

## ILLUSTRATED CONCEPTS IN TROPICAL AGRICULTURE

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### NITROGEN APPLICATION PROMOTES ROOT PROLIFERATION AND VEGETATIVE GROWTH OF CORN

Nitrogen is one of the "Big Three" nutrients (nitrogen, phosphorus, and potassium) essential to plant growth. Organic matter in the soil is an important storehouse of nitrogen, and a continuous supply is made available through its decomposition. The rate of release of nitrogen into the soil from organic matter is slow, however, and the supply of nitrogen at any one time is generally not enough to satisfy the needs of present-day, high-yielding varieties of many crops.

Nitrogen deficiency adversely affects plant growth, and a crop's root system that is basic for healthy plants is a good indication of an adequate supply of nitrogen. The addition of nitrogen fertilizer has a positive effect on the proliferation and distribution of corn roots (Fig. 1), and better root development provides the plant with access to more soil moisture and enhances the uptake of other essential nutrients by providing more sorption sites. This results in higher dry matter yield in nitrogen-treated plants than in plants in a "no-nitrogen" treatment (Table 1).

When vigorous vegetative growth is promoted by optimum nitrogen nutrition (Fig. 2), relatively more of the carbohydrate manufactured is utilized for the development of tops, and relatively little is translocated downward for root development. This results in an increase in the top/root ratio



Fig. 1. Corn root development with (no. 2) and without (no. 1) nitrogen fertilization.

for the nitrogen treatment (Table 1). In this study, nitrogen application at 224.2 kg/ha (200 lb/acre) resulted in a higher dry matter yield than the "no-nitrogen" treatment. A difference in color of the plants was noted as well: nitrogen fertilization resulted in darker green plants.

Table 1. Effect of nitrogen application<sup>a</sup> on corn root and dry-matter yield<sup>b</sup> (g/pot) and top/root ratio

	No nitrogen added	Nitrogen added
Corn part		
Roots	3.80	9.40
Tops	18.90	72.40
Top/root ratio	4.97	7.70

<sup>a</sup>Nitrogen in the form of urea was applied at the rate of 224.2 kg/ha (200 lb/acre). Both treatments received phosphorus at 112.1 kg/ha (100 lb/acre) and potassium at 224.2 kg/ha (200 lb/acre).

<sup>b</sup>Oven-dried at 60°C.



Fig. 2. Corn growth with (no. 2) and without (no. 1) nitrogen fertilization.