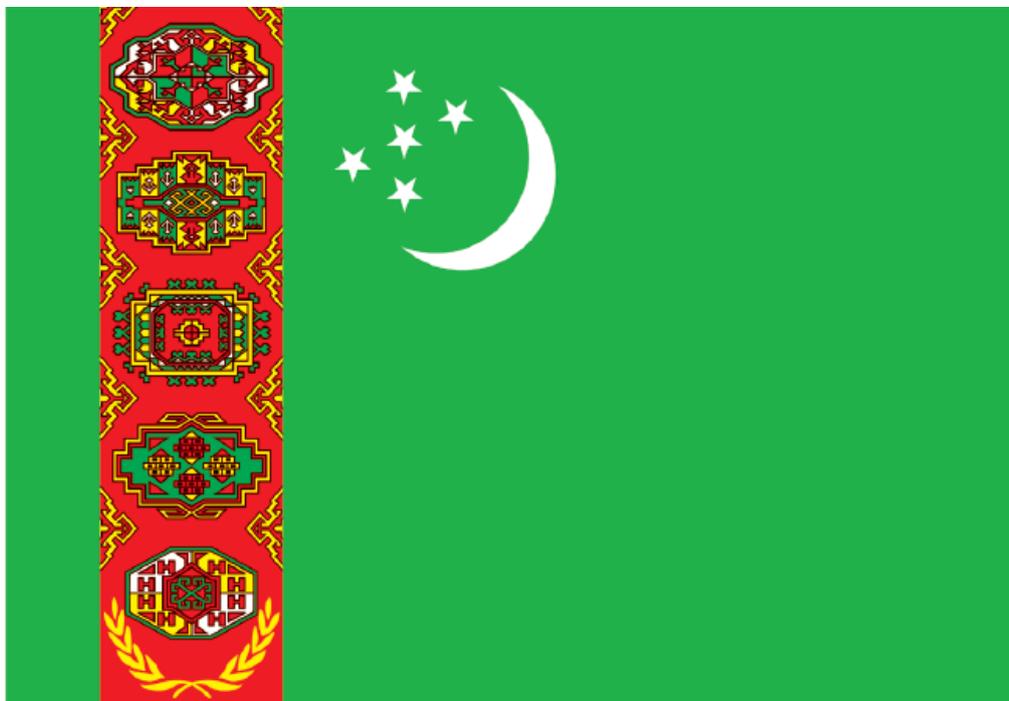
© Ministry of Agriculture and Environmental
Protection of Turkmenistan, 2021



**PRESIDENT OF TURKMENISTAN
GURBANGULY BERDIMUHAMEDOV**



THE STATE EMBLEM OF TURKMENISTAN



THE STATE FLAG OF TURKMENISTAN

THE STATE ANTHEM OF TURKMENISTAN

I am ready to give life for native hearth,
The spirit of ancestors descendants
are famous for.
My land is sacred. My flag flies in the world
A symbol of the great neutral country flies.

Refrain:

The great creation of people,
Native land, sovereign state,
Turkmenistan, light and song of soul,
Long live and prosper for ever and ever!

My nation is united and is veins of tribes
Ancestor's blood, undying flows,
Storms and misfortunes of times are
not dreadful for us,
Let us increase fame and honour!

Refrain:

The great creation of people,
Native land, sovereign state,
Turkmenistan, light and song of soul,
Long live and prosper for ever and ever!

INTRODUCTION

Thanks to the efforts of our esteemed President, during the epoch of prosperity of our sovereign state, the agricultural sector of our country is rapidly growing and changing. Achievements in science and technology, advanced experience and new technologies are widely introduced into the industry. All the necessary conditions have been created for farmers, landowners and tenants to grow abundant crops, orchards and grapes from the land. The viticulture sector is one of the largest sectors in the country and plays an important role in creating food abundance in our country.

Our country is considered one of the ancient centers of cultivated grapes. Self-improvement methods were passed down from generation to generation, honed by the experience and sharp talents of Turkmen farmers, and have come down to us today through mentoring. About 50 varieties of local Turkmen grapes can be called one of the living witnesses of the very long-standing return of the viticulture profession to our country.

During the period of prosperity of our sovereign state, the grape industry in our country became one of the most profitable industries. The natural soil and climatic conditions of our country are also favorable for the cultivation of grapes of the world famous grape producers in California (USA), France and Italy. The high required temperature and illumination of the vineyards in our country (the total active temperature is 5600C), the absence of phylloxera, which is a pest of grapes, and the dry weather in the summer months make Turkmenistan the most suitable country for growing grapes.

Currently, 4 main grape varieties are widely grown in the country - Terbash, Ashgabat black and late-ripening varieties Ak Taifi, Gyrgyzy Taifi. Early maturing varieties are small in size and include Gara Khalili, Ak Khalili and Gara Jigi-Jigi.

The grape varieties grown in our sunny country are famous for their variety, sweetness and nutritional value. Grapes are rich in hydrocarbons, mineral salts, organic acids, trace elements, glucose,

fructose, vitamins B1, B2, B6, B12, A, P, C, carotene, sodium, potassium, magnesium, calcium salts, phosphorus and iron.

Grapes are very nutritious food for the human body and are also very beneficial for the health of the body. Grapes improves the functioning of the nervous system, increases the body's resistance to infectious diseases. Increases the secretion of gastric juice, improves metabolism, increases kidney function, and dilates blood vessels. Diuretic, diaphoretic, laxative, expectorant, invigorating properties of grapes make it an excellent remedy for many diseases. It is widely used in the treatment of weakness, anemia, liver and kidney diseases.

Agrobiological features and economic value of grape varieties grown in our country

When laying the foundation for new vineyards, it is important to choose varieties that are bred at different times, with good homemade characteristics, drought tolerant and resistant to diseases and pests. Such varieties include early-ripening Jubilee raisins, Garrygala raisins, early-ripening Black raisins, intermediate-ripening Ak Kishmish, Kishmish Batyr, Sogdiana Raisins, Hishrai Kishmish, Jenjel gara, Ichkimar WIR, and Varieties such as Gyrgyzy Taifi, Ak Taifi, Late Vavilov, and Garrygala black grapes. These varieties include the early ripe Jubilee raisins, Garrygala raisins, early ripe black raisins, intermediate ripening white raisins, Sogdiana, Hishrai, Jenjel gara, Içkimar WIR. All these are varieties grown in the country's vineyards, with a yield of 110 to 250 c / ha.

It is recommended to plant grape varieties in the following ratio: early and mid-ripening 20%, mid-ripening 30% and late-ripening 50%.

For the production of vintage, food and champagne wine products, it is recommended to plant varieties of Terbash, Ashgabat black grapes, Gyzyly sapak, Ak shekerek, Gyrgyzy muscat.

Terbash is the most widely grown local Turkmen grape in our country. It covers 50% of all planted vineyards in our country. The flower is bisexual. The edges are broadly conical, intermediate in size,

sometimes large (18-20 cm long), spaced or rarely dense. The fruit is medium-sized, round or slightly purple, greenish-white. The thick rind of the fruit bark is juicy from the pulp, with a sweet taste. It is a versatile food and wine variety that matures over time. The harvest begins to ripen in early July, fully ripens by the end of August. Productivity is 250-270 kg / ha. The average weight of a handful is 204 g, and the average amount of a handful in a crop is 1.5.

Terbash is one of the most resistant to cold. It is resistant to Oidium disease.



Figure 1. *Terbash Variety*

Ashgabat gara uzum variety is widespread in our country. In terms of area, it ranks second place after Terbash. The flower is bisexual. The stem is tapered, medium in size, of medium density or dense. Fruits are medium to large in size, round, black and red. The fruit is thick-skinned, juicy from the pulp, sweet in taste. The harvest begins to ripen at the end of July, fully ripens in mid-September. The yield is very high, the yield in well-groomed vineyards reaches 380 c / ha. The mass of a handful is 210-326 g, the average amount of a handful in a crop is 1.7.



Figure2. Ashgabat gara uzum variety

Cold resistance is lower than Terbash. Ashgabat gara uzum is the highest grade, very suitable for the production of wine products. At the same time, it is a versatile variety that is suitable for both sweet and dried raisins.

Ak Taifi is a widely cultivated grape variety grown in our country in the later stages. The flower is bisexual, the aroma is large, cone-shaped, and sometimes the upper part is winged, with medium density or rare. The fruit is large, purple, light green. The bark of the fruit is thicker. The fruit is fleshy, dense, juicy, and sweet. The harvest begins to ripen at the end of August, fully ripens in mid-September. The yield on high-yielding, high-stemmed, wide-row, fan-shaped, well-groomed vineyards reaches 300-400 centners/ha. The average weight of seedlings is 468-617 g, the average number of seedlings per crop is 1.2.

The variety is very suitable for long-term storage in refrigerators. It is mainly eaten fresh, dried and turned into raisins. It is cold resistant. The variety suffers from Oidium (pollen) disease.



Figure 3. Ak taifi variety

Gyrmyzy Taifi variety is late ripening grape variety. The flower is bisexual. The edges are wide, conical, branching in a larger direction, the distance is dense. The fruit is large, purple-cylindrical, the sunny side is purple, and the shadow side is yellow-green. The bark of the fruit is firm, thick, the fruit is dense, and the flesh is juicy. The harvest begins to ripen at the end of August, fully ripens by the beginning of September. The yield on high-yielding, high-stemmed, wide-row, fan-shaped, well-groomed vineyards reaches 300-400 centners / ha. The average weight of seedlings is 368-660 g, the average number of seedlings per crop is 1.2. The variety is very suitable for long-term storage in refrigerators, mainly consumed fresh and dried. It is low frost resistance. The variety suffers from Oidium (pollen) disease.



Figure 4. Gyrgyzy Taifi grape variety



Figure 5. Gichki gyzyl uzum variety

Gichki gyzyly uzum (Late grade Vavilov) - it is a late Turkmen grape variety that is eaten fresh. The flower is bisexual. The edges are broadly conical, large, and of medium size, the upper branch is branched, of medium density. The fruit is large, cylindrical, dark red in color. It is juicy pulp, medium firm, and sour at the beginning of ripening, sweet when fully ripe. The bark of the fruit is thicker and denser. The harvest begins to ripen at the end of August, fully ripens in the first decade of September. Its productivity is high-yielding, high-stemmed, wide-row, fan-shaped, well-groomed vineyards - 300 c / ha. The variety is very suitable for long-term storage in refrigerators, mainly consumed fresh. It is resistant to cold and oidium disease.



Figure 6. Iri nohur variety

Iri nohur variety (Big Nohur variety) - it is a local Turkmen grape variety that ripens in the intermediate period. The flower is bisexual. The brushes are large and medium. The fruit is large, ovoid, and yellow in color. The bark of the fruit is thin and hard. The fruit is denser, fleshy and has a sweet taste. The harvest begins to ripen at the end of July, fully ripens by the end of August. High yield 200 c / ha. The average weight of a handful is 450-773 g, and the average amount of a handful in a crop is 1.2. The variety is eaten fresh, dried and turned into raisins. It is resistant high to cold and suffers from oidium disease.



Figure 7. *Gelinbarmak (Ladies' fingers) Variety*

Gelinbarmak Variety (Ladies' Finger) - it is a grape variety that ripens in the interim. The flower is bisexual. The stem is large,

branched, conical, sparse or spaced in density. The fruit is large, cylindrical, thin, and yellow-green. The fruit is fleshy, dense, juicy. The bark of the fruit is thin. The harvest begins to ripen at the end of June, fully ripens in mid-August. Its productivity is 100-150 kg / ha. The average weight of a handful is 300 g, and the average amount per crop is 1.1. It is resistant to cold and Oidium disease. Not suitable for long distance transport.



Figure 8. *Grape variety "Ichkimar"*

The Ichkimar variety is a grape variety created in Uzbekistan that ripens in the intermediate time. It has a flower of the same sex, i.e. mother of the same sex. It cannot be bred by paternal sex. Therefore, when planting, it is necessary to plant two grape varieties next to it. Its brush is of medium size, sometimes large, conical, of medium density. The fruit is large or very large, thin, reddish. The fruit is fleshy, very

dense, and juicy. The peel of the fruit is thick. The harvest begins to ripen at the end of July, fully ripens in mid-August. Productivity is 170-270 kg / ha. The average weight of seedlings is 350-486 g, the average number of seedlings per crop is 1.0. It is suffering from the disease Oidium (dusty), frost-resistant. This grape is eaten mostly fresh.



Figure 9. Grape variety "Jenjel"

The Jenjel gara grape variety is an Uzbek variety that ripens in the interim and is eaten fresh. The flower is bisexual. The edges are large, cylindrical-conical, and sometimes conical, of medium density. It is a handful of thread of medium length and very strong. The fruit is large, sometimes very large, well covered with a speck of fruit, dark ink, and when fully ripe it turns black. The fruit is fleshy, dense, juicy, and sweet. The bark of the fruit is thick but not hard. Fruit juice is light purple. It has fruit with 2-4 seeds of medium size. The crop begins to ripen in the third decade of July and fully ripens by the end of August. The yield on

high-yielding, high-stemmed, wide-row, fan-shaped, well-groomed vineyards reach 320-350 centners per hectare. On foot grapes yield 120-150 centners per hectare. The average weight of fruit is 315-408 g, and the average amount per harvested plant is 1.1-1.3. This variety is resistant to fungal diseases. The yield of the variety is stable. Therefore, it is suitable for long-term storage in refrigerators.

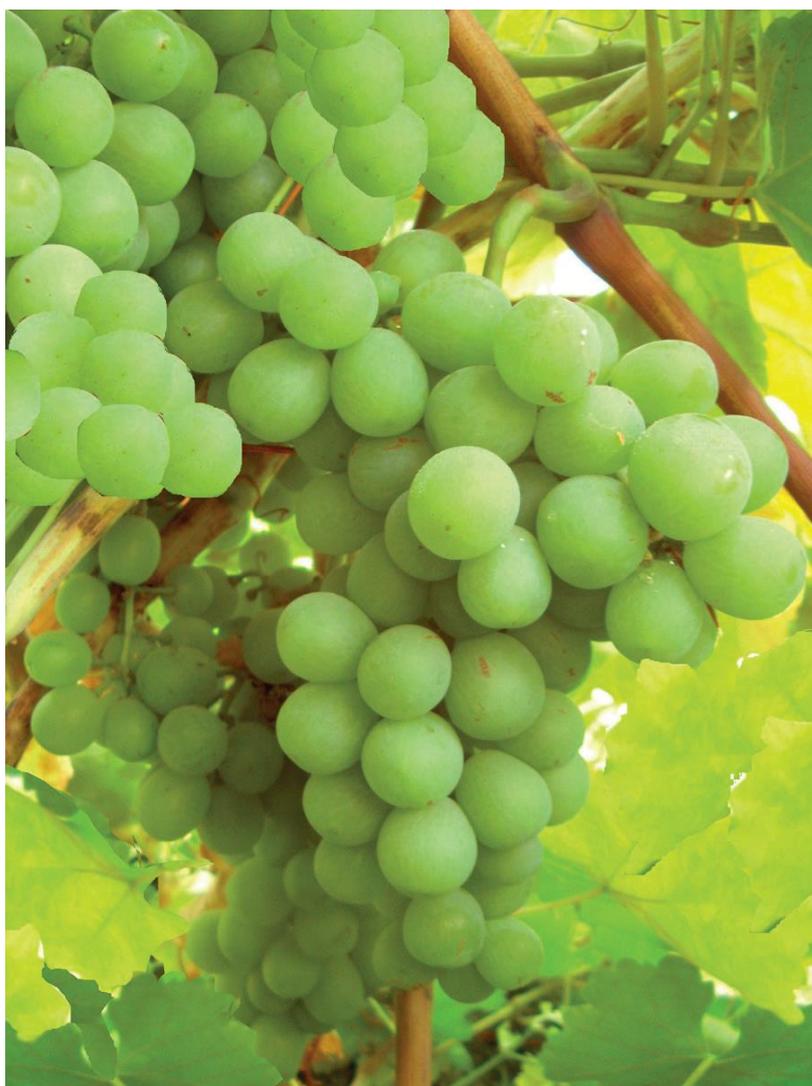


Figure 10. Grape variety (Gizil sapak) Red thread

Gyzyl sapak variety (Red thread grade) - it is a Turkmen grape variety that ripens in the middle or end of the season. The flower is bisexual. Racemes are narrow, sometimes large, cylindrical-conical, winged in the upper part, dense. The fruit is medium-sized, purple, and white. The fruit is juicy, the fruit bark is thin and fragile. The crop

begins to ripen in mid-August and fully ripens in early September. Productivity is 150-180 kg / ha. The average weight of seedlings is 220-364 g, the average number of seedlings per crop is 1.3. The variety is affected by pollen, cold-resistant. The fruits of this variety are mainly used to make wine and eat sweaters.



Figure11. Gara kishmish (Black raisin) grape variety

Gara kishmish (Black raisin) variety - it is a seedless variety of early maturing grapes. The flower is bisexual. The stem is large, cone-shaped, of medium size, winged in the upper part, of medium density, sometimes dense. The fruit is purple, medium-sized, black, fleshy, dense, juicy. Fruit taste is very good, sweetness is high. The harvest begins to ripen in mid-July, fully ripening by mid-August. It is high productivity. Productivity is 150-250 c / ha for care. The average weight

is 150 g, and the average amount per crop is 1.2. More Oidium (dusty) disease is unstable to cold. The variety is mostly eaten fresh and made into a higher quality dried product.



Figure 12. Ak kishmish "White raisins" variety

Ak kishmish (White raisin) variety – seedless intermediate grape, intermediate ripening. The flower is bisexual. The trunk is cylindrical-conical; the upper part is winged, of medium density. The fruit is small, round, sometimes purple, greenish-yellow. The fruits are fleshy, dense, juicy, sweet in taste, the fruit bark is thin. The harvest begins to ripen in early July, fully ripens in early August. The yield is high. With good care, it reaches up to 150-200 c / ha. The average weight is 180-230 g, and the average amount per crop is 1.3. It is low cold hardiness. It is used for fresh consumption and for the production of high quality dried raisins.

Khishrau Raisin variety - it is an in-between-ripening grape variety produced in Uzbekistan. The flower is bisexual. It is conical shape, medium size, and medium density. The fruit is yellow in color, with a brown spot on the sunny side, large, purple in shape, very sweet in taste and very fleshy, the bark of the fruit is dense.



Figure13. "Khishrau" raisin variety

The crop begins to ripen in the third decade of July and fully ripens in the second decade of August. The yield is high. The yield when leaving is 150 kg / ha and above. The average weight of a handful is 130 g, and the average number of seedlings per crop is 1.5. Resistant to powdery mildew disease is medium, frost resistance is high. The variety is mostly eaten fresh and made into a higher quality dried product. The high durability of the variety allows it to be stored in refrigerators for a long time in autumn and winter and to be transported over long distances.

Ak Khalili - it is a variety in which the grapes ripen early. (Figure 14)The flower is bisexual. The stem is conical or cylindrical-conical, of medium size, winged in the upper part, rarely dense. The fruit is

medium-sized, purple, and greenish-white. The fruits are fleshy, dense, and sweet in taste, the fruit bark is thin. The crop is fully ripe by early June. Productivity is 125 kg / ha. The average weight of a handful is 130 g, and the average amount is 1.3. The degree of cold resistance is average. It is suffering from the disease Oidium (pollen) disease. The variety is eaten fresh.



Figure 14. Grape variety "Ak Khalili"

Gara khalili - it is a local Turkmen variety that ripens early. The flower is bisexual. The edges are large, cylindrical or conical, often close to the top of the wing. The fruit is large, from purple to currant, sometimes cylindrical, dark red. The fruit is fleshy, densely juicy. The peel of the fruit is thick. The crop begins to ripen at the end of June and fully ripens in the second decade of July. The average yield is 190 kg / ha. The average weight of a handful is 480 g, and the average amount per crop is 0.6. It is very resistant to cold, suffers from powdery mildew (pollen) disease. The grapes are eaten fresh.



Figure 15. Grape variety "Gara Khalili"

Preparation of vineyards

Suitable for planting vineyards are considered soils with a depth of ground water 1.5-2 m, and saline ground water at a depth of at least 3 m.

Land preparation should begin with soil straightening and give 30-40 tons of rotted manure per hectare, 600 kg of superphosphate, and 100 kg of potassium chloride per hectare. Then after this work it should be carried out a deep plowing of the ground to a depth of 50-60 cm and again cross-sectional alignment on the plowed areas. The land is then divided into equal parts (5-10 hectares). In order to fully meet the needs of the vineyard in the soil and sunlight, as well as for the processing of a number of techniques, it is recommended to plant seedlings of grapes on an area of 4x2 m, and on sandy areas - on a line of 3x2 m.

Planting of grape seedlings

Grapes are recommended to be planted in Akhal, Balkan, Mary and southern regions of Lebap region in autumn from 20 to 10 December and in spring in March, in the northern districts of Lebap and in Dashoguz from 10 March to 5 April.

Before planting, it is necessary to carefully inspect the seedlings and remove weeds, roots, weak or sick seedlings. Seedlings should have at least 7 roots 40-45 cm long and less than 2 mm thick. When they are planting roots cut it 12–14 cm long. After sowing on the top of the seedlings put a strongly developed branch, which is cut from 2-3 members. The rest of the branches are completely cut off. Before planting the roots of the seedlings are immersed in clay, prepared from unburned manure and loamy soil (1: 1) or soaked in running water for 10-12 hours.

The depth of the landing pit should be 50-60 cm, and the width - 40-45 cm. Before planting seedlings in each pit should be mixed with 1.5-2 kg of soil, slice and pour 5-10 cm of clean soil. They then dig the seedlings by placing the roots of the seedlings at the bottom of the pit. It is necessary to melt the base of the planted vine and plow the ground again. After 1-2 days after planting, ground water should be treated at the rate of 500-600 m³ per hectare, and after 7-8 days - the second sowing water at the rate of 800 m³ / ha. Next to the planted seedlings of the vine for the second year of growth, the tree trunk should be planted at a depth of 35-40 cm; the length of its surface should be 120-130 cm. It is attached to a strongly developed branch of the vine, which forms the trunk of the vine.

Preparation of reinforced concrete racks. Under production conditions, the construction of reinforced concrete racks and wires should be completed by the beginning of March of the second year after planting of grapes. Reinforced concrete sleepers, iron or steel pipes and other industrial wastes can be used as a support. If a reinforced concrete rack is to be used, it must be 2.3 m high and 10 x 10 cm horizontally. The racks have a depth of 70 cm, the main rack should be 0.5 m from

the first base, and the intermediate racks should be erected every 6 meters. When planting grapes with a 4x2 m line, 475 columns per hectare is required.

3 rows of double wire are passed from the nested columns. The wire thickness should be 3 mm. If a 5 mm thick wire is used, you can skip one wire. The height of the transmitted wires should be as follows: the first row is 100-120 cm; second row 130-150 cm; the third row is also 170-175 cm. If the wire is to be missed in 2 rows, the height of the first row is 120-130 cm; and the second row can be carried out at a height of 170-175 cm.

Pruning and touching up of young grapes

In the first year of growth it is forbidden to cut and tie branches. Grape seedlings should grow freely. In March of the second year, only the remaining branches are cut off. It is also reduced to 2-3 members. During the growing season, green stems of strongly developed grapes in length and thickness are attached to a tree. Repeat the procedure every 10-15 days until the end of development 4-5 times. When the length of the stem for the trunk reaches 120 cm, from the two upper lateral branches lay the vine branches and when their length reaches 20-25 cm. tie the first wire. When the length of the stem for the trunk reaches 140 cm, the grapevine remains with 2 lateral branches, which, in turn, are attached to the second wire.

Thus, **for the second year of growth** the roots of the vine with a stem length of 120-140 cm, 3-4 branches 70-80 cm long and secondary lateral shoots with 12-16 branches grow.

For the third year of growth, in March, it is necessary to place 4-5 shoots on each hand from the base of the vine and cut into three members.

For the fourth year in a row, the branches are cut in March in the form of a cleaning complex. That is, it is cut in the form of a head, consisting of 4-6 knees and under it a replacement branch for 2-3 knees. Depending on the size of the grape branch, 4-5 sets of cultures should be

placed in each wrist. In the coming years the crop will be completely cut, and the sprouts that appear on the replacement plant will be cut in the form of a harvesting kit.

In Dashoguz region and the northern districts of Lebap, the roots of the grapes give the trunk a multi-stranded fan-shaped form. Then it is very convenient to bury the grapes if the roots of the branches are raised in a one-sided slope. When planting the grapes the first year put two strong shoots, which cut with 2 members. For the second year of development leave 4-5 strongly developed rods, cut to a length of 80 cm and fasten to the lower wires in the form of a fan. Left branches form grape seedlings. In the third year of growth shoots should be cut off in the form of a harvest set. Period of work: from 1 December to 15 March in the southern regions of the country and from 1 to 30 November in the northern regions.

Care of young grapes

In order to grow 90-95% of planted seedlings of grapes, the first three watering after planting should be done every 8 days, and the others - every 12-15 days. In the development of grape seedlings in Akhal, Balkan, and Mari regions: 15-16 times 375-400 m³ / ha for one-year grapes, 670 m³ / ha for 2-year grapes, 800-900 m³ / 5 -6 times for 3-year grapes. In Dashoguz and Lebap regions: 1-12 grapes should be watered 10-12 times a year, 2-year old grapes 7 times, 3-year old grapes 4-5 times 4-5 times a day. Water should be kept in irrigation trenches laid at a depth of 18-20 cm, at a distance of 0.4-0.5 meters from the grape branches.

Rows of vineyards should be softened with a chisel to a depth of 10-15 cm after both waters, and the roots of the vine soften the elephant twice during the growing season.

When feeding young grapes with fertilizers, every 3-4 years, 30-40 tons of lime, 500 kg / ha of superphosphate, 200 kg / ha of urea, 100 kg / ha of potassium chloride from mineral fertilizers are introduced. Then, under the winter herd, 75% phosphorus, 20% nitrogen and 100%

potassium, the remaining 25% phosphorus and 80% of nitrogen are given under plowing.

The soil between the vines should be plowed to a depth of 20-25 cm in spring from March to the first decade of April, and in the autumn from October to November to a depth of 20-25 cm with the PRWM-3 tool.

Spraying 8-10 liters of glyphos, SONROUND or SPRUT herbicides per hectare against grape weeds is very effective when spraying weeds in rows and vines roots from March 20 to April 5.

In March of the second year, healthy seedlings are planted in place of non-rooted seedlings. Starting from the third year, instead of rooted seedlings used a long branch of grape vine next to it. The selected rod is directed to the landing site, buried in a pit dug to a depth of 30-40 cm, removing the tip, the finished column is tied to a post or cable. Two years later, the wire connecting the two vines should be cut.

Caring of the yielding grape trees

The fourth year of vine growth is considered the year when they began to bear fruit. Therefore, under the autumn plow it is necessary to pour 40-50 tons of manure once in 3-4 years. Of mineral fertilizers it is recommended to water 600 kg of superphosphate, 250 kg of nitrogen and 100 kg of potassium chloride per hectare per year. Then pour in the total amount of phosphorus and 2/3 of nitrogen in the form of urea, the remaining 1/3 of nitrogen in the form of ammonium nitrate and all the amount of potassium fertilizers in the spring until March. Rows between the vineyards are planted in the spring from March 1 to April 15 and in autumn in the second half of October and November to a depth of 20-25 cm with the PRWM -3 tool.

During the growing season, the row of grapes against weeds is softened 2-3 times to a depth of 10-15 cm.

Herbicides are also used against weeds. Weeds in rows and roots of grapes are sprayed with herbicides in the amount of 8-10 liters per hectare of glyphos, Sonround or Sprut from March 20 to April 5.

Vineyards in Akhal, Balkan and Mari provinces should be irrigated three times during the winter months with a total flow rate of 6,000 m³ / ha. It should be administered in December, January and February, depending on the irrigation possibilities. If in the winter watered twice at the rate of 2000 m³/ha each, it is recommended to irrigate the third water at the rate of 1000 m³/ha in late May - early June.

In Dashoguz and Lebap regions it is recommended to retain 1500 m³ / ha of winter wet water at the rate of 1500 m³ / ha in December and January, and at the rate of 800 m³ / ha in late May at the end of the season. After watering, the soil should be softened by a drill to a depth of 10-15 cm when the soil in the rows boils. Delaying this work leads to loss of moisture in the soil and a decrease in the yield of grapes.

During the development of the fruit-bearing grape, the upper parts of its green branches are cut off, and the excess non-productive branches are completely removed.

Complete removal of unproductive vines is carried out at the end of April, when green vines reach 4-5 cm in height and in May, when vines reach 12-15 cm for the second time. The vine, stem and perennial branches of the vine, as well as the remnants of the immature branches that are laid, are then completely removed. This improves the use and ventilation of the grapes, and also ensures good growth of fruiting stems. As the vine stems grow and appear in rows, their ends are cut off. Cropping is carried out 2-3 times in July-August, depending on the rate of growth of grapes. When the branches are cut, the accumulation of nutrients in the grapes increases, and the lighting conditions of the grapes are improved. This reduces the damage caused by grapes by diseases and pests, and helps to obtain a high-quality crop.

Pruning grapes

The most important of the agrotechnical measures in the vineyard is grape pruning. It must be fully completed from December 1 to the beginning of the movement of water on the vines, i.e. March 15th. Grapes must not be pruned at temperatures below 0C in winter. When

the grapes are cut, the crop is cut into a bunch, i.e. a replacement rod, consisting of 2-3 joints and 4-8 joints, is placed on top. Last year, last year's harvest was completely turned off, and the harvest was replaced with one obtained from a replacement plant. Most of the local varieties produce more seedlings than seedlings in 8-10 segments. Therefore, depending on the vigor of growth of the grapes, they are divided into short, medium and long. A short section is cut from 2-3 joints, which is mainly used to replace the replacement bar. In low-growing grape varieties with a weak growth potential (for example, in Terbash grapes), 2-3 joints are cut, placing them in the harvest. The intermediate part is cut into 4-6 segments in culture in tall varieties (for example, in Ashgabat grapes). In vigorous grape varieties (for example, Black Khalili), the stalks are long, that is, 7-10 segments. When pruning vines, it is impossible to leave poorly developed thin twigs for the harvest. The shoots and leaves that come out of it are small, handfals are small. Fruit shoots are also very rare in the joints of these rods. This condition occurs in very thick branches; therefore, when cutting grapes, they should be made from short twigs with a thickness of 7-10 mm, that is, as thick as possible.

The number of joints formed when cutting grapes depends on the grape variety, the shape they give, the condition of the base of the vine and their water supply. We recommend leaving 150-200 shoots on tall, fan-shaped, wide-row, well-groomed shoots. If the water supply of such figured grapes is low, 80-100 joints should be cut. Likewise, 30-60 shoots are placed on the vines in a glass-shaped pedestal, depending on the strength of the vine roots. In areas where grapes are buried in winter (in the Dashoguz region and the northern districts of Lebap), the pruning- should be completed by the end of November. Then the number of segments should be larger, that is, 3-4 grape branches with 4-6 reapers (each reaper is located from 10-11 jaws). Then the grapes are covered with soil 20-25 cm thick. The grapes will be buried by hand in the Lebap velayat on March 2-3, in the Dashoguz velayat from March 25 to April 10. The topsoil is removed and the exposed branches of the vines are repaired and tied to the wire. Broken, cold, dry hands and rods

are then cut off. Tape blanks of long livestock are cut and shortened to 6-8 joints.

Impact of cold winter on grapes

The resistance of a vine to severe cold depends on its variety, the age of the vine and its care.

Among industrially cultivated varieties in our country, local varieties are more resistant to dangerous air cooling than Caucasian, Uzbek and Tajik varieties. Of these, the varieties Terbash, Ashgabat black grapes, Gyzyly sapak (Red thread), Sary uzum (Yellow grapes), and Khalili varieties are more resistant.

According to long-term data, these varieties tolerate a drop in air temperature to -20°C for 7-10 days. Examples of such varieties include the Ichkimar variety, which is widely cultivated in our country.

For low-grade varieties with frost resistance, varieties such as Gyrgyzy taifi, AK taifi, Ak Hussein, Gelinbarmak, Gara kishmish (Black Raisins) can be derived. The cold resistance of different parts of the base of the vine is not the same. Overwintering vines emerge from the axillary hollow of the leaf and are divided into 3 parts, in the center of which are fruit buds, and on both sides there are spare buds. Cold resistance of crops in the center is weaker than that of reserve shoots. Therefore, in the event that the central bud is cold, branches are formed from the lateral buds, but they are often unproductive.

Perennial branches and creepers are more resistant to extreme cold air. Therefore, it is wrong to completely prune the vines when they are cold. The grapes on the vine are mostly unfrozen or not fully ripe. If the dangerous air temperature drops below -20°C , annual and perennial branches of the vines are severely damaged, depending on the variety and care. Freezing temperatures of $25-320^{\circ}\text{C}$ at freezing temperatures causes the top of the vine to hit the ground completely in the cold. Even so, if local grape varieties such as Terbash and Ashgabat black grapes are well cared for in well-tended areas, they are capable of producing yields of 25-30 quintals per hectare. Even if frost hits the ground part of

the vine in winter, do not rush to cut them off completely. In this case, the vine removes new branches from the shoots lying on the ground. It would be very appropriate to use the cold-pressed vine as a support for these branches. When cold shoots of grapes and annual shoots are affected, new shoots grow from perennial shoots and shoots lying on the vine. While these branches are unproductive, they allow me to reshape and reap the benefits in a second year.

Young roots of grapes, as well as their aging and decrease in yield, have a lower resistance of the roots to frost-resistant vines than those of fruit-bearing berries.

Cold resistance of vines is directly related to their care. In autumn, local varieties are poured into the rows of grapes - grapes, superphosphate, nitrogen, potassium-chloride fertilizers, their rows droop, and from December they endure frosts down to -24°C . However, in areas where too much nitrogen fertilization is applied, the ripening of the vines is delayed. As a result, the cold resistance of shoots and rods decreases. Likewise, grapes that are poorly looked after and are not periodically treated, fed or irrigated will be seriously damaged if the air temperature drops below -20°C .

In places where grapes are not buried in winter, we recommend that you take the following measures to protect the grapes to some extent from the dangerous cooling of the air:

1. Water the rows of grapes and keep the moisture in the winter.
2. Vineyards should be smoked at an air temperature of -20°C and below.
3. Once you have determined the percentage of cold uranium in the vines (they are brown when you cut them off with a knife), you should increase the number of shoots you planted by cutting them off by a percentage more than in previous years.
4. When cutting grapes, if the seedlings are placed from lateral autumn shoots from the buds located in the armpits of the leaves of the main stem, they are more resistant to cold. Timely implementation of the above measures will help to a certain extent reduce the damage caused to the roots of the vine from frostbite.

Reviving of surface frost-bitten grapes

When the surface of the vine is frost-bitten, at the beginning of spring, 600 m³ per hectare should be watered first. After irrigating of the surface frost-bitten grapes, 15-20 strong branches emerge from its underground column. When new stems reach 8-10 cm in length, 1-2 strong growth buds should be left on them, and the rest should be completely removed. After 5-6 days, the laid branches must be carefully glued and tied to the dried vine of the column. If there is no old creeper, you should plant a post with a height of 1 m 20 cm.

During the growing season, work on tying new branches to the column should be carried out 5-6 times. The first time the stems reach 15-20 cm, the second time - 30-35 cm, and the third time - 40-45 cm. In addition to tying the stems, cut off the stems from the autumn shoots in the armpits of the leaves. When the stems reach a length of 100-120 cm, one of them is straight and strongly developed, and the other is completely cut off. The head of the laid stem is pointed, and all autumn new branches are completely removed, except for the branches emerging from the autumn buds in the arches of the upper 2-3 leaves. When the length of the autumn branches reaches 40-45 cm, they are tied up on both sides and tied to a wire. Repeat knitting 2-3 times until their length reaches 1 meter. Then you need to scrape off the end of the bandage. Thus, a two-legged vine base with high posts is formed. The branches of the grapes are freed from the branches falling from the autumn branches into the armpits of the leaves of both shoulders. In winter they are cut and collected from them.

Protection from pests and diseases

To combat leaf beetle worms, grasshoppers, compost worms and other pests that are pests of grapes, you need to scrape and burn the outer shell of the posts and branches of the vine. This measure allows you to destroy up to 80% of winter pests. During pest control with one of the pesticides such as Desis (0.4-0.6 l/ha), Karate (0.3-0.5 l/ha),

Goldplan 20 pn (0.4 kg / ha) , poorly watered 350 liters of water. ... It is recommended to sow the first time in early May - before the flowering of the vines, and the second time - in early June.

During the development of the vine, which is one of the most common diseases of the vine in our country, against powdery mildew (pollen), fungal rot: for the first time, when the length of young branches reaches 15-20 cm (April 20 -25), the second time in early May (before the flowering of the vines), after the third flowering of the grapes (May 25-30), the fourth time on June 15 and the fifth time on June 30, it is recommended to spray 30 kg of sulfur per hectare. Topaz (0.15-0.25 l / ha), Ridomil Gold (2.5 kg / ha) and Fulpas (0.35-0.45 l / ha) are effective against fungal diseases when sprayed three times (in May, June and July). Rotting grapes begins on August 15-20, when the grape juice begins to sweeten. To prevent this from happening, we recommend spraying Topaz, Ridomil gold or Fullpas in the same amount the first time on July 15-20 and the second time in early August. The rules and terms for carrying out agrotechnical measures in the cultivation of grapes are shown in Table 1.

Methods of using chemicals that increase fruit in without stone grape varieties

The gibberellin chemical is only recommended for use in grape varieties. Its use in raisins ensures good quality and higher yields.

The most common way to use gibberellin is to spray a water solution on the flower, or to immerse the lily flower in a gibberellin solution.

To prepare an aqueous Gibberelli solution, it is first dissolved in a small amount of ethyl alcohol and added to the water. The most effective gibberellin solution is 120 mg / l, i.e. 1.2 g of gibberellin is obtained by adding 10 l of water. If the solution will be stored for a long time, it must be prepared with evaporated and purified water. A solution for immediate use can also be prepared in plain water.

Gibberelline grapes give good results when used after massive flowering and petal flowering. At that time, the grapes given to gibberellin were beautiful, elongated, which gave the appearance of aroma. If the grapes are not grown during the mass flowering period, it is recommended to use them when the fruit emerges from the flower and looks like a pea. But then the grapes are round in shape and the aromas are not so beautiful. When gibberellin is used in grape varieties, their fruits grow 1.5-2 times. As a result, the weight of the grapes increases. The ripening period for grapes is also reduced by 3-4 days.

Under the influence of gibberelline, the grape bark thickens and hardens, the meat thickens, and the fruit's resistance to mechanical stress increases.

Harvesting the grapes

It is very important to harvest the grapes on time. The sugar content in grapes is 16-17%, in white wine - 17-18%, in red wine - 18-20% and in dried raisins - 22-25%. In our country, there are varieties of gara and ak khalili, which are planted in wider areas than early-ripening grape varieties that ripen according to long-term data from June 20-30. Early maturing varieties of black raisins ripen from 19 to 22 July. By the end of July, August 10-15, grape varieties ripen, ripening in an intermittent period: Gelinbarmak, Ak shekerek, Gozel gara (Beautiful Black), Jenjel gara, and Ichkimar WIR. Late-ripening varieties Ak and Gyrgyzy taifi, Garrygala gara uzum, Gichki gyzyly uzum ripen from late August to September 10.

The Ak and Gyrgyzy Muscat varieties grown in Turkmenistan fully ripen on August 9-10. The most common processed grape varieties Terbash, Gyzyly sapak fully ripen after August 20. In a later period, from September 10 to 15, Ashgabat gara uzum variety fully ripens.



Figure 16. Harvesting grapes

Drying grapes

Turkmenistan has very favorable conditions for the production of dried grapes. Long hot summers, low humidity, lack of precipitation make it possible to obtain high-quality dried products at a low price from grape food and raisins. The best unsuitable varieties for dried foods are: Ak kishmish, Gara kishmish, Kishmish batyr, Sogdian Raisins, Khishrau Raisins, Jenjel gara, Ak tyaifi, Gyrgyzy taifi, Gelinbarmak.

Grapes brought to the drying area should be processed immediately, i.e. seeds should not be stored for more than 10 hours.

Before drying, the grapes are inspected, rotten and damaged, unripe fruits, damaged fruits and pests of diseases and pests are removed. One of the most common methods of drying grapes is shade drying. In this

method, grapes are immersed in a 0.3% -0.4% boiling sulfur solution for 4-5 seconds and written onto a grid drawn on wooden or iron shelves. Then the bright grapes of the grapes are smoked with sulfur gas (dry sulfite) or treated with a weak solution of sulfuric acid (wet sulfite). For 1 kg of fresh grapes, 0.5-0.8 g of sulfur or 0.4-0.1 g of sulfur dioxide is consumed. The incubation time is 1–1.5 hours, depending on the size of the fruit for light varieties and 30–40 minutes for light purple varieties. The content of sulfur dioxide in the dried product should not exceed 0.01%.

Before smoking, the grapes are covered with plastic wrap from the gray shelf and sulfur gas is released into it.

After smoking the gray vines, the plastic films on the shelves are removed and covered with small porous protective nets. When this is done, the raisins will turn golden. Drying takes 11-12 days.

Table 1

Rules and terms for the implementation of agrotechnical measures in the cultivation of grapes

№	Agrotechnical measures	Norm	Dates of events	
			Southern districts of Ahal Mary Lebap regions	Northern districts of Dashoguz and Lebap regions
1	Deep leveling of vineyards	Endigan	01.08-01.10	01.08-20.09
2	Apply fertilizer	Manure - 30-40 t/ga, Superphosphate - 400 kg/ga, Potassium chloride - 100 kg/ga	01.10-01.12	01-30.10
3	Deep dredging	50-60 sm	01.10-01.12	01-30.10
4	Alignment	Transverse section	01.10-01.12	01-30.10
5	Divide the prepared area into rows and between the roots	4 x 2 m along the line	10.11-05.12 01.12-20.02	01.02-20.02
6	Breeding sows	The depth of the row is 25-30 cm.	10.11-05.12 01.12-20.02	01.02-20.02
7	Digging seed holes	50 cm deep and 40 cm wide	10.11-05.12 01.12-25.02	20.02-10.03
8	Leveling the soil diluted with manure and comparing it in sown fields	Pour 1.5-2 kg of manure into each soil into the pit where the soil should be 5-10 cm thick.	10.11-05.12 01.12-25.02	20.02-10.03

Continue of table 1

<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
9	Preparing grape seedlings for sowing	a) The roots should be shortened by 12-14 cm and cut into 2-3 segments, placing the branch at the top; b) Dip the roots in clay prepared from an unburned object and clay soil (1: 1)	15.11-10.12 01-30.03	20.02-10.03
10	Planting grape seedlings	The root should be grafted into a hole and covered with earth	20.11-10.12 01-30.03 on all days when the air temperature is above 0C	10.03-05.04
11	Watering	When sowing 500-600 m ³ / ha, then after 7-8 days 800 m ³ / ha	20.11-05.04	10.03-10.04
12	Planting poplars in vineyards	Height should be 1-1.2 m	01.05-10.12	01.05-01.11
13	Rack of reinforced concrete columns	Columns are erected at a distance of 0.5 m from the original base and every 6 m, to a depth of 70 cm.	01.05-20.12	01.05-10.11
14	Pulling wires to poles	In 3 rows: 1) 100-120 cm, 2) 130-150 cm, 3) 170-175 cm high; in 2 rows: 1) 120-130 cm, 2) 170-175 cm in height	01.05-20.12	01.05-10.11

Continue of table 1

1	2	3	4	5
15	Inter-row spring loosening	20-25 cm	01.03-10.04	01.03-15.04
16	Using herbicides against weeds	Glyphos, Sonroad or Sprut - 8.0-10 l/ha	20.03-05.04	20.03-15.04
17	Irrigation ditches	0.4-0.5 m from the vine and 18-20 cm deep	01.12-10.08	01.11-10.08
18	Water for growing young grapes: a) For annual grapes b) For biennial grapes c) For 3 year old grapes d) For annual grapes e) For two year old grapes f) For 3 year old grapes	15-16 times 375-400 m ³ /ha 9 times 670 m ³ /ha 5-6 times 800-900 m ³ /ha 10- 12 times 500-600 m ³ /ha 7 times 500-600 m ³ /ha 4-5 times 500-600 m ³ /ha	01.04-30.09	01.04-30.09
19	Adding water for growing grapes	1-раз 900-1000 м ³ /га 1-раз 600-800 м ³ /га	20.05-20.06 20.05- 20.06-	-20.05-25.06
20	Soften the rows with a chisel.	4-5 times during development 10-15 cm deep	01.03-01.11	01.03-01.10
21	Pruning and shaping young grapes	The rods should be cut from 2-3 joints. The height of the vine should be 1-1.2 m, while placing 4-5 grape branches. You should put 4-5 vines 70- 80 cm long.	01.12-15.03-	-01.11-30.11

Continue of table 1

22	Pruning and harvesting of grapes	It is cut into a set of cultures with 4-10 joints and a removable joint with 2-3 joints.	01.12-15.03	01.11-30.11
23	Removing cut vines	With LPW-1.5A manifold or chisel device	01-30.03	10.03-10.04
24	Tying vines and branches to posts and wires.	4-5 times every 10-15 days during development	15.05-30.07	25.05-30.07
25	Removing unnecessary and unproductive branches	8-10 times every 10-15 days during development	01.05-30.10	01.05-30.09
26	Pest control of grapes (worms, lizards, etc.)	Desis should be sprayed with 0.4-0.6 l/ha, Karate 0.3-0.5 l/ha, Goldplan 20 mon 0.4 kg/ha 2 times.	20.04-01.06	25.04-01.06
27	Fight against grape diseases (pollen powder, ringworm, etc.)	Yellow sulfur should be powdered 4-5 times at the rate of 30 kg/ha. Or topaz 0.15-0.25 l/ha, Ridomil gold 2.5 kg/ha, Fulpas 0.35-0.45 l/ha, spray 3 times	01.05-30.08	01.05-30.08
28	Crushing the branches of grapes	Find the twigs between them and transfer the grapes as if they were peas.	10.06-10.08	15.06-10.08
29	Vintage	It must be collected in anhydrous dry air.	20.06-30.09	5.07-30.09

Continue of table 1

30	a) Feeding young grapes with fertilizers Under the autumn sowing b) For spring plowing	After 3-4 years manure - 30-40 t/ha, Every year superphosphate - 375 kg/ha, Urea - 40 kg / ha, Potassium chloride - 100 kg/ha Superphosphate - 125 kg/ha, Urea - 160 kg/ha	01.09-10.12 01.03-05.04	01.09-10.12 01.03-10.04
31	Yielding with fertilizer of grapes feeding under the autumn herd under the spring herd	manure in 3-4 years - 40-50 t/ha, each Superphosphate per year - 600 kg / ha, Urea - 160 kg/ha Ammonium nitrate - 90 kg/ha, Chlorine potassium - 100 kg/ha	20.10-20.11 01.03-05.04	10.10-10.11 01.03-10.04
32	Autumn between them drive	20-25cm	10.10-30.11	10.10-30.11
33	Young and yield winter moisture on the grapes water supply	3rd time 2000 m ³ /ha (total 6000 m ³ /ha) 2nd time 1500 m ³ /ha (total 3000 m ³ /ha)	10.12-15.03	-01.12-01.03
34	The roots of the grapes overthrow	With a PRWM-72000 type reduction or by hand 2 times	01.11-15.04	20.10-20.04
35	Grape trees to bury	With soil 20-25 cm thick	-	01-30.11
36	Grapes buried in winter to open	Grape by removing the soil by hand need to restore their signatures	-	25.03-10.04
37	Dried grape roots re-planting	Taking the root stick next to it or plant a new grape seedling	20.11-30.03	01.11-30.03

CONTENT

Introduction	7
Agrobiological features and economic value of grape varieties grown in our country	8
Preparation of vineyards	22
Planting of grape seedlings	23
Pruning and touching up of young grapes	24
Care of young grapes	25
Caring of the yielding grape trees	26
Pruning grapes.....	27
Impact of cold winter on grapes.....	29
Reviving of surface frost-bitten grapes.....	31
Protection from pests and diseases	31
Methods of using chemicals that increase fruit in without stone grape varieties	32
Harvesting the grapes.....	33
Drying grapes	34

**MINISTRY OF AGRICULTURE AND ENVIRONMENTAL
PROTECTION OF TURKMENISTAN**

TURKMEN AGRICULTURAL INSTITUTE

AGRICULTURAL SCIENTIFIC-PRODUCTION CENTER

MANUAL OF GRAPE CULTIVATION

Compiled by: M. Pashshikov, A. Zayko

Managing Editor: A. Gapurov