INTERNATIONAL MULTIDISCIPLINARY JOURNAL FOR RESEARCH & DEVELOPMENT
SJIF 2019: 5.222 2020: 5.552 2021: 5.637 2022:5.479 2023:6.563 2024: 7,805
eISSN :2394-6334 https://www.ijmrd.in/index.php/imjrd Volume 11, issue 03 (2024)

PHYSIOLOGICAL SIGNIFICANCE OF MICROELEMENTS IN PLANT LIFE

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Abstract: Trace elements are chemical elements that are necessary for the normal functioning of plants and animals and are used by plants and animals in small quantities compared to the main components of nutrition. However, the biological role of microelements is large. All plants without exception need microelements to create enzyme systems - biocatalysts, including the most important ones are iron, manganese, zinc, boron, molybdenum, cobalt and others.

Key words: Trace element, temir, manganese, rux, boron, molybdenum, cobalt, sucrose, enzyme, intensive, biocime, reaction, catalyst, hemoglabin, citrus.

Аннотатция: Микроэлементы - это химические элементы, которые необходимы для нормального функционирования растений и животных и используются растениями и животными в небольших количествах по сравнению с основными компонентами питания. Однако биологическая роль микроэлементов велика. Все растения без исключения нуждаются в микроэлементах для создания ферментных систем - биокатализаторов, в том числе наиболее важными из них являются железо, марганец, цинк, бор, молибден, кобальт и другие.

Ключевые слова: Микроэлемент, темир, марганец, рукс, бор, молибден, кобальт, сахароза, фермент, интенсив, биоцим, реакция, катализатор, гемоглабин, цитрусовые.

Environmental conditions—temperature, light, humidity, soil nutrition, etc.—primarily determine the areas of cultivated plants. There is almost no area in our country where unfavorable factors do not affect the plant organism to one degree or another. If in the northern regions, productivity for the growth and development of plants is limited by low temperatures, in the southern regions, especially in Central Asia, they usually suffer from a lack of moisture and excessively high temperatures.

The policy of intensification of agricultural production in our republic requires reducing its dependence on weather conditions. Violation of the physiological activity of plants under the influence of an extreme factor is not noticeable at first glance, but in the future it can lead to significant losses in the final product.

Micronutrients are chemical elements that are necessary for the normal functioning of plants and animals and are used by plants and animals in small amounts compared to the main components of nutrition. However, the biological role of trace elements is great. All plants, without exception, need trace elements to create enzyme systems – biocatalysts, including the most important iron, manganese, zinc, boron, molybdenum, cobalt, etc. Microelements are called “elements of life”, as if without these elements the life of plants and animals would be impossible. The lack of certain elements in the soil does not cause the death of plants, but it is the reason for the decline. As a result of the speed and consistency of the processes responsible for the development of the organism, plants do not realize their potential and do not always produce high-quality crops.

Microelements cannot be replaced by other substances and must be replenished, taking into account their lack in the soil. Plants can use micronutrients only in water-soluble form (portable form of micronutrients). After complex biochemical processes involving humic acids in the soil, the plant, in most cases, these processes continue very slowly and with excessive watering of the soil. As a result, a significant part of the mobile forms of microelements is washed away. All trace elements of life are part of boron or other enzymes. Boron is not part of enzymes, but it is distributed in the substrate and participates in the movement of sugars across membranes due to the formation of a carbohydrate-borate complex.

Boron is not part of enzymes and participates in the movement and distribution of sucrose. The main role of microelements in increasing the quality and quantity of the elements is as follows:

1. In the presence of the required amount of trace elements, plants have the ability to synthesize all enzymes that allow intensive use of energy, water and nutrition (N, P, K) and, accordingly, high yield.

2. Microelements and enzymes based on them increase tissue regeneration activity and prevent plant diseases.

3. Microelements are one of the few substances that increase the immunity of plants. Their lack creates a state of physiological depression and general susceptibility of plants to diseases.

Most trace elements are active catalysts that accelerate a number of biochemical reactions. Microelements with their excellent properties have a strong influence on vital processes. In some cases, only the composition of trace elements can restore normal plant development or restore hemoglobin in the case of anemia. However, it is wrong to reduce the role of elements only to their catalytic effect. Microelements greatly affect and affect biocolloids.

Therefore, manganese regulates the ratio of divalent to trivalent iron in the cell. The iron-manganese ratio should be greater than two. Copper protects chlorophyll from decay and increases the amount of nitrogen, and phosphorus approximately doubles.

However, the role of trace elements is not only their catalytic effect, but trace elements have a great impact on biocolloids and positively affect the direction of biochemical processes. Therefore, manganese regulates the ratio of divalent to trivalent iron in the cell. The iron-manganese ratio should be greater than two. Copper protects chlorophyll from decomposition and increases the dose of nitrogen, and phosphorus is approximately doubled.

Boron and manganese enhance photosynthesis in plants after the temperature drops. A sharp change in the ratio of nitrogen, phosphorus, potassium can cause plant diseases. The analysis of the results of domestic and foreign experts on the study of the effectiveness of the use of micronutrients in agriculture shows the following:

1. Acceptance of trace elements in the same measure is optimal, especially for phosphorus and zinc, nitrate nitrogen and molybdenum.

2. During the entire growing season, plants need basic micronutrients, some micronutrients are not reused by plants. They do not pass from old organs to young ones. Currently, micronutrients in biologically active form do not have equality in foliar nutrition, which is especially distinguished by the ratio of macro and micronutrients.

3. Regardless of the composition of the soil, the amount of biologically active microelements used does not affect the total composition of microelements in the soil, but has a beneficial effect

on the condition of plants. Microelements increase the state of physiological activity of plants and resistance to parasitic diseases, and in general, this has a positive effect on the increase in the quantity and quality of the harvest.

Ўсимликлар таркибидаги барча оғир металлар орасида темир етакчи рол ўйнайди, бу унинг ўсимлик тўқималарида бошқа металларга қараганда муҳимроқ миқдорда бўлишидан далолат беради. Шундай қилиб, барглардаги темир миқдори фоизнинг юздан бирига етади, ундан кейин марганец, рух концентрацияси ифодаланади, мис таркибида эса фоизнинг ўн мингдан бир қисмидан ошмайди.

Zinc deficiency for plants is often observed in sandy natural soils. Saline soils are very low in zinc. Its deficiency moderately affects the development of vegetative organs. Symptoms of zinc deficiency are observed in various fruit crops (apples, cherries, Japanese plums, walnuts, apricots, lemons, grapes). Citrus crops especially suffer from zinc deficiency.

The physiological role of zinc in plants is very diverse. It has a great effect on oxidation-reduction processes.

Zinc deficiency leads to a violation of the hydrocarbon conversion process. In the leaves and roots of tomatoes, citrus and other crops, due to zinc deficiency, phenolic compounds are accumulated and the amount of starch is reduced.

A part of various zinc enzymes: carbonic anhydrase, triose phosphate dehydrogenase, peroxidase, oxidase, polyphenoloxidase, etc. It has been found that high doses of phosphorus and nitrogen aggravate the symptoms of zinc deficiency in plants, and zinc fertilizers are especially necessary when high doses of phosphorus are applied[9]. The value of zinc for plant growth is closely related to its participation in nitrogen metabolism. Zinc deficiency leads to significant accumulation of soluble nitrogenous compounds – amines and amino acids, which causes changes in protein synthesis.

The effect of microelements on drought tolerance of plants is determined by biological characteristics of the plant organism as well as other factors. It is known that the needs of micronutrients in plants are different, and they react differently to their deficiency and excess. An example of this is V.P. Bojenko's experiments with authors (Bojenko, Shkolnik, 1963).

Theoretically, it is especially interesting to know the physiological mechanisms of the positive effect of micronutrients on drought tolerance of plants. And to date, important experimental materials have been collected on this issue.

The resistance of plants to drought is determined by many aspects of the water regime, including the ability of the protoplasm to withstand long-term dehydration. The effect of trace elements was reflected in the works of some researchers, and I.V. Goridko (1972) showed that cobalt increases the resistance of potato leaves to dehydration under the influence of drought along with high temperature.

The supply of mineral elements to plants is affected by moisture conditions. Conversely, the lack of moisture in the soil reduces the available forms of micronutrients. According to G.N. Popov (1970), the decrease of the plowed horizon moisture in ordinary black soil from 34-35% in May to 17.5-18% in July-August led to a decrease in the amount of boron available in plants. Soil in May ranged from 0.8 to 0.3-0.4 mg/kg. In parallel, the mobility of manganese and molybdenum in the soil decreased. Thus, moisture conditions have a significant effect on the quantitative content of plant-available forms of mineral elements in the soil.

The availability of water is essential for plants to obtain nutrients from the soil. Even a short-term lack of moisture sharply reduces the adsorption capacity of tissues, slows down synthetic processes. This leads to weakening of absorption activity of root systems (Petinov, Berko, 1961; 1974). Waterlogging has a similar effect on the availability of cations from the soil (Nikonov, 1973).

Minimal nutrition, including nutrition with micronutrients, is one of the factors that rapidly affect the metabolism, growth and development of plants. That is, its high efficiency in influencing the vital processes of the plant organism has attracted the attention of researchers involved in increasing the resistance of plants to extreme environmental conditions.

Even, K. A. Timiryazov (1948) emphasizes the use of macro and micronutrients among the external factors that can reduce the inefficient waste of water to plants.

Research on determining the effect of microelements on drought resistance in plants was conducted for the first time by M. Ya. Shkolnik.

An increase in grain yield in barley and oats during drought, especially if it is limited to the sensitive period, also when copper (Sviderskaya, 1955, Skazkin, 1971), zinc (Govrina, 1959), aluminum (Rubinchikova, 1968), manganese (Fomina, 1950) are introduced into the soil. Observed. The application of the above-mentioned microelements in the form of freezing or spraying in their salt solutions during the sensitive period of plants' resistance to drought and before planting seeds is considered effective (Sviderskaya, 1959).

Thus, the analysis of the above data shows that micronutrients have an active effect on the regulation of the water regime of plants in drought conditions. By increasing the amount of water in plant tissues, increasing the amount of water bound with colloids in cells, reducing the rate of transpiration, increasing the hydrophilicity of colloids and their resistance to dehydration, microelements create more favorable conditions for plants to withstand water shortage.

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