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PLANT STRESS AND HOW TO MINIMIZE ITS EFFECTS ON CROPS IN AGRICULTURE

By Kenny Beeton

Plant stress can have a direct effect on crop health and crop performance, stress and its effects on plant health can be either short-term or long-term depending on the stressor. When aiming to address crop performance through stress management it is important to know, what is the primary cause of the stress and its effect on the crop.

UNDERSTANDING PLANT STRESS

Plant stress can be defined as:
1. Abiotic stress
2. Biotic stress

Abiotic stress relates to the physical environment in which the plant grows. Contributing factors such as excessive temperatures, flooding, soil salinity, soil pH, presence of heavy metals and drought conditions are all abiotic stressors. Biotic stress relates to pathogens such as *Phytophthora* or *Pythium*, leading to soilborne diseases such as root and collar rot in citrus as an example. Certain Bacteria and Fungi can also lead to biotic stress in plants. However, not all bacteria and Fungi are negative stressors, there are beneficial species which can be used to combat the effects of stress. These beneficial organisms are readily available to growers in the form of *Mycorrhiza* and *Trichoderma* species.

As farmers are at the mercy of mother nature, plant stress can be minimized by focusing on good farming practices. This means paying attention to irrigation and fertilization practices on the farm. An example of this is that excessive watering can be just as detrimental to a crop as exposure to drought conditions. In some cases, the effects can be even worse, as overwatering can lead to oxygen-deprived soils. In young plants pathogens such as *Pythium* thrive in waterlogged soils. Furthermore, certain crops (e.g. citrus) will draw moisture from their fruit to survive the drought conditions which can lead to further fruit defects.

ALLEVIATING PLANT STRESS

Fortunately, there are various naturally occurring "anti-stressors" available. The most frequently applied in agriculture is Seaweed extracts. Seaweed extracts contain hormones such as Cytokinins and Auxins which are known to promote plant growth. There are two types of Seaweed commonly used in agriculture. The most common is *Eklonia maxima* also known as sea bamboo and is harvested from the South African west coast. Another seaweed species with widespread use is *Ascophyllum Nodosum* harvested from the cold waters of the Northern Atlantic.

The primary difference between the two seaweed species and their extracts lies in the hormonal level differences. *Ecklonia Maxima* contains higher levels of Auxins which play a role in root growth in plants. *Ascophyullum Nodosum* is a brown algae and contains higher levels of Cytokinins and Gibberellins which are known to promote cell division leading to apical dominance or lateral growth of plants.

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ACTIVATING PLANT SYSTEMIC RESISTANCE

Plants have naturally occurring defence mechanisms to activate a physiological state of increased resistance. Plant resistance can be subdivided into systemic acquired resistance (SAR) and induced systemic resistance (ISR). SAR in plants can be activated by treatment with Bioflavonoids which are secondary metabolites found in plants. Bioflavonoids play a critical role in the colour development of flowers and the flavour development of fruit. Bioflavonoids are also known to improve resistance against extreme temperatures and improve drought tolerance in plants. The combination of Bioflavonoids and Salicylic acid is also known to suppress and control bacterial infections such as *Xanthomonas* disease in stone fruit and *Boytritus cinera* in grapes and potatoes.

Nutrient uptake and absorption can also be improved significantly by applying Bioflavonoids in combination with foliar feeds. Salicylic acid (SA) is an extract from the Poplar tree and is known as a pain inhibitor. Salicylic acid plays a critical role in the activation of plant resistance. Salicylic acid will accumulate at the site of the infection and will then spread to the rest of the plant leading to ISR.

An understanding of plant stressors leading to plant reactions is required when evaluating the cause of a disease or plant defect. There are various combinations of hormones, bacteria, and fungi species available to assist plants in the initiation of their defence response, minimizing the spread of infection of a particular disease.

PRODUCT RECOMMENDATIONS

FLAVOMUNE™

Bioflavonoids + Salicylic acid

FlavoMune is an activator of phytoalexin activity in plants. Phytoalexins activate the plant's natural defence mechanism.

Flavomune plays a critical role in enhancing colour and flavour development in flowers and fruit.

ALGAE Roota

Extract of the seaweed
Ascophyllum nodosum

Algae Roota Promotes cell elongation and the development of roots in a variety of crops when applied either as a foliar application or directly in the rootzone through irrigation.

ALGAE Folia

Extract of the seaweed
Ecklonia maxima

Algae Folia promotes cell division, promoting Apical dominance in a variety of crops.

TRICON

Triacontanol stimulates the production and activity of chlorophyll in plants. Chlorophyll pigments harvest sunlight energy that drives photosynthesis.

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