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Relationship of Fruit Plants to Soil Conditions

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Annotation: В данной статье рассмотрены Макро и микро элементы, а также органические и неорганические в-ва которые используется для плодовитость растений и почвам, так как она повышает интенсивность роста и развития плодовых культур.

Keywords: Ions, fertilizers, thermal, light, plants, strawberries, raspberries, diseases of the root system, soil, macro and micro elements, organic and inorganic substances, mineral substances.

The main plant nutrients are carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, calcium, sulfur, magnesium, iron, as well as boron, manganese and other trace elements. Carbon in the plant enters the air through the stomata of the leaves, and all other substances from the soil through the suction roots. The main significance of mineral substances for plants can be seen from the following: 1) the elements listed above (except for potassium) are part of the organic matter of a living cell; 2) they contribute to the metabolism in cells, accelerating the biochemical reactions of some of these elements; 3) they contribute to the movement of organic substances inside the plant (for example, potassium). Without a sufficient amount of the necessary mineral elements, the processes of growth and fruiting stop.

The total amount of mineral elements in the plant is relatively small; it makes up about 5% of the total dry matter of the tree. The content of nitrogen and ash elements in different parts of the same plant is not the same. For example, in an apple tree, the content of these substances (as a percentage of dry weight) is presented in the following form.

№	Element name	The content in the organs of the apple tree (in% to dry weight)					
		In fruits	In the leaves	In growing branches	In fruit branches	In trunk and branches	In the roots
1	Nitrogen	0,40-0,80	2,30	0,50	0,80	0,50	0,30
2	Phosphorus	0,09-0,20	0,45	0,14	0,28	0,12	0,11
3	Potassium	1,20	1,60	0,30	0,50	0,27	0,23
4	Calcium	0,10	3,00	1,40	2,70	1,30	0,50

The table shows that more nitrogen is contained in leaves, fruits and fruit branches, less in growth branches and even less in the trunk, in old branches and roots. The largest amount of phosphorus is found in leaves, fruit branches and fruits. There is little phosphorus in the trunk, branches, and thick roots. The largest amount of potassium in the leaves and fruits. In the fruit branches, the potassium content is higher than in the growth ones. Fruits differ in the least content of calcium. Fruits differ in

the least content of calcium. Calcium is relatively less in the roots than in the trunk and old branches. Despite the fact that the fruits contain relatively little nitrogen and ash elements, they carry away a huge amount of them from the soil due to large yields.

The content of nitrogen and mineral elements in various parts of other species is approximately the same as that of an apple tree. Plants grow normally and bear fruit only if all nutrients are present in sufficient quantities. Deficiency or excess of individual elements causes, to varying degrees, a disorder in the vital functions of the plant. For example, with a lack of nitrogen, the synthesis of proteins in the plant is delayed, while the leaves acquire a yellowish tint, age faster and fall off; shoots develop poorly and relatively quickly finish their growth; flowers are poorly fertilized and fall off in large quantities; young ovaries are shed by the tree, and if they remain on the plant, then small fruits develop from them; roots grow slowly. With an acute lack of nitrogen, nitrogenous substances move to the young growing parts on the older ones, which therefore die prematurely. With an excess of nitrogen, the leaves grow strongly, remaining tender for a long time, and are easily affected by diseases and insects; shoots develop violently, delay growth, ripen poorly and are severely damaged by winter frosts; fruits are slightly stained, do not acquire normal sugar content, and are poorly preserved in maturation. The lack of phosphorus weakens the growth of shoots and roots, causes the formation of purple and reddish spots on the leaves. Phosphorus starvation has a particularly harmful effect on the laying of fruit buds and the fruiting of plants; ovaries fall in large numbers; seeds are underdeveloped: fruits acquire an abnormal, dull color.

With a lack of potassium in plants, synthetic processes are weakened, the amount of carbohydrates, especially sucrose and starch, is sharply reduced, the outflow of plastic substances from the leaves slows down, and the consumption of carbon for respiration increases. Potassium deficiency causes a slight thickening of the trunk, branches and shoots, and acute potassium starvation causes the leaf blade to dry out, going from the edges to the middle. The ovaries fall off easily: the fruits are underdeveloped and acquire a grassy taste. With a lack of calcium, nitrogen metabolism and the movement of plastic substances weaken; roots grow abnormally and poorly absorb ammonia nitrogen. With a lack of calcium, the cell walls of leaves and stems become fragile; oxalic acid, formed during the breakdown of proteins, is not completely neutralized. The stems of stone fruits are severely affected by gum disease and often develop cancer. With a lack of iron, the formation of chlorophyll and the growth of the plant occur abnormally; leaves become ill with choruses, acquiring a light yellow and even whitish color. We should dwell on substances that are necessary for the plant in very small quantities and which are called microelements. These include boron, manganese, copper, zinc and some others. With a lack of boron, some plants experience painful phenomena: the death of growth points near shoots, abnormal formation of a conducting system, abnormal fertilization of flowers, weakening of root growth. Flowers are richest in boron. Manganese is necessary for the normal formation of chlorophyll. Like iron, manganese, apparently, has an effect on the redox processes in the plant. Due to the longevity of some fruit trees, there may be cases when it is necessary to add microelements to the soil: Trace elements are found in manure, compost, bird droppings and ashes. Therefore, with the correct application of local fertilizers to the soil, the need of plants for trace elements is usually fully satisfied. The need of a plant for water, nitrogen and ash elements throughout the year is not the same and changes in connection with the phases of its vegetation. In some halyards, the plant absorbs relatively more water and relatively less nutrients, while in others, on the contrary, less water and relatively more nitrogen and ash substances. At the beginning of the growing season, the plant requires a relatively small amount of water. Then the need for water increases and reaches its maximum value in the phase of enhanced and fading shoot growth. In the phase of tissue maturation and accumulation of plastic substances, the need of plants for water decreases.

In a plant producing a large yield, the need for water in the phase of increased fruit growth remains quite large. For normal growth and fruiting, the plant requires significant amounts of nitrogen, phosphorus and potassium throughout the growing season. Especially a lot of nitrogen should be received by the plant during flowering, in the phase of enhanced and fading shoot growth, and somewhat less in the second half of summer. During the period of autumn root growth, the plant's

need for nitrogen increases again. In the phenophase of bud break, the plant absorbs potassium relatively more than nitrogen; in the phase of enhanced growth of shoots, nitrogen is absorbed more than potassium; in the phase of decaying growth, potassium uptake increases again and reaches its maximum value in the phenophase of tissue maturation and accumulation of plastic substances. With sufficient nitrogen nutrition, potassium contributes to the enhanced growth of shoots and the timely completion of progressive growth. Of great importance is the provision of plants with potassium as part of a complete mineral fertilizer in the year of fruiting to enhance growth and lay fruit buds for the next year's harvest.

The plant absorbs phosphorus in the phases of initial and enhanced growth of shoots in a significant amount: in the phase of decaying growth, the supply of phosphorus sharply decreases, and in subsequent phases, it increases again. Sufficient supply of phosphorus with the provision of plants with a lot and potassium contributes to the laying of flower buds and their normal differentiation. Both phosphorus and especially potassium in the composition of a complete mineral fertilizer increase the frost resistance of plants. Fruit and berry plants in the autumn phases of vegetation continue to absorb nutrients in significant quantities, which, accumulating in the plant in the form of a reserve, are used by it in the spring of next year during the phenophase of bud break. The need of fruit and berry plants for food elements is not the same in different periods of growth and fruiting. Since before laying a garden or a berry plantation, deep cultivation of the soil (and subsoil) is carried out with the application of organic and mineral fertilizers, in the first years after planting, i.e. at the beginning of the period of increased growth of vegetative parts, plants react poorly to mineral fertilizer. With the increase in the age of the trees, as the time of fruiting approaches, and especially during the period of full fruiting, the effect of fertilizers increases more and more. At this time, along with the growth processes, the laying of fruit buds, flowering and fertilization, development and ripening of fruits take place in the plant. For the normal passage of these processes, a significant amount of food elements is required. Therefore, the correct application of a complete mineral fertilizer in combination with organic fertilizers contributes to both normal growth and regular fruiting.

The soils on which fruit and berry plants grow are acidic, neutral or alkaline. For example, some podzolic soils a acidic. Mineral fertilizers on such soils do not give the desired effect. On soils with excessive acidity, fruit and berry plants bring reduced yields. The decrease in yield on these soils can be caused by various reasons. With increased acidity, calcium carbonates dissolve in water and are washed out of the soil. As a result, the structure is destroyed and the physical properties of the soil deteriorate. On such soils, both the growth of roots and the absorption of water and minerals are difficult. In acidic soils, conditions are created that are unfavorable for the active activity of beneficial soil bacteria (nitrifies, Azotobacter, etc.) and, conversely, the fundamentals of the biology of fruit and berry plants are enhanced by the activity of fungi, which are often the causative agents of various diseases of the root system. Chernozem, chestnut and gray soils have a neutral reaction. Alkaline and saline soils have an alkaline reaction. On such soils, plants often lack digestible iron salts and develop choruses.

Various fruit and berry plants are not equally related to the acidity of the soil. For example, strawberries and raspberries normally grow and bear fruit on soils with significant acidity; on soils with an alkaline reaction, raspberries suffer from choruses; stone fruits (cherry, sweet cherry, apricot, peach, plum) prefer neutral soils: apple, pear, gooseberry, currant grow well and bear fruit both on neutral and slightly acidic soils. There are indications that different varieties of the same breed are not equally related to the acidity of the soil. For example, Antonovka, which successfully grows in the zone of podzolic soils, is easier to put up with increased soil acidity than southern varieties (Rozmarin, Sary sinap). Different rootstocks of apple, pear and other species have different requirements for soil properties. For example, a pear grafted on a quince is more sensitive to soil acidification than a pear grafted on a wild forest pear.

The ratio of the plant to the reaction of the soil solution depends on the buffering capacity of the soil (i.e., on its ability to quickly change the reaction), the presence of calcium, potassium and other ions in the soil solution, the form of nitrogen fertilizers, and on the thermal, light, water and nutritional

regime. The ratio of certain plants to soil acidity must be taken into account both when laying a garden or berry plantation, and when caring for existing gardens and plantations. Applying one or another system of measures for soil care, it is possible to regulate the acidity of the soil to a significant extent in accordance with the needs of plants. On the contrary, by applying physiologically acid fertilizers for many years, good soils can be spoiled and unsuitable for normal growth and fruiting of plants. When applying fertilizers, one should keep in mind not only the need of plants for nutrients, but also the regulation of the soil reaction, taking into account the properties of the soil and the characteristics of individual fruit and berry crops.

Without knowledge of the relationship of cultivated plants to the acidity and shelf life of the soil, it is impossible to correctly choose the forms of fertilizer and correctly resolve the issue of the need for liming the soil.

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