TIGER® TECH NEWSLETTER

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Crop Uptake of Sulphur

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Agronomic crop production enhancements have progressed significantly over the past ten (10) years. Precision farming tools have provided methods to conduct site-specific management within individual fields. Biotechnology, plant breeding, crop protection, and plant nutrition have made significant contributions to increased crop production potential. Maximizing crop yield potential requires "fine tuning" a complex nutrient management system such that all essential nutrients are available when plants needs them. However, all nutrients will not be available to the crop in optimum quantities at all times due to loss/fixation mechanisms within the plant-soil system. Employing the 4-R's (right source, right rate, right time, and right place) enhances timely in-season plant nutrient availability and uptake.

EVALUATING SULPHUR REQUIREMENTS

A sufficiency evaluation of the availability of sulphur (S) to a crop is more complex than for the other plant nutrients. The influential factors include multiple S sources and rates of utilization and targeted use of S within the plant. Sources of S are organic matter, atmospheric deposition, naturally occurring minerals, and fertilizer. The targeted use of S in the plant is protein synthesis and structure of the enzyme thiamine. Once S enters the plant it has a specific destination and is not translocated. These interactions are dynamitic and perpetual which results in a continuous changing soil environment.

SULPHUR UPTAKE TIMING

Two concepts in plant nutrient management that need differentiation are 1) nutrient uptake – the total amount of a given nutrient that must be utilized during the growing season, 2) crop removal – amount of a given nutrient that remains in the harvested grain, fruit or plant tissue. Matching nutrient supply with crop needs is required to eliminate stress from a nutrient deficiency, especially in a high yield environment. In a research trial conducted by Bender et al. at University of Illinois evaluating nutrient uptake patterns in corn concluded "understanding of uptake timing, rates, partitioning, and remobilization of nutrients by corn plants provides opportunities to optimize fertilizer rates, sources, and application timings".

THE TIGER® TECH QUARTERLY NEWSLETTER

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Nitrogen (N) and S are the only two nutrients that require microbial activity during some stages of their conversion cycles before becoming plant available. Therefore, both nutrients are subject to similar environmental influences that create challenges in improving timely nutrient availability. Approximately two-thirds of total N uptake and accumulation in corn occurred prior to tasseling (VT) Figure 1. Whereas, half of S had accumulated in leaves and stalks at VT and was not translocated to grain, but plant continued to take-up S from soil till maturity as shown in Figure 2 (Bender et al. 2013).

CORN NITROGEN ACCUMULATION

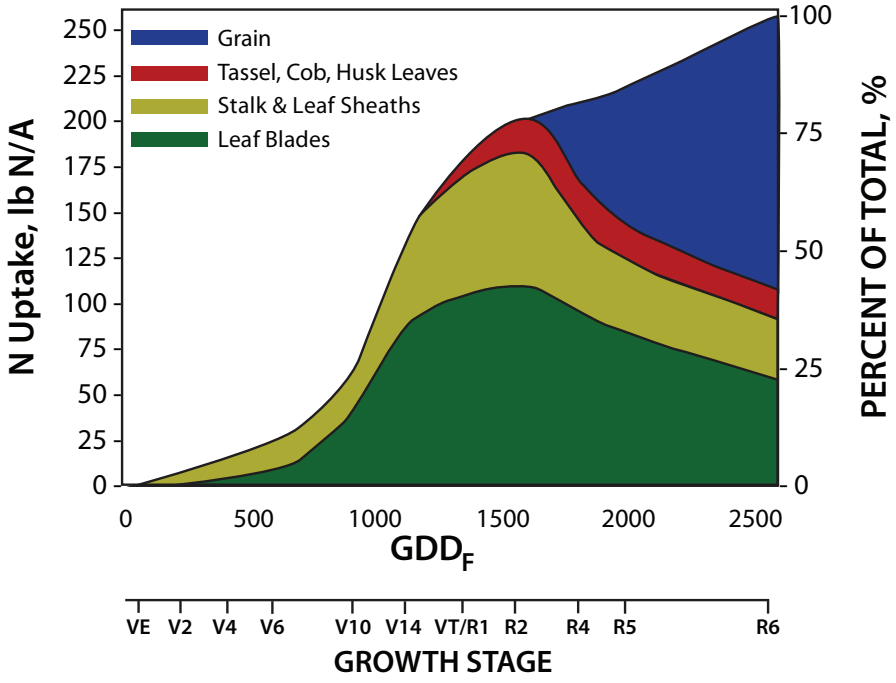

Figure 1.
Total corn nitrogen uptake and accumulation.

CORN SULPHUR DEMAND

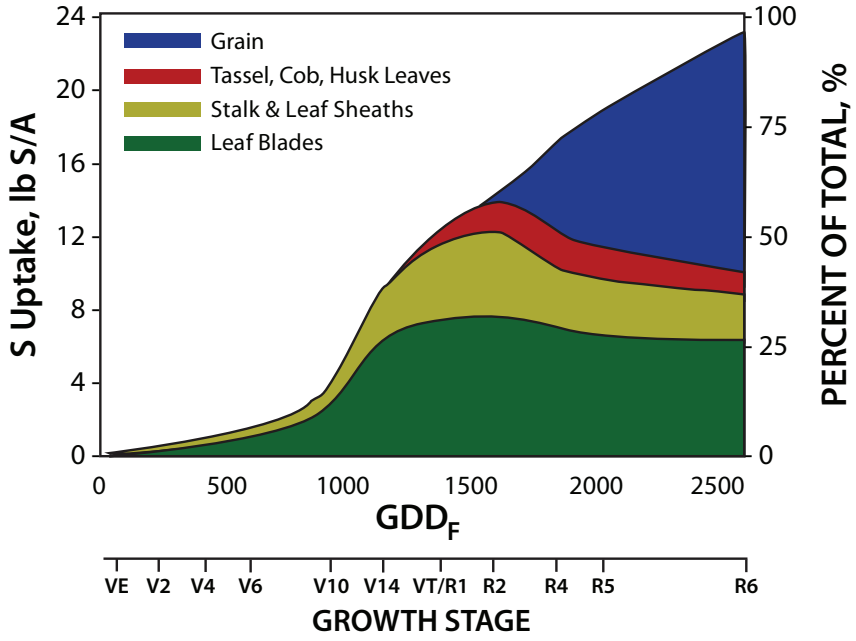

Figure 2.
Corn has demand for sulphur throughout the growing season as uptake continues until maturity.

Figure 1 illustrates the mobility of N within the plant as a much greater amount of N was stored in the stalk and leaf tissues and later remobilized to the grain as compared to S as shown in Figure 2. Therefore, season long supply of S is critical to balanced plant nutrition.

SULPHUR ACCUMULATION IN COTTON

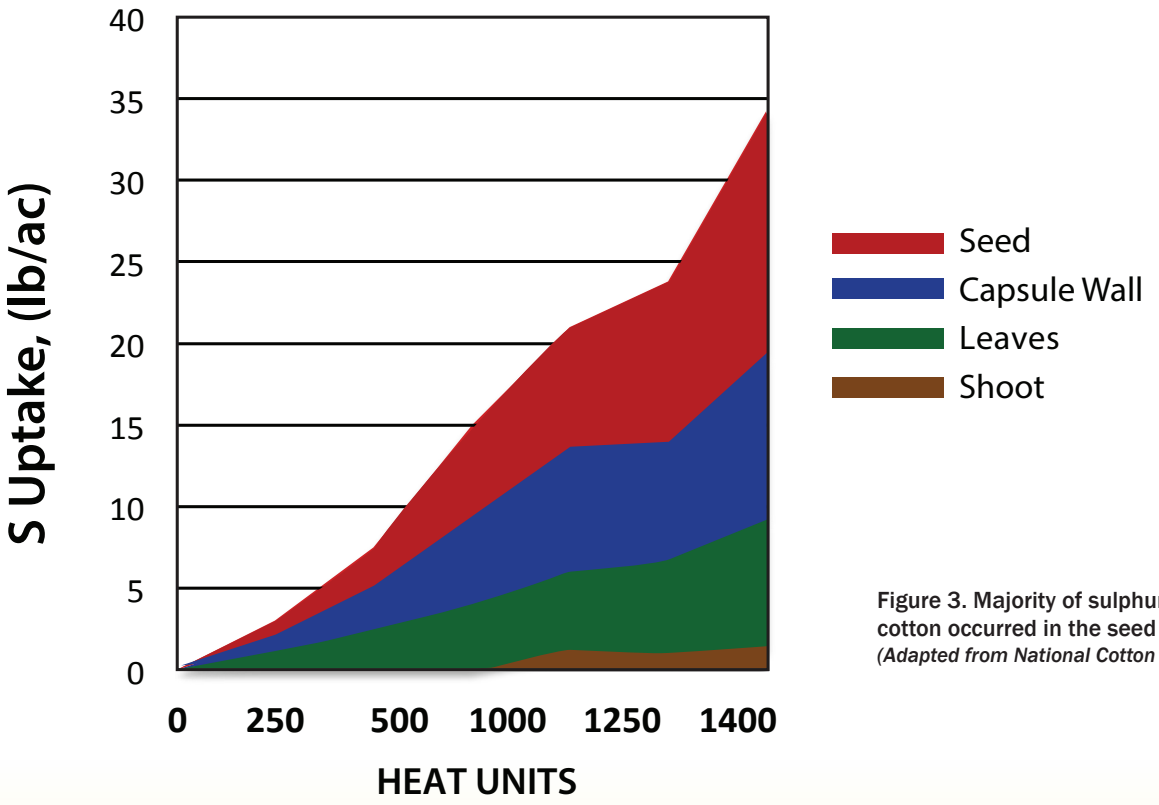

Figure 3. Majority of sulphur accumulation in cotton occurred in the seed and capsule wall. ***(Adapted from National Cotton Council)***

Sulphur uptake by cotton was similar to the uptake pattern in corn as illustrated in Figure 3.

Sulphur is not readily translocated; therefore, cotton requires available S supply throughout the growing season. Cotton has approximately two-thirds of total S accumulated in the seed and capsule wall.

Canola has somewhat different S demand and uptake pattern than corn and cotton. As the sulphate (SO_4) concentration in soil solution increases the uptake rate by canola increases. A low SO_4 level in the canola plant will increase the SO_4 uptake rate through the root system. Unlike corn and cotton, canola has a high demand for S earlier in the growing season. (Figure 4)

As the plant matured the S level declined somewhat and leveled out at about same time the uptake rate stabilized.

SULPHUR DEMAND BY CANOLA

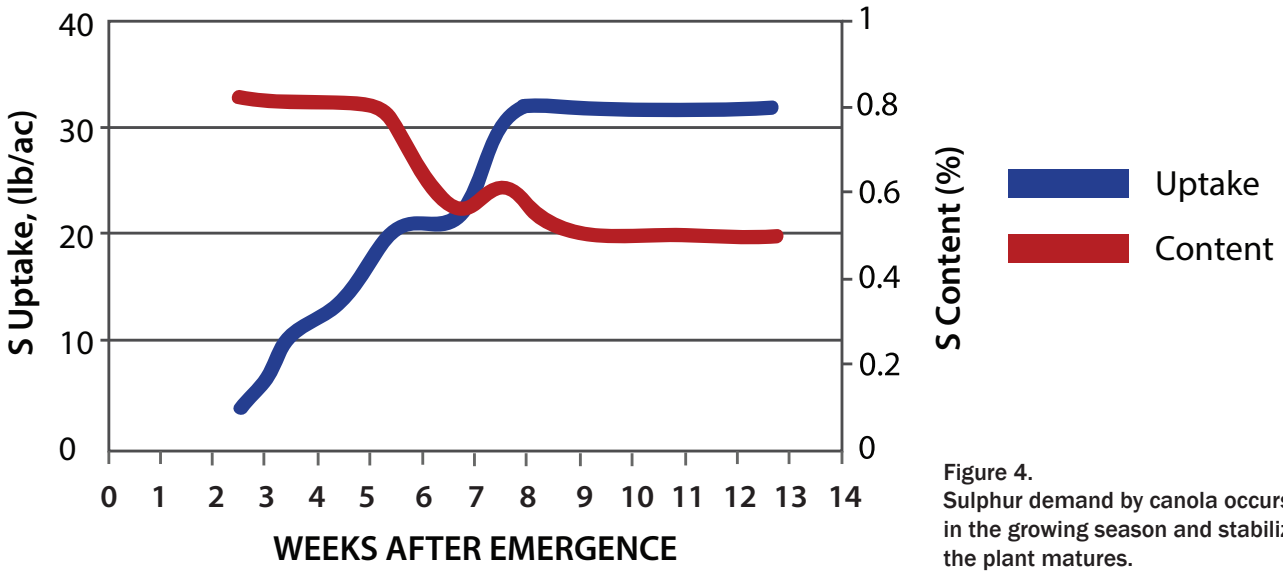

Figure 4.
Sulphur demand by canola occurs early in the growing season and stabilizes as the plant matures.
(Adapted from Canada Canola Council)

MATCHING SULPHUR APPLICATION RATES WITH CROP

The total S requirements and uptake patterns of various crops are species dependent. Crops producing significant levels of dry matter such as sugar cane and corn generally have high demand for S. High protein crops which include legumes are responsive to S and high oil crops such as canola also have a high S requirement. Since many crops need to take-up S throughout growing season, a supply of S must be readily available.

TIGER® 90CR product will provide continuous release of S throughout the growing season and enhance the opportunity for optimum plant uptake of sulphur. Fall applications of TIGER® 90CR provide the maximum opportunity for sulphur availability during the following growing season.

The advancements in crop production practices continue to place higher demands on sufficient plant nutrient availability and uptake physiology. Maximum economic crop yields are a function of all influential factors optimized via “fine tuned” nutrient management planning that incorporate the right source of product, at right rate of application, at right time, and right place.

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