REVAMPING SOYBEAN NUTRIENT UPTAKE, PARTITIONING, AND REMOVAL DATA OF MODERN HIGH YIELDING GENETICS AND PRODUCTION PRACTICES

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Abstract

The base of all soil fertility build, maintain, and drawdown programs are crop nutrient uptake and removal estimates. Unfortunately, soybean [*Glycine max* (L.) Merr.] nutrient uptake and partitioning models are primarily built from work conducted in the early 1960's with obsolete soybean genetics and production practices. Since the 1960's, yields have nearly doubled to 47.5 bu acre^{-1} in 2014 and soybean physiology has been altered with approximately one more week of reproductive growth and greater harvest index's for currently cultivated varieties. These changes in soybean development along with new production practices warrant re-evaluating soybean nutrient uptake, partitioning, and removal to better guide soybean fertility recommendations in the Upper Midwest. This study's objective was to re-evaluate these factors across a wide yield range of 40 to 90 bu acre^{-1}. Trials were conducted at three locations (Arlington and Hancock, WI and St. Paul, MN) during 2014. Plant samples were taken at the V4, R1, R4, R5.5, R6.5, and R8 growth stage and partitioned into stems, petioles, leaves, pods, seeds, fallen leaves, and fallen petioles, totaling about 4,000 samples annually. Preliminary 2014 results indicate that dry matter accumulation at R6.5 was only 86% of the total and that as yield increased the harvest index changed from 40% at 40 bu acre^{-1} to 55% at 80 bu acre^{-1}. Nutrient uptake for N, P_2O_5, and K_2O was 220, 52, and 141 lb acre^{-1}, respectively and crop removal was 187, 43, and 75 lbs. a^{-1}, respectively at a yield level of 60 bu acre^{-1}. Preliminary 2014 data showed that the extended reproductive growth phase (~7 days), greater nutrient remobilization efficiencies (>70%), and a higher harvest index with increasing yields helped contribute to higher yields without greatly increasing total nutrient uptake. Data from 2015 are currently being analyzed.

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