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Analysis of the Effectiveness of Technologies for Working the Soil between the Vine Row

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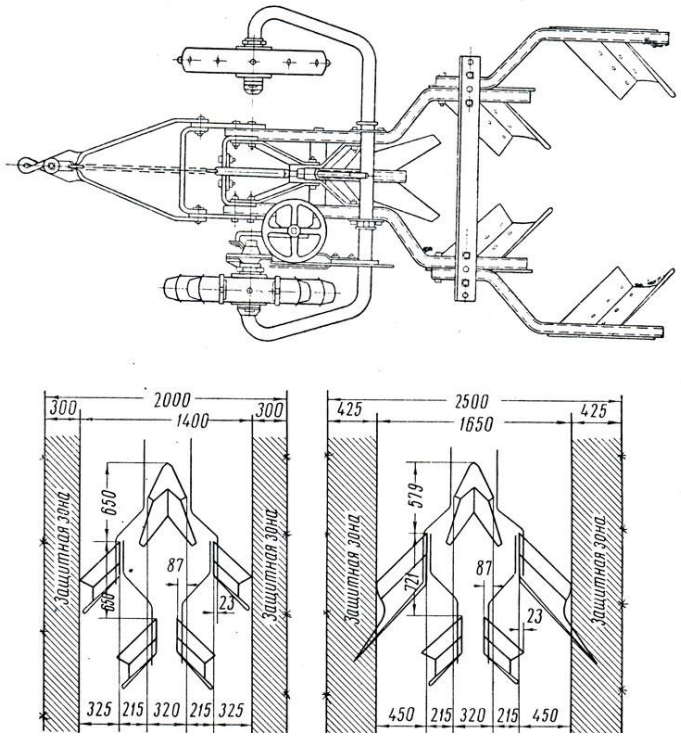
Abstract: It is not recommended to open grape bushes too late, as this leads to molding of the vines and dampening off of the buds. No less dangerous is the very early opening of grapes. In this case, the bushes may be damaged by late spring frosts. Grapevines at this time are characterized by reduced frost resistance. In addition, the eyes on the vine awaken very quickly and easily die from low temperatures.

Keywords: depth, viticulture, row spacing, loosening, soil, plow.

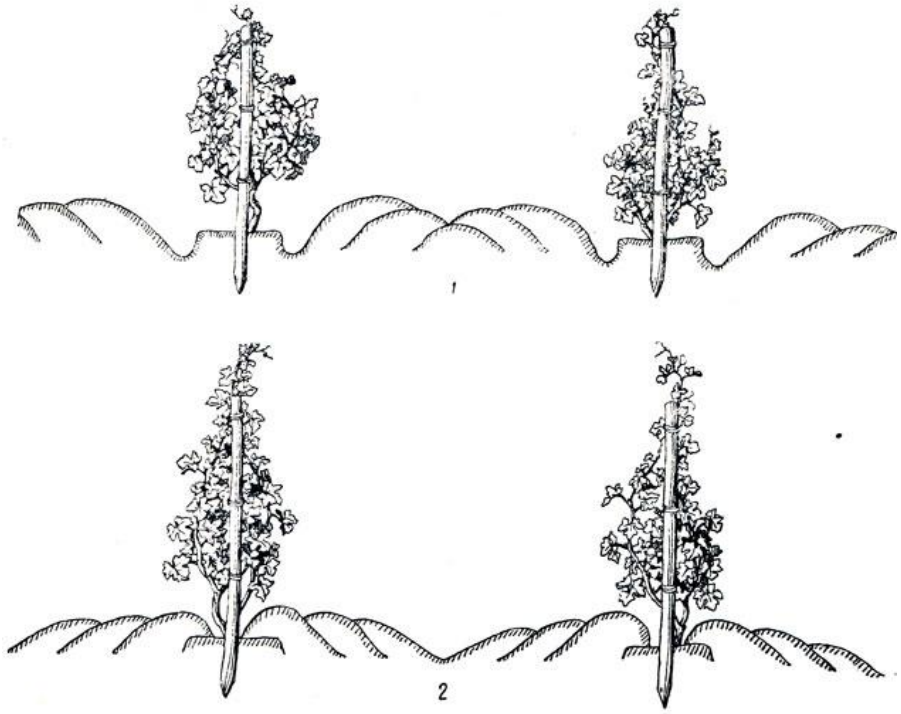
The southern arid regions and in the middle zone of viticulture, autumn plowing is carried out to a depth of 20-25 cm, in more northern regions and on heavy soils, where the root system develops closer to the surface, to a depth of 18-22 cm. In the zone of covered viticulture, plowing is accompanied by closing bushes with earth.

To plow and cover the bushes, they use a PV-1.7 tractor plow designed by the All-Union Scientific Research Institute of Winemaking and Viticulture "Magarach" with a row spacing of 2 m on a KD-35 tractor, and with a 2.5-meter row spacing - on an STZ tractor -NATI (Fig. 1). This plow covers the entire row-spacing and plows in a waddling or dumping manner to a depth of 25 cm. When plowing in a waddling manner, the bushes are covered with earth on both sides. Plow productivity in 10 hours is 4-6 hectares. It replaces the labor of 250-300 people per day. For the same purpose, you can use the VUM-60 machine.



Rice. 1. Tractor plow PV-1.7, mounted for tumble operation (top) and arrangement of working parts for tumble operation (below)

The universal machine VUM-60 performs a number of works: 1) plowing the vineyard by waddling and tipping, i.e. covering and opening the vineyards, 2) updating the planting (deep loosening), 3) applying mineral fertilizers to a depth of 60 cm with simultaneous loosening of the soil, 4) continuous deep loosening of the soil to a depth of 30 cm (chiselling), 5) cultivation to a depth of 8-10 cm, 6) digging a trench for planting plants in the shkolka, 7) digging out seedlings from the shkolka.



Rice. 2. Tillage in the vineyard: 1 - spring waddling, 2 - autumn waddling

To combat compaction, as well as to accumulate moisture during the period from harvesting to autumn plowing of vineyards, the soil is loosened to 25-28 cm with a VUM-60 chisel cultivator. This work is carried out in the fall, immediately after harvesting (see Fig. 2).

The second time, deep cultivation is carried out in the spring, after opening the bushes and completing the main spring work (pruning, dry garter, etc.).

In vineyards where the bushes are not covered for the winter, in the spring, in order to reduce soil spraying and conserve moisture, instead of spring plowing, you can limit yourself to deep soil cultivation. This technique gives a significant increase in productivity.

Deep cultivation can be repeated in the summer in case of severe soil compaction. The depth of chiselization varies depending on the nature of the soil and the depth of the roots. In the same vineyard, soil cultivation must be done at different depths so as not to create a dense soil. In the summer, the soil is systematically loosened to a depth of 6-10 cm. The purpose of this loosening is the accumulation and preservation of moisture in the soil and the destruction of weeds. If deep cultivation has not been carried out, the first loosening of the soil should be deep - 12-15 cm, and the rest - 5-10 cm.

Cultivation between rows is carried out using a trailed cultivator "Magaracha", VUM-60, pulled by a KD-35 tractor. The productivity of the tractor cultivator per day is 5-6 hectares.

The Magarach Institute has designed and is currently studying a three-row unit on the KD-35 or STZ-NATI tractor, which cultivates 18-20 hectares in 10 hours and replaces the labor of 200-250 people (Fig. 117). For cultivation in row spacings 1.5 m wide, you can use SOT or Temp tractors. However, all of these tractors are unsuitable for summer tillage: tracked tractors are too heavy, and SOT and Temp are weak. Of greater interest is the wheeled tractor XT3-7 (12 horsepower), which cultivates 5-6 hectares in 10 hours.

When planting-passing to a depth of 40-70 cm, the entire humus-rich top layer of soil is thrown down. In the first years, the most favorable conditions for the development of roots are created here in the deep layers. But later the soil, especially the structureless one, becomes more and more dense. In it, due to the difficulty of air access, the conditions for the work of microorganisms deteriorate, and the root system begins to develop in the upper soil horizons. In order to restore the looseness of the soil to the planting depth, once every 3-5 years it is loosened in the rows to a depth of 40-70 cm. For this purpose, the RU-2 subsoiler, as well as the VUM-60, are used. The productivity of such machines is about 4 hectares per day. The durable frame has a powerful stand with a wedge at the bottom, which can be installed to a depth of up to 60 cm. When the machine passes along the row, the stand cuts the soil, and the wedge slightly lifts it. This loosening of the soil increases its porosity. The roots cut in this way abundantly form lateral roots that penetrate into the freshly loosened lower horizons of the soil. To prevent damage to the root system from negatively affecting the development of bushes, deep loosening is carried out for two years (every year - every other row).

Experiments with the use of periodic deep loosening have shown that this technique significantly increases productivity, especially if it is combined with deep application of mineral fertilizers. The Ukrainian Research Institute of Winemaking and Viticulture recommends deep loosening of the soil once every 2-3 years, accompanied by the application of organic and mineral fertilizers to a depth of 35-50 cm and once every 5-6 years to a depth of 55-65 cm.

Deep loosening is usually carried out in the fall, but this work can be done in the spring. It is especially necessary in areas where grapes were planted in holes, grooves or the planting was not deep enough. This technique is of great importance on structureless, clayey, heavy soils in terms of mechanical composition, as well as on irrigated vineyards.

To preserve moisture from evaporation, destroy weeds and improve the chemical and physical properties of the soil in vineyards, mulching is sometimes used, that is, the soil is covered with paper, manure, chaff, peat and other materials. This technique has not yet been sufficiently

studied in different viticulture regions. In experiments with mulching in vineyards, shoot growth and yield increased significantly, but the growing season was somewhat delayed and the shoots ripened worse.

Mulching deserves the greatest attention in the northern regions of viticulture, but it is especially important in the arid regions of the Volga region on sandy soils.

Growing grapes on sandy soils also requires, along with mulching, planting windbreaks and other protective strips. Straw or reeds are used here as mulch, pressing them into the sand with shovels or disc harrows. This operation is applied three times in the first year after planting and then once annually after the autumn plowing of the vineyard. In addition, during the summer they destroy weeds and try to loosen the soil surface as little as possible to avoid sand being blown out. On grape bushes, as a result of blowing out sand, the roots are exposed, and the plants have a stunted appearance.

To improve the condition of such a vineyard, techniques called “precipitation” and “toppings” are used. To settle the bushes, dig a hole on the side of the bush and under the bush itself, without cutting off the roots. Then they lower the bush lower into the hole, cover it with sand and cover it with straw on top. After such an operation, the bush quickly recovers and after a year begins to bear fruit normally.

More often, sand is added to bushes. This is done in autumn or winter. One long shoot is left on the bushes (the rest are removed), the rows are deeply plowed and a layer of sand 25-45 cm thick is poured on the vineyard. Thanks to this technique, the vineyards quickly recover and produce very high yields. This technique is especially important in the case of blowing sand to the underlying clay. A set of agrotechnical practices on sand should be aimed at combating blowing, improving the physical properties and nutritional value of the soil, and destroying beetle larvae.

In the northern viticulture regions, sandy soils are the best for grape culture. In summer they warm up quickly, which creates good conditions for the development of roots and ripening of grapes. In winter, these soils must be insulated by mulching with peat or manure and covering the bushes with a three-layer tire.

A large number of vineyards are located on slopes of varying steepness. Rains wash away the surface layer of soil here (erosion), sometimes to a significant extent. Surface water flow in mountainous areas reaches 30-50% of precipitation. Storm flows carry away large amounts of fine soil and nutrients. This is most pronounced on clayey, structureless soils. For this reason, in the upper parts of the slope, the vineyards are usually sparse and less productive than in the lower parts.

To combat soil erosion, proper organization of the territory is required (agroforestry measures, installation of trays, storm drains, retaining walls, terraces, etc.), as well as a system of agrotechnical practices.

Tillage across the slope is of great importance. On slopes up to 5° steep, the rows can be straight across the slope. The operation of the tractor and trailed implements in this case is almost no different from work on level ground. On a slope with a steepness of 5 to 10°, the rows should be placed along the contours along the horizontal terrain. For slopes steeper than 10°, it is necessary to terracing the slopes. When contour planting and on terraces, mechanized tillage is also used.

Among the agrotechnical measures to combat erosion, proper tillage occupies an important place: autumn deep plowing, spring deep cultivation, summer tillage, periodic deep loosening - after 2-5 years, as well as the application of organic and mineral fertilizers aimed at increasing its fertility. To combat erosion, sowing green manure or borders of shrubs and grasses is done across the slope, as well as “shuttle” tillage, that is, a strip of uncultivated soil is left across the slope.

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