

Be Your Own Maize Doctor

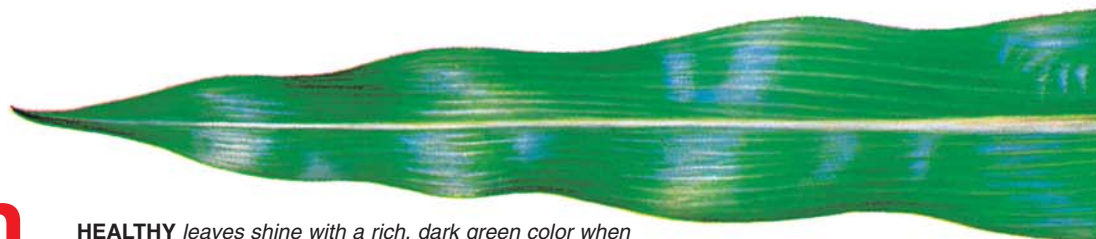
HAVE YOU had a “maize check-up” this season? Every grower should learn to recognize the symptoms that are pictured here — signs that a maize crop is deficient in one or more of the nutrients that are essential for healthy plant growth and profitable yields. You can be your own maize doctor. It is an important part of crop management to look at fields regularly and identify signs that problems are developing.

Nutrient Deficiency Symptoms

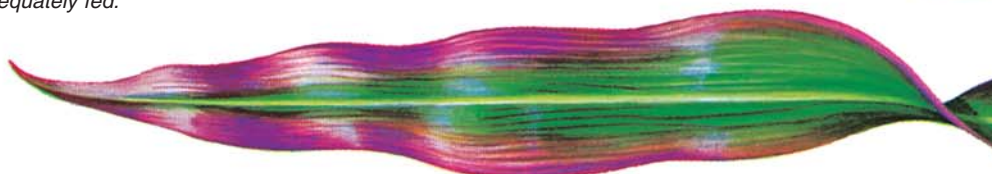
Optimum economic returns on your crop production investment depend upon an adequate nutrient supply throughout the growing season. These nutrient deficiency symptoms indicate that this need is not being met. Check the field several times during the season. Some deficiencies detected early may be corrected by additional fertilizer applications. Even if they cannot be corrected this year, knowing where they occur can be helpful information in planning fertilizer programs for next season.

Healthy maize leaves should have a rich, dark green color. Any stress or nutrient shortage will alter the color.

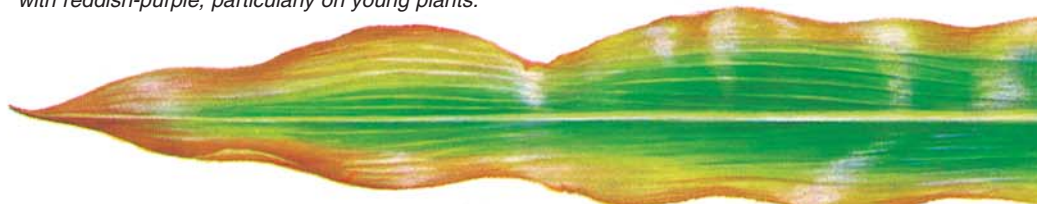
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ICIPE compound
Duduville-Kasarani, Thika Road
P.O. Box 30772-00100
Nairobi, Kenya
Telephone: +254 (20) 863-2720
Fax: +254 (20) 863-2029
E-mail: szingore@ipni.net
Website: <http://africa.ipni.net>



HEALTHY leaves shine with a rich, dark green color when adequately fed.



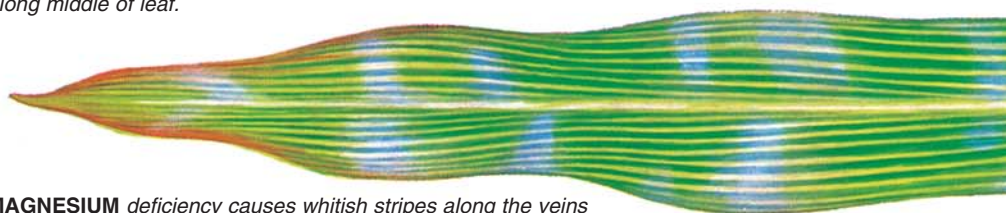
PHOSPHORUS (phosphate) shortage marks leaves with reddish-purple, particularly on young plants.



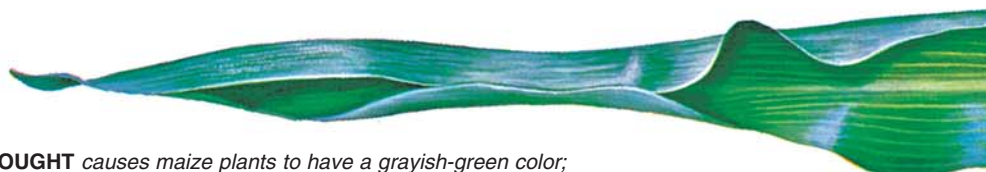
POTASSIUM (potash) deficiency appears as a firing or drying along the tips and edges of lowest leaves.



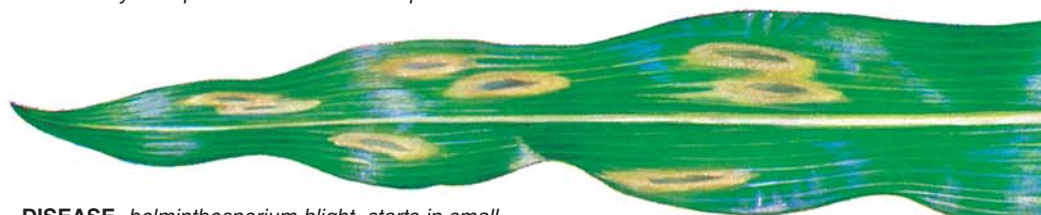
NITROGEN hunger sign is yellowing that starts at tip and moves along middle of leaf.



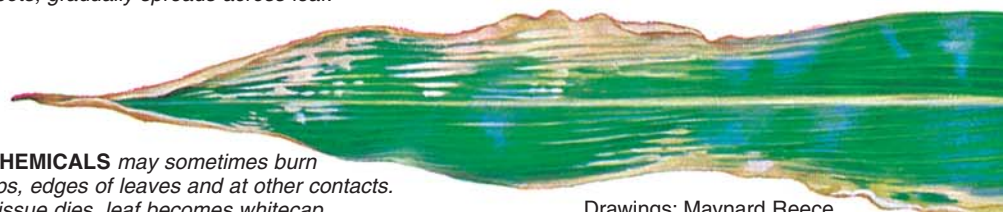
MAGNESIUM deficiency causes whitish stripes along the veins and often a purplish color on the underside of the lower leaves.



DROUGHT causes maize plants to have a grayish-green color; leaves may roll up to about the size of a pencil.



DISEASE, *helminthosporium blight*, starts in small spots, gradually spreads across leaf.



CHEMICALS may sometimes burn tips, edges of leaves and at other contacts. Tissue dies, leaf becomes whitecap.

Drawings: Maynard Reece

Nitrogen Deficiency

Nitrogen (N) deficiencies are less likely to be detected early in the season, but when young plants are light yellowish-green in color, shortage of N may be responsible. If deficiency is detected early, topdressed N fertilizer may be applied to help correct the problem.

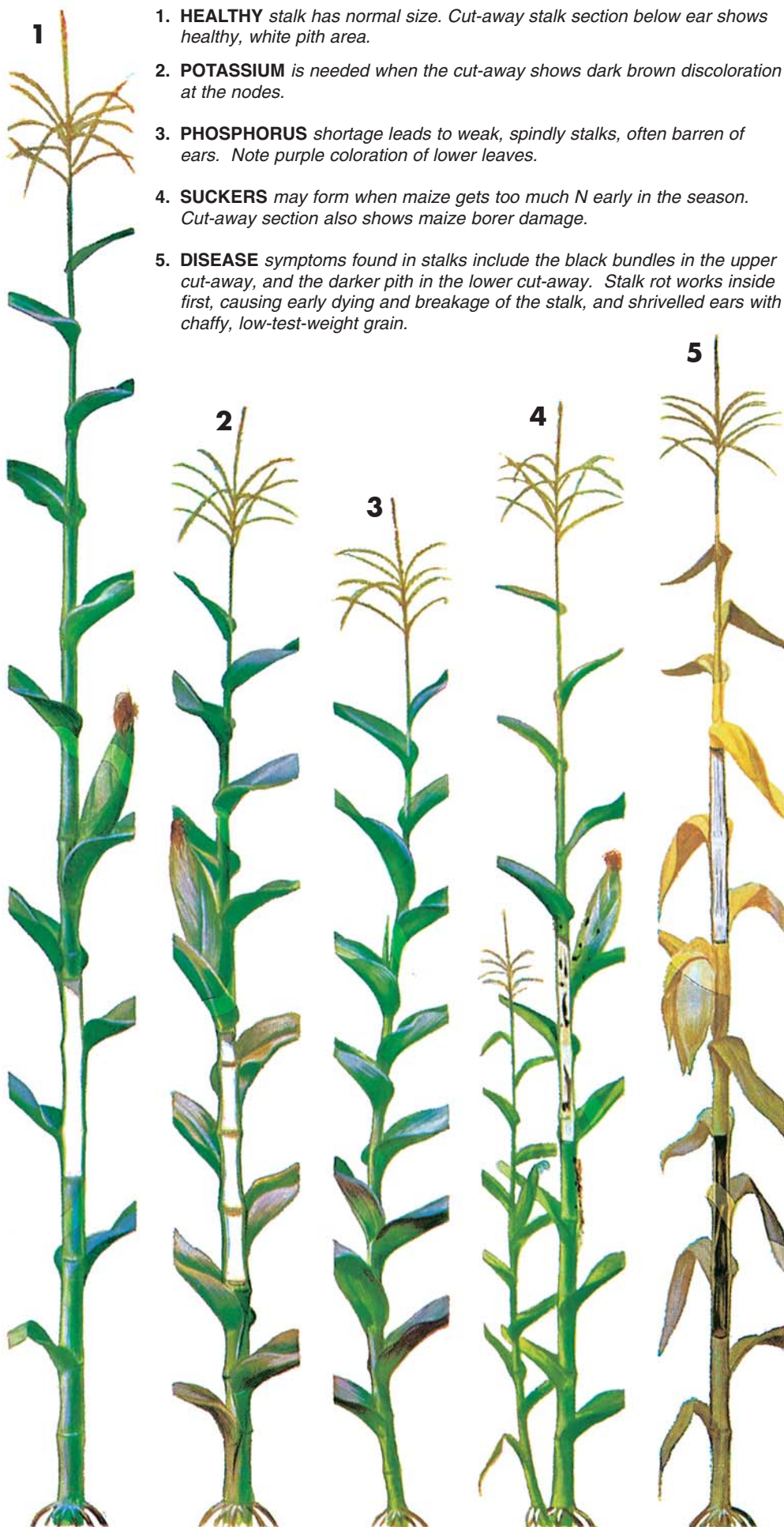
After the maize is about knee-high, growth rate increases, and N demand increases rapidly. If not enough is available, lower leaves begin to turn yellow at the tops, with yellowing progressing along the midrib. Since N is a mobile nutrient in the plant, the symptoms gradually move to leaves higher on the plant. Lower leaves die. Premature death of the plant and small, chaffy ears result from N deficiency.

Phosphorus Deficiency

Phosphorus (P) deficiency usually appears when plants are very young. An early symptom is reddish-purple coloration of the leaves. Weak, spindly stalks — either barren or with small, twisted ears — are also an indication of P deficiency. Cool temperatures and excessively dry or wet conditions early in the season...or any physical restriction to root development...may lead to deficiency symptoms, even if adequate P supplies are in the soil. Phosphorus deficiency will also result in delayed maturity. High rates of uptake per day during rapid growth emphasize the importance of high soil fertility for adequate P nutrition.

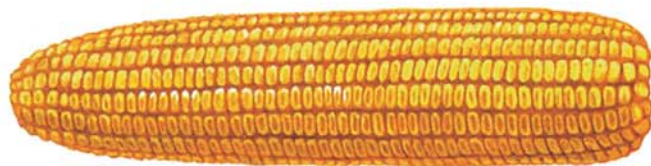
Potassium Deficiency

Potassium (K) deficiency shows up initially as a yellowing or browning along the margins of lower leaves, moving gradually toward the midrib, and to leaves higher on the plant. Another common symptom of K deficiency is a dark-brown discoloration of the nodes inside the stalk which may be revealed by slicing the stalk lengthwise. Ear size may not be affected as much as with N or P deficiencies, but tip kernels do not develop and ears may be chaffy as a result of K deficiency. Potassium is also a major factor in water use efficiency, so drought effects are much more pronounced when K supplies are inadequate.

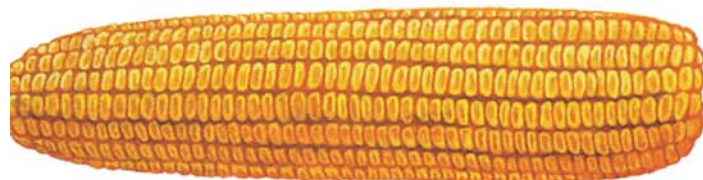




DEEP SPREADING ROOTS of healthy, high-yielding plants will explore a large area of the soil profile.



NORMAL EARS, on well fertilized high-producing maize, often weigh 0.1 – 0.3 kg. Ear tips may not be completely filled with grain.



BIG EARS, in excess of 0.3 kg and with kernels covering the tip of the cob, indicate that plant population may be too low for most profitable yields.

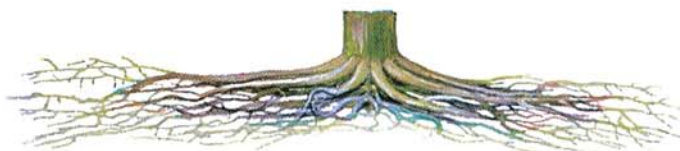


PHOSPHATE shortage during early weeks causes a shallow root system with little spread.

ROOTWORMS prune heavily as they eat small roots and tunnel in larger ones.



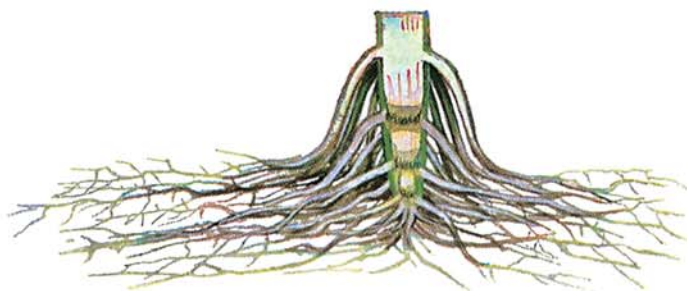
SMALL EARS, may be a sign of low fertility, excessive population, or other problems.



POOR DRAINAGE and hardpan are causes of a flat, shallow root system. Maize with poor roots can't stand drought and is easily blown over by high winds.



POTASSIUM (potash) shortage shows up in ears with poorly filled tips and loose, chaffy kernels.

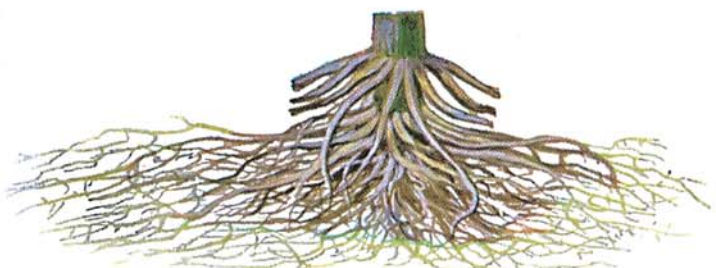


ACID SOIL is indicated when the lower part of the root is discolored and decayed, particularly when brace roots shoot from third or fourth node.

PHOSPHORUS (phosphate) shortages interfere with pollination and kernel fill. Ears are small, often are twisted and with undeveloped kernels.



NITROGEN is essential throughout the growing season. If plant runs out of N at a critical time, ears are small and protein content is low. Kernels at tip do not fill.



PRUNED ROOTS are work of a cultivator. Shovels were too deep and too close.

CHEMICAL damage makes roots writhe and twist. Joined brace roots may be another symptom.

GREEN SILKS at maturity may be caused by too much N in relation to other nutrients.



DRY WEATHER slows silking; kernels aren't well pollinated.



Other Nutrient Deficiencies

Besides N, P, and K, other nutrient deficiencies occur less frequently, but can be very important factors in setting limits on yield. Sulphur (S) deficiency shows up as a light green coloration in upper leaves, and as poor growth rates. It is most common on sandy or low organic matter soils. Various S-containing fertilizers may be used to correct the problem. Magnesium (Mg) deficiency causes whitish striping along the veins of the lower leaves, with some purplish-red discoloration along the leaf margins. It may be an indication of acid soil, especially in young plants under reduced tillage. Application of dolomitic limestone may help correct the problem in future years. If acid pH is not a problem, Mg sources such as potassium-magnesium sulphate can correct the deficiency.

Drying and twisting of the upper leaves may be an indication of copper (Cu) deficiency. Zinc (Zn) deficiency is indicated by chlorotic stripes parallel to the midrib of younger leaves, shortened internodes, and stunted plants. Barren stalks or barren ears in well-fertilized,

high population fields may be due to boron (B) deficiency.

Acid soil affects uptake of many plant nutrients and may cause deficiencies even when adequate supplies of nutrients have been applied. Soil tests should be used regularly to identify pH problems and monitor soil P and K levels in the soil. Soil profile nitrate tests provide reliable information to help guide N application in regions where nitrate carries over from one season to the next. In more humid regions, nitrate tests may be less reliable than pH, P, and K tests.

Be Thorough

As a maize doctor, be thorough in evaluating the "patient". Note the general appearance of the field and contrast problem areas with the appearance of "normal" healthy areas. Pull or dig up some plants in "normal" and "problem" areas. Carefully inspect the roots, split the stalks, and examine ear development. Look for insect and disease problems, too. Plant samples collected from "problem" and "normal" areas during the growing season can provide useful diagnostic information through laboratory analysis.

Make detailed notes of what you see and the exact location in the field. Use a camera to document "normal" and "problem" areas in pictures or video. If you use a video camera, talk about the symptoms and field conditions as you are taping. Be sure to note field location and date for all photos. Such documentation in notes and pictures will be valuable in planning next season's crop.

At the end of the growing season, check ears before harvesting the field. Again, careful notes can be a valuable planning tool to help correct problems for next season. Poorly filled, deformed ears, and barren stalks may indicate nutrient shortages. If soil analysis can be done, collect soil samples from areas of the field where such problems are found, as well as "normal" areas. Comparing laboratory analyses of these samples will help complete the diagnosis.

Being a good maize doctor and learning to identify nutrient deficiencies and other plant health problems are important parts of responsible maize management. Proper fertilization, based on soil tests, and coupled with other sound management practices is a key to efficient, economic yield production. ■

This publication was originally developed from an article by K.C. Berger, former Professor of Soils, University of Wisconsin – College of Agriculture. It was revised by Dr. Harold F. Reetz, Jr., of the International Plant Nutrition Institute staff (retired).