Role of Nutrients in Plants, its deficiency And Management

ABSTRACT

Plants like all living beings need energy source. The energy needed by the plants are uptaken in the form of 17 essential elements. Among which Carbon, hydrogen, and oxygen are derived from surrounding. The remaining 14 essential necessary elements are supplied either from rhizosphere and soil organic matter or by important organic or inorganic fertilizers or value added soil amendments. Plants start showing nutrient deficiency when they do not get the necessary nutrients. More nutrient use can also show poor growth because of toxic chemicals in soil. So, required amount of use and the placement of nutrients is necessary. Soil and plant tissue tests have been developed to assess their' nutrient content. By analysis, plant scientists determined the nutrient need of plant in a given soil. In addition to the levels of available nutrients, soil pH shows its role in nutrient availability and elemental toxicity in soil. In the majority, disease effect in crop plants has been reduced by fertilizer application. This is due to the host plant tolerance or resistance mechanisms involve these nutrients. When the plants were deficient, the application of nutrients significantly reduced disease.

Keywords Essential, Management, Nutrients

INTRODUCTION

Below this certain level, plants start showing nutrient deficiency. More nutrient application can also show poor growth of plants. So, the proper requirement and the settling of nutrients is needed. Soil and plant tissue tests have been done to see their nutrient content. By analyse scientists can determine the nutrient requirement of plant in a the soil. In addition soil pH, Soil structure and its composition pays a major role.This describes the essential nutrients, the forms in which they are available to plants, their requirement in plants, symptoms of deficiencies, and required nutrient in plant tissues of selected crops.

It is required to maintain nutrient use through fertilizers or change the rhizosphere to influence nutrient availability, and in that way to control plant disease in an integrated pest management system **(Huber and Graham, 1999 and Graham and Webb, 1991).** The use of fertilizers show a direct means of using nutrients to low the severity of many diseases and together with various practices show impact on diseases **(Marschner, 1995, Atkinson and McKinlay, 1997 and Oborn *et al*. 2003).**

Nitrogen

Nitrogen is an essential nutrient for plant growth and development, as it is a key component of proteins, chlorophyll, and nucleic acids. When plants experience a deficiency of nitrogen, their growth is stunted, their leaves become pale or yellow, and their yield is reduced. **(Engelhard, 1989 and Huber and Watson, 1974).** To manage nitrogen deficiency in plants, it is important to identify the cause of the deficiency. This can be done through soil

testing to determine the nitrogen content of the soil, or through visual inspection of the plant's leaves and growth patterns. Once the cause of the deficiency is identified, a variety of management strategies can be employed to rectify the situation. **(Huber and Watson, 1974, Büschbell and Hoffmann, 1992, Marschner, 1999 and Hoffland *et al.* 2000).** These are due to the form of N nutrition in host and their pathogen **(Büschbell and Hoffmann, 1992 and Marschner, 1995)** or the development stage of N application on the interaction among nutrient, pathogen, and biocontrol organisms **(Tziros *et al.* 2006).**

The form in which nitrogen applied is been reported to affect the damage in plants. Thus plants where nitrate show more tolerance to photo damage is observed by **Zhu *et al.* (2000)** in bean plants. In addition to fertilization, other management practices can also help to mitigate nitrogen deficiency in plants. For example, crop rotation can be used to reduce nitrogen depletion in the soil, while intercropping can help to provide a complementary source of nitrogen from other plants. **(Kovacik *et al.* 2009, 2014)** the management of nitrogen deficiency in plants requires a multifaceted approach that considers both the immediate and long-term needs of the plants. By using a combination of fertilizers, crop rotations, and other management practices, farmers and gardeners can help to ensure healthy and productive plant growth while minimizing the impact of nitrogen deficiency.

Phosphorus

Phosphorous deficiency is a common problem in plants that can lead to reduced growth and yield. Phosphorus plays a crucial role in plant development, including energy storage, DNA synthesis, and root growth. When plants lack sufficient phosphorus, they may exhibit symptoms such as stunted growth, reduced root development, and purple discoloration of leaves. To manage phosphorus deficiency in plants, several approaches can be taken. One way is to improve soil fertility by adding organic matter, such as compost or manure. This can increase the availability of phosphorus in the soil and promote plant growth. Additionally, using fertilizers that contain phosphorus can be effective, but it's important to use them sparingly and in the correct amounts to avoid over-fertilization, which can harm the environmen **(Huber and Graham, 1999; Potash and Phosphate Institute, 1988)**.

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Potassium

Symptoms of potassium deficiency in plants include yellowing and curling of leaves, stunted growth, and poor root development. In severe cases, plants may even show necrosis, or tissue death. These symptoms can vary depending on the plant species, but they all indicate a lack of potassium in the plant.To manage potassium deficiency in plants, it is essential to understand the factors that contribute to it. Factors such as low soil potassium levels, poor soil drainage, and high soil salinity can all lead to potassium deficiency. To address these issues, it is recommended to test soil fertility regularly and use appropriate fertilizers to supplement the soil with potassium.**(Marschner, 1995; Mengel and Kirkby,**

2001). under drought conditions, chloroplasts lose high amounts of K to further depress photosynthesis **(Sen Gupta and Berkowitz, 1987)** In addition to soil management, foliar application of potassium can also help address deficiency symptoms in plants. This involves spraying a potassium solution directly onto the leaves of the plant. However, it is important to note that foliar application is not a long-term solution, and it should be used in combination with soil management practices.In conclusion, potassium deficiency is a significant challenge that can affect the growth and development of plants. However, by understanding the factors that contribute to deficiency and implementing appropriate management practices, it is possible to address the issue and promote healthy plant growth. **(Sangakkara *et al*., 2000).**

Calcium

Calcium is an essential macronutrient that plays a crucial role in the growth and development of plants. However, calcium deficiency can lead to various physiological disorders, such as blossom-end rot, leaf curling, stunted growth, and poor fruit quality. Therefore, managing calcium deficiency is a critical aspect of plant growth and production. One of the most effective ways to manage calcium deficiency in plants is to ensure that the soil pH is within the optimal range. Most plants grow best in soils with a pH between 6.0 and 7.0. If the soil is too acidic or alkaline, the availability of calcium may be limited, leading to deficiency symptoms. Therefore, it is essential to test the soil pH regularly and make adjustments as necessary to maintain the optimal range. Another way to manage calcium deficiency is to ensure that the plant has an adequate supply of water. Calcium is a mobile nutrient, which means that it can be transported within the plant from older to younger tissues. However, this process requires a sufficient supply of water to move calcium ions from the soil into the plant roots and up through the xylem. Therefore, it is crucial to maintain adequate soil moisture levels and avoid drought stress.

In addition, incorporating organic matter into the soil can also help manage calcium deficiency. Organic matter acts as a natural source of calcium and other essential nutrients, which can improve soil fertility and plant growth. Organic matter also helps to improve soil structure, water retention, and nutrient availability, which can enhance the plant's ability to absorb calcium and other nutrients.

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Sulphur

Sulphur is an essential macronutrient that plays a critical role in plant growth and development. A deficiency of sulphur can result in stunted growth, yellowing of leaves, and reduced crop yields.

Sulphur deficiency in plants can occur when the soil lacks sulphur, or when the plant is unable to absorb it due to various factors such as high pH, low temperature, or waterlogging. To manage sulphur deficiency in plants, it is important to first identify the cause of the deficiency. Soil testing can help determine the sulphur content of the soil and whether additional sulphur needs to be added.

One effective method of managing sulphur deficiency in plants is to apply sulphur fertilizers. These fertilizers can be applied to the soil or sprayed directly on the leaves of the plant. It is important to apply the right amount of fertilizer, as too much sulphur can be harmful to the plant.

Another way to manage sulphur deficiency is to improve soil conditions to enhance sulphur availability. This can be achieved by adding organic matter to the soil, reducing soil pH, or improving soil drainage. Additionally, crop rotation can help maintain adequate levels of sulphur in the soil.

Magnesium

Magnesium deficiency is a common problem that affects the growth and development of plants. Magnesium is an essential mineral for plants as it is involved in many physiological and biochemical processes, including photosynthesis, enzyme activation, and protein synthesis. When magnesium levels in the soil are low, plants can suffer from a range of symptoms, including yellowing leaves, stunted growth, and poor fruit development To manage magnesium deficiency in plants, it is important to first identify the problem. This can be done by analyzing the soil to determine the magnesium levels and pH. If magnesium levels are found to be low, then it may be necessary to add magnesium-rich fertilizers or soil amendments to the soil. These can include materials such as magnesium sulfate, magnesium oxide, or dolomite lime. **(Maathuis 2009).** In addition to soil amendments, other management strategies can be employed to prevent magnesium deficiency. These include ensuring adequate soil moisture levels, maintaining proper soil pH, and avoiding over-fertilization with potassium and nitrogen, which can interfere with magnesium uptake. **(Shaul 2002).** Starch is accumulated, and the rate of photosynthesis and respiration is low under magnesium deficiency.

Finally, it is important to monitor plants regularly for signs of magnesium deficiency and take appropriate action as needed. By addressing magnesium deficiency in a timely manner, growers can ensure healthy plant growth and development, leading to improved yields and higher quality crops

Iron

Iron is an essential micronutrient required for various physiological processes in plants, such as photosynthesis, respiration, and nitrogen fixation. Iron deficiency can severely impact plant growth and development, resulting in chlorosis, stunted growth, and reduced yield. To manage iron deficiency in plants, various strategies can be employed. One approach is to improve the soil's iron availability by adding organic matter, such as compost, which can increase the soil's iron content and improve its availability to plants. Another approach is to adjust the soil pH, as iron availability is influenced by the pH level. In alkaline soils, iron tends to form insoluble compounds, making it less available to plants. Thus, lowering the soil pH to slightly acidic levels can improve iron availability.

Foliar application of iron fertilizers can also be effective in managing iron deficiency. This involves spraying iron chelates directly onto the leaves, which can be quickly absorbed by the plant and alleviate iron deficiency symptoms. However, excessive foliar application can cause leaf scorching, so it should be done in moderation. **(Graham and Webb, 1991)** .selecting plant species or cultivars that are more tolerant to iron deficiency can also be a viable strategy. Some plants have developed mechanisms to adapt to low iron levels, such as enhanced iron uptake, root exudation, and chlorophyll synthesis. By selecting these plants, farmers can ensure better crop yields even in iron-deficient soils.

In conclusion, managing iron deficiency in plants requires a combination of soil management, fertilization, and plant selection. By implementing these strategies, farmers can optimize their crop production and minimize yield losses caused by iron deficiency.

Zinc

Zinc deficiency is a common issue in plants that can severely affect their growth and development. This micronutrient plays a crucial role in several physiological processes such as protein synthesis, enzyme activity, and DNA regulation. Zinc deficiency in plants can lead to stunted growth, chlorosis, necrosis, reduced fruit and seed production, and susceptibility to diseases and pests.Fortunately, there are several management strategies that can be implemented to overcome zinc deficiency in plants. One of the most effective approaches is to ensure that the soil is rich in zinc. This can be achieved by applying zinc-containing fertilizers such as zinc sulfate, zinc oxide, or chelated zinc. However, it's important to note that excessive use of these fertilizers can lead to toxicity and other problems.. (**Bettger and O'Dell (1981),** Another strategy to manage zinc deficiency is to enhance the absorption and utilization of zinc in plants. This can be accomplished by improving soil pH, increasing organic matter content, and applying micronutrient fertilizers in combination with other essential nutrients such as nitrogen, phosphorus, and potassium. In addition, foliar application of zinc-containing solutions can help to address acute zinc deficiency in plants. **Welch *et al*. (1982).** In conclusion, zinc deficiency can have detrimental effects on plant growth and development, but there are several management strategies that can be implemented to overcome this issue. By improving soil quality, applying micronutrient fertilizers, and enhancing zinc absorption and utilization in plants, growers can ensure healthy and productive crops **(Rengel 1995)**

Manganese

Manganese is an essential micronutrient required for proper growth and development of plants. It plays a crucial role in photosynthesis, respiration, and nitrogen metabolism. However, when plants do not get an adequate amount of manganese, they can suffer from manganese deficiency, which can have detrimental effects on their growth and yield.

Manganese deficiency in plants can manifest in different ways, depending on the severity and the plant species. Symptoms of manganese deficiency typically include yellowing or chlorosis of leaves, stunted growth, reduced root growth, and decreased resistance to disease and pests.

(Marschner, 1995 To manage manganese deficiency in plants, it is important to first diagnose the problem accurately. This can be done through soil and plant tissue analysis, which can help determine the levels of manganese present in the soil and the plant. If the deficiency is severe, foliar application of manganese sulfate can be used to correct the issue quickly. In the long term, however, the most effective way to manage manganese deficiency is to ensure that the soil has an adequate supply of manganese. This can be done by maintaining the soil pH at an optimal level, typically between 5.5 and 6.5, as manganese availability decreases as soil pH increases above 7. In addition, incorporating organic matter into the soil can improve manganese availability, as well as using manganese fertilizers and applying micronutrient-rich compost.

In conclusion, manganese deficiency in plants can be a serious issue that can lead to reduced growth and yield. However, proper management through accurate diagnosis and soil amendment can help prevent and correct the problem, leading to healthier and more productive plants.

Copper

Copper deficiency is a common problem that affects the growth and development of plants. Copper is an essential micronutrient that is required in small quantities by plants for various physiological processes, including photosynthesis, respiration, and enzyme activation. However, when plants do not receive adequate amounts of copper, they can exhibit a range of symptoms, including stunted growth, chlorosis, and necrosis.

To manage copper deficiency in plants, it is important to first identify the symptoms and confirm the diagnosis. This can be done through plant tissue analysis or soil testing. Once copper deficiency is confirmed, there are several management strategies that can be employed.

One approach to managing copper deficiency is through soil amendment. This involves adding copper to the soil in the form of copper sulfate or chelated copper. However, it is important to be careful when adding copper to the soil, as excessive amounts can be toxic to plants.

Another approach to managing copper deficiency is through foliar application. This involves spraying a solution of copper onto the leaves of the plant. Foliar application can be an effective way to quickly provide plants with the copper they need, but it is important to ensure that the solution is applied evenly and at the right time. In addition to soil amendment and foliar application, it is also important to maintain proper soil pH levels. Copper availability is influenced by soil pH, with acidic soils often having low copper availability. By maintaining the proper soil pH, plants can more easily absorb the copper they need.

Overall, managing copper deficiency in plants requires a multi-faceted approach that involves identifying the symptoms, confirming the diagnosis, and employing appropriate management strategies such as soil amendment, foliar application, and maintaining proper soil pH levels. By taking these steps, it is possible to help plants overcome copper deficiency and promote healthy growth and development

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Boron

Boron is an essential micronutrient required by plants for their proper growth and development. It plays a crucial role in various physiological and metabolic processes such as cell wall formation, membrane integrity, pollen germination, and fruit development. However, plants are often faced with the problem of boron deficiency, which can significantly affect their productivity and quality.

Boron deficiency in plants is often characterized by a range of symptoms such as stunted growth, distorted leaves, reduced root development, and poor fruit quality. In severe cases, plants may even exhibit necrosis and dieback of shoot tips.

To manage boron deficiency in plants, it is essential to identify the root cause of the problem. This can be done through soil and tissue analysis to determine the level of boron available to the plant. In many cases, boron deficiency may be caused by soil pH imbalances, excess nitrogen, or other nutrient deficiencies such as calcium or magnesium.

One effective way to manage boron deficiency in plants is through the application of boron fertilizers. These fertilizers are usually applied to the soil or foliage of the plant, depending on the severity of the deficiency. Foliar application of boron can provide quick relief to the plant, while soil application can provide long-term benefits.

Another way to manage boron deficiency in plants is through the use of boron-rich organic materials such as manure or compost. These materials not only provide the necessary boron but also improve soil health and fertility.

In conclusion, boron deficiency is a common problem faced by plants, but with proper management, it can be effectively addressed. Through soil and tissue analysis, identification of the root cause, and appropriate application of boron fertilizers or organic materials, plants can thrive and reach their full potential **(Bonila *et al.* 1997)**

B deficiency shows stunted growth, shows symptoms on the growing point and young leaves In many crops, the symptoms are well-defined and crop-specific, such as:

• peanuts: black hearts

• celery: weakned stem

• beets: hollow hearts

• papaya: abnormal fruit

• carnation: separating calyx

• Chinese cabbage: crack, turn brown

• cabbage, broccoli, and cauliflower: cracked stem

Molybdenum

Molybdenum is an essential micronutrient required for the growth and development of plants. It is involved in several important physiological processes, including nitrogen fixation, enzyme activation, and carbohydrate metabolism. However, molybdenum deficiency is a common problem in many agricultural soils, particularly those that are acidic or high in organic matter.

The symptoms of molybdenum deficiency in plants can vary depending on the species and severity of the deficiency. Some common signs include stunted growth, yellowing of the leaves (particularly between veins), and leaf curling. In severe cases, the leaves may become brittle and easily damaged. **(Delgado *et al.* 2006)**. In lab, different legumes that are severely given less of Mo showed more of deficiency.

Another approach to managing molybdenum deficiency is to apply fertilizers that contain molybdenum. However, it is important to be cautious when using molybdenum fertilizers, as excessive amounts can be toxic to plants. Therefore, it is important to follow recommended application rates and timing guidelines.

In some cases, foliar applications of molybdenum may be necessary to address deficiency symptoms quickly. Foliar sprays are typically used on plants that are experiencing severe molybdenum deficiency, and they can be effective when applied at the right time and with the right concentration.

In summary, molybdenum deficiency is a common problem in many agricultural soils, and it can have significant impacts on plant growth and development. To manage molybdenum deficiency, it is important to identify the cause of the deficiency and take appropriate measures to address it, such as liming the soil, applying molybdenum fertilizers, or using foliar sprays. By taking these steps, farmers and growers can ensure that their plants have the nutrients they need to thrive and produce healthy, high-yielding crops.

.Chlorine

Chlorine is an essential nutrient for plants as it plays a crucial role in photosynthesis, ion uptake, and osmotic regulation. A deficiency of chlorine can lead to stunted growth, leaf chlorosis, and reduced crop yield.

To manage chlorine deficiency in plants, several approaches can be taken. Firstly, soil analysis should be conducted to determine the availability of chlorine in the soil. If the soil is deficient in chlorine, then it can be supplemented with chloride fertilizers such as potassium chloride, calcium chloride, or magnesium chloride.

Another approach to manage chlorine deficiency in plants is through foliar sprays. Foliar sprays of chlorine-containing solutions such as potassium chloride or sodium chloride can be applied to the leaves of plants. This method provides a quick and efficient way of supplementing chlorine to the plants, especially during periods of high demand, such as in the flowering and fruiting stages., **(Graham and Webb, 1991; Mann *et al.*, 2004).**

MANAGEMENT

The nutritional value of plant and the reasons that can influence the development of the disease, such as dense genes, discoloration and light interception, and more humidity in the crop stand, are because of fertilizer application on plant disease under field environment. Proper diet must be given at the exact moment for the nutrient is effective and helps preventing disease and increase in yield. All that changes the soil environment, like tillage, seedbed thickness, moisture control (irrigation or drainage), crop rotation, cover crops, green manures, manures, and intercropping, can influence disease development in addition to fertilizer application.

By changing the nutrient availability and uptake is a way that nutrient manipulation can be reduced and control the disease. Using a fertilizer is a common method for altering the use of nutrients; So, modifying the environment through various ways as in tillage, adjusting thesize and structure of the seedbed, maintaining moisture (through irrigation or drainage), and doing particular crop sequence can show significant impact on the availability of nutrients. Where there is high leaching or denitrification, the use of nitrification inhibitors can increase the efficiency and availability of nitrogen. Expand microorganisms. In the case of Mn, Zn, and Fe in high pH soils with high concentrations of free CaCO3, or when Mn is

made unavailable in the soil by rapid oxidation by microorganisms, the application of fertilizers to the soil may not always be effective. Mn is not well translocated in the phloem, so root tissues that are attacked by the pathogens remain Mn-deficient. Additionally, the addition of nitrification inhibitors to NH+ 4 fertilizers can suppress Mn oxidation as well as nitrification and increase the availability of Mn, P, and Zn for plant uptake.

CONCLUSION

In the majority of the studies presented here, disease incidence in crop plants has been reduced by fertilization or the addition of nutrients. This is probably because the host plant's tolerance or resistance mechanisms involve these nutrients. When the plants were deficient, the application of nutrients significantly reduced disease.

Additionally, disease incidence can be reduced at supraoptimal rates of nutrients. It's possible that the disease has been exacerbated by toxicity rather than deficiency when a nutrient has been added; or, the excess of a nutrient can make the main shortage worse.a balanced diet is needed of any integrative crop protection program in sustainable agriculture because controlling plant deficiency with the correct nutrients and zero pesticides is typically more cost-effective and better for the environment.

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