

## **Agrotechnical Requirements and Benefits of Fertilizing the Vine's Root System**

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**Abstract:** Timing of fertilizer application. Organic fertilizers should be applied in the fall at the same time as fall plowing so that over the winter they transform into a form easily absorbed by plants. Organic fertilizers applied in the spring have very little effect on the development of the grape plant, especially in dry weather, since they do not have time to completely decompose. If they still manage to completely decompose, the ammonia released can have a harmful effect on the development of grapes. Organic fertilizers are applied to sandy soil in early spring. In early spring, only well-rotted manure is applied to light sandy and sandy loam soils. During the first spring plowing, even before the grape bushes open, it is deeply plowed. Slow-acting mineral fertilizers are applied to the soil of vineyards at the end of winter, and fast-acting ones in the spring. For example, ammonium nitrate is applied in the spring, when the grape growing season begins.

**Keywords:** soil, fertilizer, kg, nitrogen, mineral, organomineral, vineyard, vegetative.

Each farm sets fertilizer application rates based on the soil map of its plots and the results of periodically conducted soil tests. The poorer the soil, the more fertilizers are applied. With a higher yield, the amount of fertilizer applied is also increased.

To increase the soil fertility of the area allocated for planting a vineyard, before planting plowing, rotted manure or compost is applied at 20-30 t/ha, mineral fertilizers per hectare are 90 kg of phosphorus and 45 kg of potassium (active substance).

Fertilization of young vineyards in the first year after planting is carried out at the end of May-June in the form of top dressing if the bushes have weak growth. Nitrogen and phosphorus fertilizers are applied. For the purpose of early fruiting and for accelerated formation of bushes, mineral fertilizers are required from the second year. If no fertilizers were applied during the preparation of the soil for planting, then in the second year, when opening the bushes, it is necessary to apply 60-120 kg of nitrogen, 45 kg of phosphorus and 30 kg of potassium (a.i.). From the third year of planting, fertilizers are applied in the same way as in fruit-bearing vineyards.

For fruit-bearing vineyards, the average fertilizer rates per 1 hectare are: manure 20-40 tons - once every three to four years or compost 40 tons once every two to three years, applied in the fall after covering the vineyard; mineral fertilizers annually: nitrogen -120, phosphorus 90 and potassium 30 kg/ha. In addition, mineral fertilizers are given in the form of fertilizing.

Before application, mineral fertilizers are crushed (particle diameter should not exceed 5-10 mm). You can mix various fertilizers shortly before incorporating them into the soil. Organo-mineral fertilizers have a positive effect on the growth and fruiting of grapes, which provide plants not only with nitrogen, phosphorus, potassium and other nutrients, but also significantly improve the physical and chemical properties of the soil, its structure, air regime and microbiological activity. Under the influence of organomineral fertilizers, certain changes occur in the soil, facilitating the transition of nutrients into compounds accessible to plants. Thanks to this, the growth of the above-ground parts of the bushes and the root system of grapes is enhanced compared to plants that received only mineral fertilizers. Against the background of organo-mineral fertilizers, the number of fruiting buds, the number and size of bunches, and the average weight of berries increase noticeably. As a result, the grape yield increases and the ripening of shoots accelerates.

Depending on the availability of manure on the farm, the following composition of the organic-mineral mixture is used annually: 5-20 tons of manure, 120 kg of nitrogen, 90 kg of phosphorus and 30 kg/ha of potassium. The organomineral mixture and phosphorus-potassium fertilizers are planted to a depth of 40-50 cm at a distance of 50-70 cm from the vineyard using a UOM-50 machine, while deep loosening of the row spacing is carried out. In years when loosening is not carried out, fertilizers are applied during autumn and spring plowing with fertilizer sowing devices on the PRVN-2.5A plow. Nitrogen fertilizers can be applied superficially with mandatory subsequent incorporation. When spreading grapes, fertilizers are applied into two deep furrows made at the bottom of the side of the ditch and covered with earth to a depth of 25-35 cm.

Sedentary fertilizers (phosphorus, potassium, humus, compost) are applied in the fall, nitrogen fertilizers are applied in early spring before buds begin to bloom. If phosphorus and potassium fertilizers were not applied to the vineyards in the fall, they are given in the spring at the same time as nitrogen fertilizers. It is advisable to apply phosphorus in mixtures with other fertilizers. Some nitrogen fertilizers (25% of the annual norm) are also applied in the fall. They are necessary for autumn-winter growth and root activity. They are applied in ammonium form so that they are not washed out of the soil. After fertilizing the vineyard with nitrogen in the autumn, moisture-recharging irrigation is not carried out.

Vineyard feeding is carried out at a time when the plant needs a large amount of nutrients for the formation and formation of the current year's harvest and the laying of fruit elements for the next year. The first feeding in May per 1 hectare is applied: 60 kg of active substance nitrogen, 45 kg of phosphorus and 15 kg of potassium 15-20 days before flowering; The second feeding is carried out 10-15 days after the first. Fertilizer dosage: 45 kg of phosphorus, 15 kg of potassium, and in areas with weak bush growth an additional 60 kg/ha of nitrogen. But if the bushes grow well, then nitrogen is excluded from the second feeding. After each feeding, watering is given.

On pebble soils, where fertilizers can be washed out as a result of strong filtration, it is better to apply nitrogen in the form of two or three times fertilizing, completing this work no later than 20 days after the end of flowering of the grapes.

In non-irrigated vineyards with close fresh groundwater, phosphorus and potassium fertilizers are applied in the fall or early spring simultaneously with nitrogen fertilizers, and fertilizing is also carried out during the growing season. In vineyards located on saline soils that are washed in winter, fertilizers are applied in early spring before opening the bushes or after washing the soil. Deep application of fertilizers at a depth of 50-60 cm is carried out once every two to four years, through a row with simultaneous loosening of the soil with a PRVN-2.5A plow.

In recent years, foliar feeding has been used. This is an agricultural technique based on the adsorption capacity of grape leaves. It consists of spraying the leaves with a solution of ammonium nitrate, superphosphate, potassium chloride and trace elements. These fertilizers increase the size of the berries, their sugar content increases by 2%, and the yield increases by

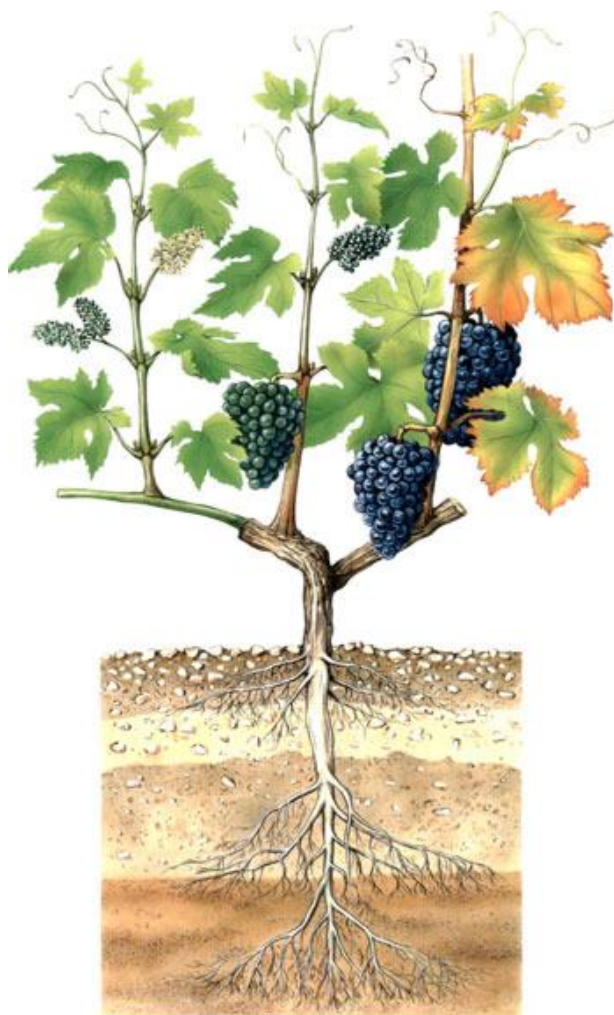
20-25%. Foliar feeding is carried out one to three times, from May (before flowering) to August (at the beginning of berry ripening), in the early morning hours and in calm weather, using manual, motor spraying or by air method. Solution concentration: 0.5-0.75% ammonium nitrate, 3-5% superphosphate, 0.5-1% potassium chloride. The solution consumption is 500–800 l/ha (0.4–0.5 l per bush). The amount of mineral fertilizers introduced is determined by the formula

$$\frac{K \cdot 100}{P}, \quad (1)$$

where K is the amount of active substance, kg/ha;

P is the percentage of active substance in the fertilizer.

Other microelements also become important - molybdenum, cobalt, aluminum, etc. When administered together, the dose is reduced by one and a half times. Microfertilizers are applied along with main fertilizers in the spring. They are most effective when combined with organomineral fertilizers. The aftereffect of microelements affects the second and third (small) years after application to the soil.



**Fig. 1. The structure of the root system of the vine**

A balanced nutritional system for grapes regulates the processes of absorption and accumulation of nutrients and directly influences the size and quality of the harvest. In fertilized areas, the roots of grape plants are located at a greater depth, their mass and length increase. The degree of absorption of nutrients in plants increases. The productivity of photosynthesis, carbohydrate metabolism, the outflow of sugars, the amount of chlorophyll and starch in leaves and other organs increases. Water metabolism improves, the amount of bound water increases,

transpiration decreases, which helps to increase the drought resistance of plants. The mass of vegetative parts, leaf surface, and mass of clusters increase, and the zone of inflorescence formation along the length of the shoots expands. As a result, the productivity of plants on fertilized plantations increases by 10-50%.

The application of fertilizers regulates the accumulation of various components in the berries. It is important to take into account that there is selectivity in the absorption and accumulation of nutrients by plants of different varieties and rootstocks, which determines different quality of products. Nitrogen fertilizers in optimal doses, influencing growth processes, help increase the weight of berries, bunches and yield without negatively affecting the quality of grapes. One-sided nutrition of grape plants with organic and mineral nitrogen fertilizers enhances growth processes, more protein fractions accumulate in the berries, but the acidity and amount of aromatic phenolic substances in the juice decreases, the harmonious combination of the main components is disrupted, which affects the quality of grapes and products from them. Phosphorus fertilizers have a positive effect on the quality of grapes: more sugars and phosphorus compounds accumulate in them, and the ripening of the crop is accelerated.

Potassium fertilizers increase the resistance of berries to rotting, accelerate their ripening, while increasing the sugar content and extract content of the juice, and the amount of phenolic substances. When applying potassium fertilizers in double doses, the acids in the berry juice are neutralized.

Calcium fertilizers enhance the aromaticity and color intensity of berries, accelerate the rate of grape ripening and the accumulation of sugars. Microelements contribute to the accumulation of sugars, aromatic and coloring substances in berries, accelerate enzymatic processes and ripening of the crop, and improve its taste. When using drip irrigation with fertigation and an automatic control system, precise dosing of all fertilizers in the solution is carried out, and control of the amount of solution per unit area of irrigation is carried out.

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