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Nutrition is Protection: A Brief Review

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Abstract: The aim of agriculture is to develop and produce crops and livestock for human consumption. Nutrients are the key factors in the plant development and final output in terms of yield. Besides nutrition, some protectors are necessary to control crop diseases. Certain nutrients can act as a defender too. This article is about basics of nutriprotection and its future scope.
Keywords-Plant, Disease, Nutrition, Protection

I. INTRODUCTION

A. Plant Nutrition

Plants require essential nutrients for normal functioning and growth. All plants require nutrients to survive and grow. Plants take nutrients from the air, soil and water. Seventeen elements have been shown to be essential for plants: carbon (C),hydrogen (H), oxygen (O), nitrogen(N), phosphorus (P), potassium (K), sulphur (S), magnesium (Mg), calcium (Ca), iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), boron (B), molybdenum(Mo), chlorine (Cl), nickel (Ni). Furthermore, additional elements may be essential to a few plant species, e.g. sodium (Na) and cobalt (Co). Carbon, H and O are obtained from the atmosphere and water, and are not considered mineral elements. The remaining essential elements can be divided into three groups: primary macronutrients (N, P and K), secondary macronutrients (S, Mg and Ca) and micronutrients (Fe, Mn, Zn, Cu, B, Mo, Cl and Ni) based on average concentrations in plants.

B. Plant Protection

Plant protection is the science and practice of managing pests, diseases and weeds that damage crops and other plants, and which can have a devastating effect on farmer livelihoods. Plant protectors are therefore an indispensable tool for the sustainable production of high quality food. Crop protection products have helped farmers in the developing world grow two or three crops a year, so much that these countries can become 'breadbaskets' for the rest of the world.

C. Plant Diseases

A plant disease is any physiological or structural abnormality that is caused by a living organism. Organisms that cause disease are referred to as 'pathogens,' and affected plants are referred to as 'hosts.' Many organisms rely on other species for sources of nutrients or as a means of survival, but are not always harmful to the host. For example, saprophytic organisms obtain nutrients from dead organic material and are a vital part of many ecosystems. Plant pathogens, on the other hand, utilize hosts for nutrients and reproduction at the hosts expense. Disease causing organisms include fungi, oomycetes (fungus-like organisms called water molds), bacteria, viruses, nematodes, phytoplasmas, and parasitic seed plants. Once a pathogen infects a host, symptoms often develop. Symptoms are the outward changes in the physical appearance of plants. Symptoms take time to develop, and thus, disease development may be delayed for several days, weeks, months, or even years after initial infection occurs. Examples of symptoms include wilt, leaf spots, cankers, rots, and decline [1].

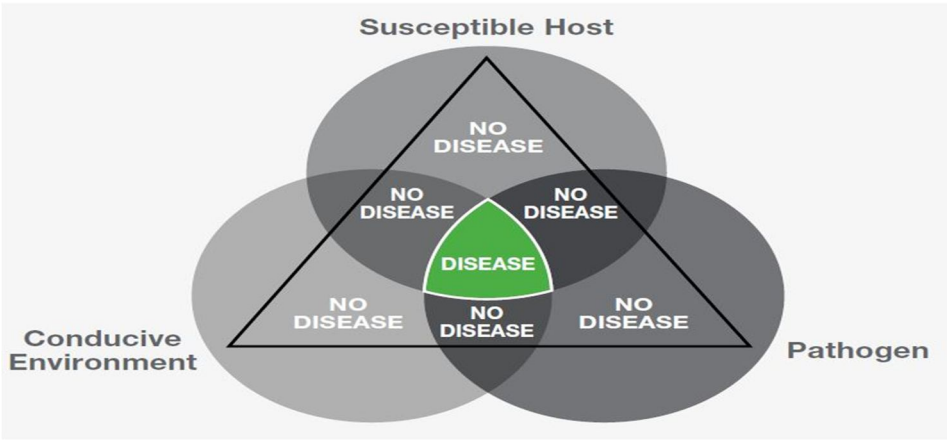

Fig 1: Disease Triangle

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Crops can be damaged by diseases caused by fungi (rust, blight, mildew, rot), bacteria/phytoplasma (wilt) and viruses. The occurrence of plant fungal and bacterial pests depends on climate and weather, but are also strongly influenced by agricultural practices. Viruses and phytoplasma are often transferred via vectors, often insects [2] . Temperature, rainfall, humidity, radiation or dew can affect the growth and spread of fungi and bacteria [3] . Other important factors influencing plant diseases are air pollution, particularly ozone and UV-B radiation as well as nutrient (especially nitrogen) availability [4, 5].

D. Effect of Nutrients on Crop Diseases

Nutrient provides sufficient power to fight against diseases. This aspect works when plant is fulfilling balanced food. The effect of many nutrients on disease has been observed incidentally as a consequence of fertilizing to optimize plant growth or yield [6] .Potassium phosphite is emerging as a vital fungicide in agriculture practices. It is a reduced form of traditional fertilizer phosphate. Being a systemic fungicide, it works effectively against oomycetes and fungi. It is known to induce defence responses in plants against certain diseases. Phosphite works by boosting the plant's own natural defences and thereby allowing susceptible plants to survive [7] . This phosphite provides P and K which are necessary for plant growth as well as for crop protection. Manipulating the various interactions of the plant, pathogen, and environment over time can reduce most diseases. Passive and active mechanisms of disease control are activated through nutrient management. Adequate nutrition is generally required to maintain a high level of disease resistance. Plants contain preformed anti-microbial compounds and have active response mechanisms where inhibitory phytoalexins, phenols, flavonoids, and other defense compounds accumulate around infection sites of resistant plants if the nutrients required for the synthesis or induction of those compounds are adequate. An adequate supply of Mn and several other micronutrients are important in most of the active defense mechanisms mediated through the Shikimate pathway. Glycoproteins (lectin) associated with resistance of sweet potato to Ceratocystis fimbriota (black rot) and potato to Phytophthora infestans (late blight) require Mn for activity [8]. Nutrients such as Ca that suppress macerating diseases caused by bacterial soft rots (Erwinia), Sclerotium rolfsii, Pythium myriotylum, Rhizoctonia solani, Cylindrocladium Clubroot, Rhizoctonia canker and Fusarium wilts of fruit and vegetable crops can be controlled by liming to increase soil pH and fertilizing with a nitrate source of N [9] . These diseases also are less severe following crops that enhance nitrification [10].

II. DISCUSSION

Crop Nutrition and protection are vital aspects in agricultural practices. The nutritional status of a plant determines its histological or morphological structure and properties. Proper nutritional balance decides yield of crop. End user-farmer is dependent on many fungicides for control of pests, diseases and deficiencies. Certain molecules plays bi-role in controlling the disease and growing the plant. Much attention is necessary to invent such multi useful products. If such thing happen it will dramatically change the face of Agriculture era.

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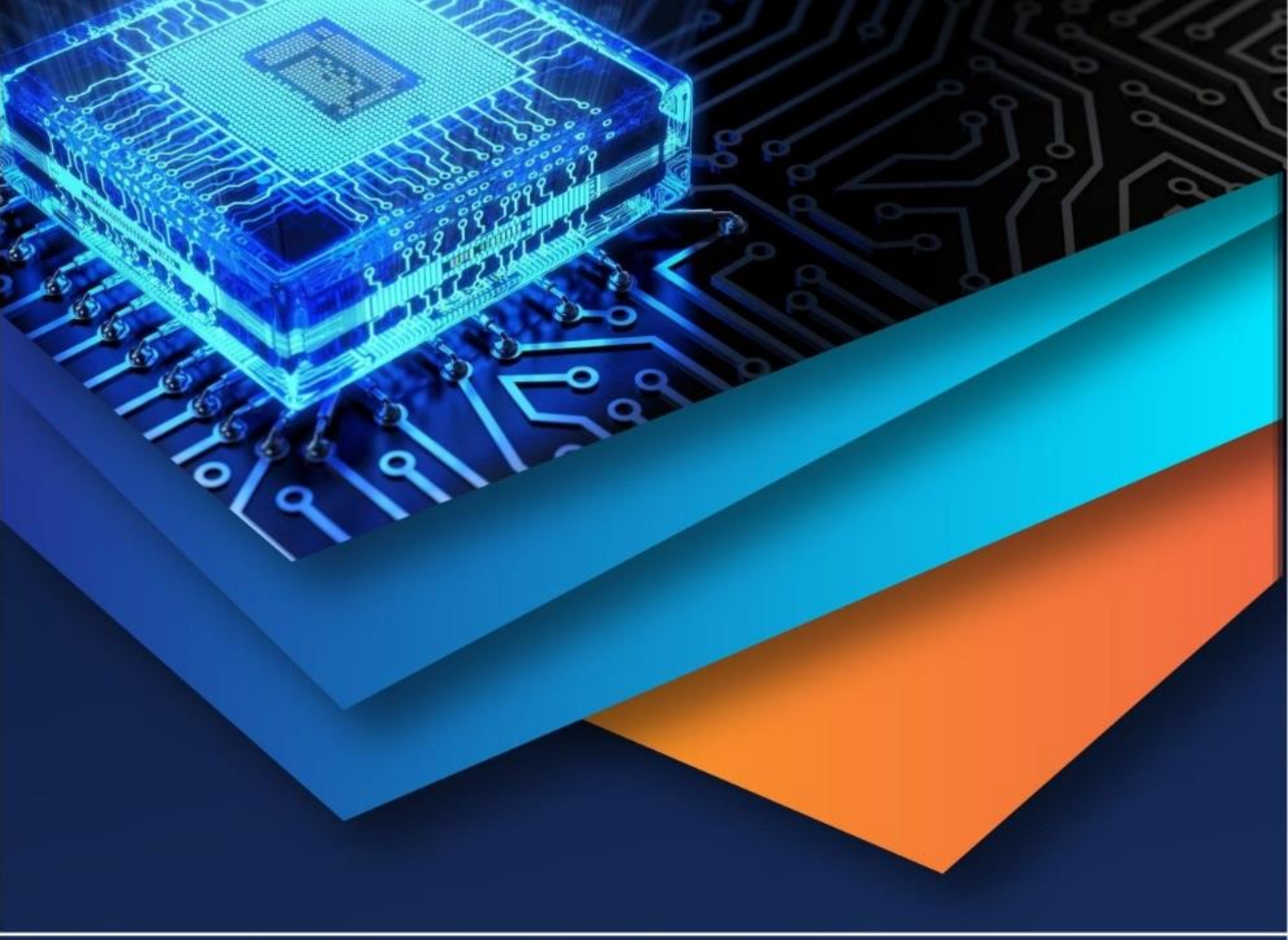

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