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DIAGNOSIS OF NUTRIENT DISORDERS IN FLUE CURED TOBACCO

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INTRODUCTION

Tobacco requires nutrients timeously and in balanced proportions. Any deviations result in nutrient disorders, i.e. the plant becomes unhealthy and exhibits disease-like symptoms (Fig. 1 a, b, c and d). This affects the functioning of the plant system and may result in a reduction in yield and quality. Prolonged shortage of even a single nutrient might eventually lead to plant mortality. Thus, early detection of nutrient stress is critical to attain the expected yield and quality.

(a) Calcium deficiency

(b) Boron deficiency

(c) Magnesium deficiency

(d) Potassium deficiency (K-firing)

Figure 1 (a, b, c, d): Visual symptoms of some nutrient deficiencies in tobacco

VISUAL IDENTIFICATION OF NUTRIENT DISORDERS

Visual symptoms are a helpful and quick diagnostic tool for identifying nutrient deficiencies in tobacco. However, interpreting these visual nutrient deficiency and toxicity symptoms can be difficult and thus, plant analysis or soil testing is necessary to confirm nutrient stress. When visually identifying nutrient disorder symptoms, it is necessary to critically observe and define deficiency symptoms. The deficiency symptoms might be distinguished based on the presence or absence of dead spots, plant part that shows deficiency symptoms, and entire leaf or interveinal chlorosis. A flow chart that can be used in diagnosing tobacco nutrient disorders is shown in Figure 2.

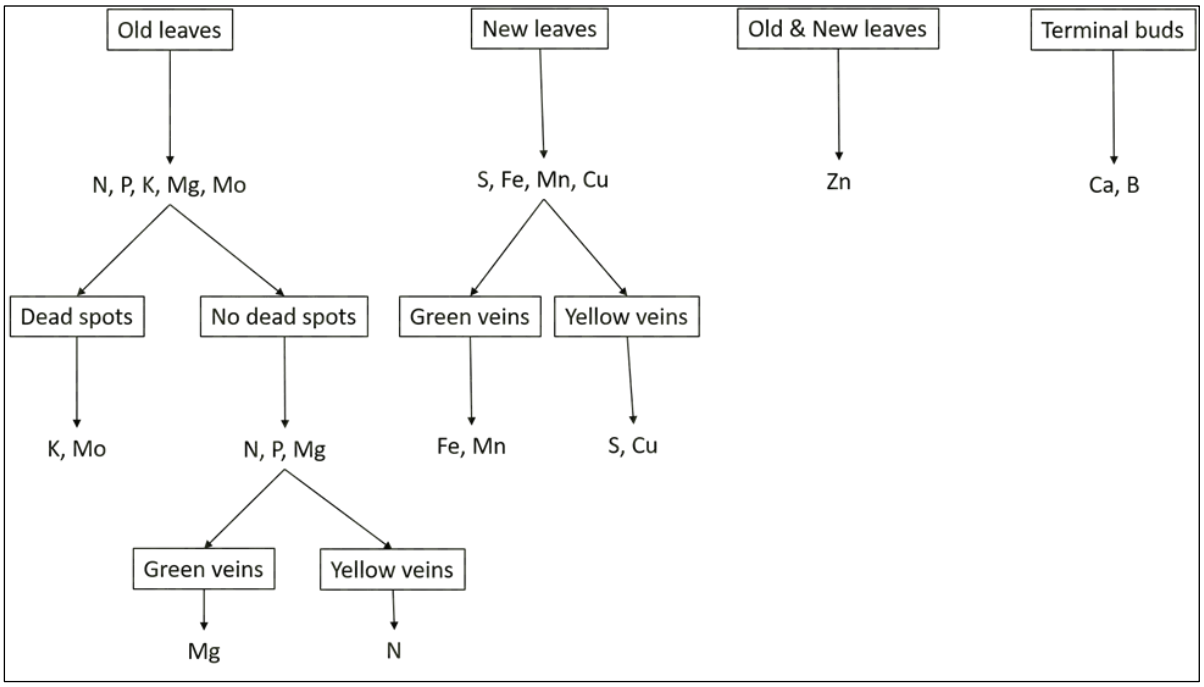

Figure 2: Diagrammatic representation of nutrient deficiency identification

LIMITATIONS OF VISUAL IDENTIFICATION OF NUTRIENT DISORDERS

Although visual observation is a quick and readily available technique of diagnosing nutrient disorders, there are many limitations associated with it.

1. Many symptoms appear similar

Nutrient deficiency symptoms may appear similar and this can lead to misdiagnosis. For instance, nitrogen (N) and sulfur (S) deficiency symptoms can be very alike, depending upon growth stage, placement, and severity of deficiencies. For example, phosphorous (P) deficiency is often misdiagnosed as it is similar to toxicity of molybdenum (Mo) or selenium (Se).

2. Multiple deficiencies and/or toxicities can occur at the same time

Deficiency or toxicity symptoms may be a result of more than one nutrient, or possibly an excess in one nutrient can induce deficiency of another (i.e., excessive P causing Zn deficiency). In such cases, the common mistake is to address the deficient nutrient, whilst the cause of the problem (the excess nutrient) is often ignored. In addition, when two or more elements are deficient simultaneously, the complex picture of symptoms may resemble no single known deficiency.

3. Pseudo (false) deficiency symptoms

Mineral deficiency symptoms are sometimes confused with other complex field events leading to misdiagnosis. Potential factors causing pseudo (false) deficiency include, but are not limited to, disease, drought, excess water, genetic abnormalities, herbicide and pesticide residues, insects, and soil compaction.

4. Hidden hunger

Plants may be nutrient deficient without showing visual signs. Thus, visual observation will, in this context, be limited by time. Between the time a plant is nutrient deficient (hidden hunger) and when visual symptoms appear, crop health and productivity may be substantially reduced and corrective actions may or may not be effective.

5. Field symptoms appear different than 'ideal' symptoms

The reference guide for many plant deficiency or toxicity symptoms is established after plants are grown under controlled nutrient conditions. However, deficiency or toxicity symptoms observed in the field may or may not appear as they do under controlled nutrient conditions and this can lead to misdiagnosis. Therefore, experience and knowledge of field history are excellent aids in determining causes for nutrient stress.

WHAT DO YOU DO IF YOU OBSERVE NUTRIENT DISORDER SYMPTOMS?

After observing visual symptoms, one must make the following steps:

1. Record

Record which crop(s) are affected, a detailed description of symptoms, their location with respect to topography, aspect, and soil conditions, and time of season that the symptoms first appeared. Mark affected field locations so that these can be monitored over time using either flagging or GPS readings. This information will be useful in preventing nutrient stress for subsequent years.

2. Soil analysis

Testing and correcting soil pH is important because soil pH has a direct effect on the availability of plant nutrients. In slightly acidic to neutral soil the availability of plant nutrients is not restricted by pH. Whereas, in moderately to strongly acidic soil, and as the soil becomes more alkaline, the availability of many plant nutrients decreases or increases to toxic levels. Soil should be tested for pH and nutrient levels prior to planting, allowing for enough time to apply fertiliser. However, if visual symptoms are observed, a soil sample should be collected to determine soil pH and nutrient levels

3. Plant analysis

Plant tissue analysis can also serve as a trouble shooting tool to diagnose a suspected nutrient deficiency. Plant analysis can be used to distinguish between nutrient deficiency and toxicity as compared to sufficiency. A plant analysis has three main applications:

i. When visual symptoms are present, confirm a suspected nutrient deficiency or toxicity.
ii. Monitor plant nutrient status in an effort to achieve optimum yield and quality while protecting the environment
iii. Serve as a basis, along with a soil test, for fine tuning fertilization programs.

You should consider plant analysis if you see indications that your crops are not healthy. These indications include leaf yellowing or spotting, wilting (even with sufficient moisture), and

reduced growth or plant death. By using plant analysis, you can confirm a suspected deficiency before applying a corrective treatment.

4. Apply corrective measures

Corrective treatments should be applied, as prescribed by an Agronomist, before significant losses in yield or quality occur. However, when a nutrient deficiency is confirmed by a plant analysis or an unsuspected deficiency is uncovered, a corrective treatment may not always be applicable to the sampled crop. Treatments may be specified for future growing seasons, or additional plant and soil samples may be needed to fully evaluate the suspected deficiency. A plant analysis may indicate that a nutrient deficiency or toxicity does not exist. Therefore, a factor other than nutrition may be responsible for poor plant growth or visual symptoms. This information is invaluable in problem solving.

PREVENTION IS BETTER THAN CURE

Numerous cases can be described where incorrect diagnosis of a crop problem led to crop failures, as well as to costly, ineffective corrective treatments. The monitoring role of a plant analysis offers the opportunity to maintain high-quality production with maximum efficiency and a minimum of nutrient deficiency problems. To provide a means of noting changes in nutrient content, sample each year or on a regular basis and compare test results from one sample to the next. To identify a potential nutrient deficiency, excess, or imbalance, carefully study upward or downward trends along with previous nutrient. Therefore, regular soil or plant testing is recommended for the prevention and early diagnosis of nutrient stress.

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