Research Technical Note
Urban Greenery Series
RTN
14-2013
December

Visual Symptoms of Nutrient Deficiency in *Axonopus compressus* (Cow Grass)

Author: Chin Siew Wai

Fig. 1 Cow Grass (*Axonopus compressus*) lawn with complete nutrition is green and dense

Introduction

Turfgrass nutrition plays an important role in maintaining the vigour and density of a lawn. Nutrients are essential to support proper plant growth and development. When available in adequate amounts, they enable plants to better adapt to environmental stress, tolerate human traffic impacts as well as combat invasion by weeds. Macronutrients such as nitrogen (N), phosphorous (P) and potassium (K) are required in large amounts by plants for the formation of new roots, shoots, expansion of leaf tissues and chlorophyll pigment synthesis while micronutrients like iron (Fe) is closely involved in the synthesis of chlorophyll pigments.

Plants obtain nutrients from the soil substrate. Nutrients may be lost when soil leaches or when plant tissues are removed during mowing operation. In addition, nutrients in the soil may also be converted to forms that are unavailable for plant uptake under suboptimal soil conditions. Therefore, it is important to apply fertilizers to replace the nutrients lost after several regular mowing regimes or ameliorate the soil conditions to make nutrients available.

Visible symptoms of nutrient deficiency are usually expressed only when nutrient levels within the plant tissues fall below minimum critical levels that affects growth. It is useful to be able to recognize early symptoms of nutrient deficiency and apply corrective measures. This helps to prevent the lawn quality from degrading.

This Research Technical Note (RTN) documents the early visual symptoms of nutrient deficiencies (N, P, K and Fe) in Cow Grass (*Axonopus compressus*) under controlled nutrient deficiency conditions. Coupled with experience and knowledge of the site conditions, this RTN can serve as a diagnostic guide for operational managers.

Nutrient deficiency symptoms in Cow Grass

Nitrogen deficiency symptoms

Fig. 2A

Fig. 2B

Fig. 2C

Fig. 2D

The mature leaves first became yellowish-green with reddish-purple streaks spreading from bases of leaves towards the tips [Figs. 2A & B 'N2']. The mature leaves turned entirely reddish-purple [Figs. 2B 'Red' & 2C], became necrotic and caused the leaf to wither and die (Figs. 2B & C).

When deficiency persisted, young leaves too became yellowish-green (Fig. 2B 'N1'). The shoot density reduced; the lawn thinned out and weeds started to establish (Figs. 2C, D & E)

Fig. 2E

Phosphorous deficiency symptoms

Fig. 3A


Fig. 3B

Both mature and young leaves first became uniformly dark green ('Phosphorous' in Fig. 3A). The mature leaves then turned dark purple with the pigment spreading from the tip towards the base (Fig. 3B). The leaf tips of the dark purple leaves became necrotic. Necrosis soon spreads from leaf tip; causing the leaf to wither and die.

The phosphorous deficiency symptoms differed from nitrogen deficiency symptoms in which the mature leaves first became yellowish-green before the accumulation of reddish-purple pigments that spread from leaf base to leaf tip ('Nitrogen' in Fig. 3A & Figs. 2A, B & C)

Potassium deficiency symptoms

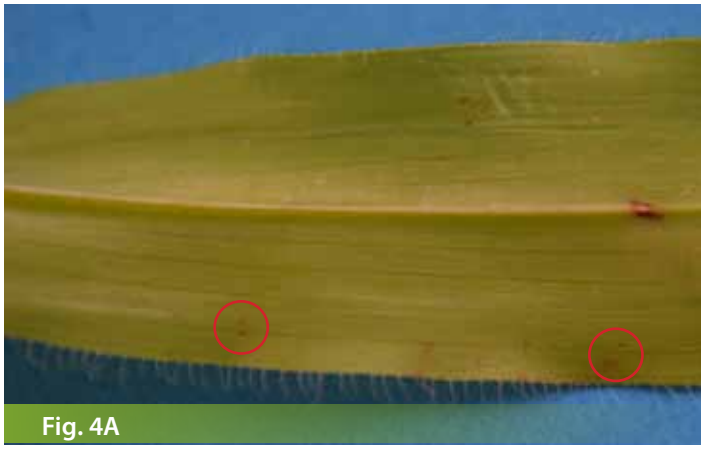
Fig. 4A


Fig. 4B


Fig. 4C

The mature leaves first became greenish-yellow. Necrosis was observed as either small dark-brown spots distributed randomly throughout the entire leaf (Fig. 4A) or as necrotic areas on the leaf margin (Fig. 4B) or at the leaf tip (Fig. 4C). Necrosis soon spreads towards the leaf base, causing the leaf to wither and die. Some of the mature leaves wilted, mimicking a drought-stressed condition.

Iron deficiency symptoms

Fig. 5A

Fig. 5B

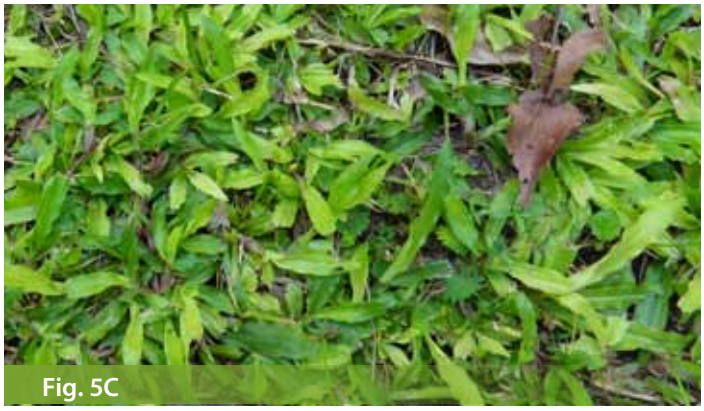

Fig. 5C

The young leaves first displayed interveinal chlorotic condition which made the leaves appeared 'netted' (Fig. 5A). The 'netted' leaves turned pale green to whitish-yellow (Figs. 5B & C); drooped while the rest of the mature green leaves remained upright.

As deficiency persisted, the mature leaves developed similar symptoms and became necrotic at the tip; causing the leaf to wither and die.

Applications and Limitations

- Nutrient deficiency symptoms described in this RTN for Cow Grass could be used as a guide to diagnose deficiency conditions. For example, the distinct early symptoms of N and Fe deficiencies can be used with certainty as diagnostic tool to detect nitrogen and iron nutrient deficiency problem. However, it has its limitations when used to detect early deficiency symptoms of phosphorous and potassium, as symptoms are subtle and less discernible.

- One must consider the complex interactions between nutrient availability and soil pH, available soil moisture, soil oxygen levels, excesses of other nutrients, and organic matters when interpreting the visual symptoms in order to accurately rectify the problem. Examples of such interactions include (1) alkaline soil pH (pH > 7.0) resulting in iron to exist in insoluble Fe (III) form that is unavailable to the plant and (2) waterlogged wet soil condition resulting in high bicarbonate content, which restricts root uptake of iron. Therefore, accurate diagnosis of a nutrient deficiency condition cannot be based on visual symptoms alone and must be accompanied with soil or tissue nutrient testing.

- Routine fertilization regime with complete fertilizers, preferably 4:1:2 (N: P: K), is a positive approach to prevent the onset of nutrient deficiencies and ensure the vigorous and healthy growth of Cow Grass plants. Conversely, if other interacting factors such as suboptimal soil pH (too acidic or alkaline soil) or poor soil aeration (waterlogged condition) are not remediated, correction of nutrient deficiencies by supplying the associated nutrients may not be effective.

NATIONAL PARKS
CUGE
CENTRE FOR URBAN GREENERY AND ECOLOGY