Soybean Nutrition

FACT SHEET

Yield increases of late in soybeans have been static with averages of 35 – 45 bu per acre common, when the potential is so much more. Part of this is due to poor soil placement of the soybean seed, but mainly due to the fact that the soybean has become a rotation crop that requires less input or so we think.

The soybean nutritional demand per bushel is much greater than corn, yet we often plant soybeans after a crop of corn with no additional fertilizer applied.

The soybean removes per bushel produced 5.5 pounds of N, 1.3 pounds of P and 4.3 pounds of K (Roy L. Flannery 1986) and corn removes 1.5 pounds of N, .6 pounds of P and 1.3 pounds of K per bushel produced.

The lack of attention to nutrition of the soybean is partly due to the fact that it produces some of its own Nitrogen but even this is misunderstood. The soybean has the ability to produce or use 50% of its N requirement from N2 nitrogen that it produces from the symbiotic relationship with rhyizobia that infect the root system. The remainder to the Nitrogen it requires comes from organic sources or residual N in the soil.

As we become more conscientious of our environment and water quality issues residual Nitrogen available for soybeans may be limited and Nitrogen application on soybeans may become common practice, but this is a whole other article on soybean nutrition.

Getting the "Soybean" Out of the Ground

Before we discuss nutrition of soybeans we must first of all look at one very important management function that plays a significant role in soybean yield and performance, that is population. In order to achieve 60+ bushel of beans we must first of all have a good stand of beans. Anything that reduces population reduces potential for yield.

Yield potential begins on planting day, when we plant, what variety, (both of which take advantage of day length and growing season), planting depth and fertilization. Both nutrition and depth of planting have an impact on root growth and health.

Without adequate root growth and development nutrient uptake is impossible. If soybeans are planted to shallow the lateral roots that take up water and nutrients most efficiently are too shallow and in soil that dries out or where herbicides may reduce their ability to produce root hair. If planted too deep lateral root formation is reduced as the bean uses too much energy to get out of the ground and the lateral roots never form properly.

The proper planting depth for soybean is 1 ½ to 2 inches deep for maximum efficiency. Any deeper or shallower and nutrient management and fertilization is just a waste of time and effort.

Another consideration for emergence and lateral root growth is soil Manganese (Mn) levels. It is common knowledge that soils low in Manganese reduce hypocotyl growth. If anything impedes hypocotyl growth and delays emergence it will increase the chance of an opportunistic pathogen such as rhyzoctonia to infect the delicate seedling. Early infection of rhyzoctonia will reduce the xylem's ability to translocate nutrients and increase further potential for disease in the plant. Secondly low Manganese in soils reduces lateral root growth and in severe Manganese deficiency lateral root growth ceases completely.

Although the most efficient method of getting Manganese into a plant is foliar, foliar feeding Manganese does not help the plant get out of the ground therefore soil Manganese levels or placement of Manganese near the developing seedling in low Manganese soils is important.

Another important management tool to increase early growth and development of soybean is the use of a planter mix. Many researchers in the United States have shown significant yield advantage by using a small amount of fertilizer at time of planting.

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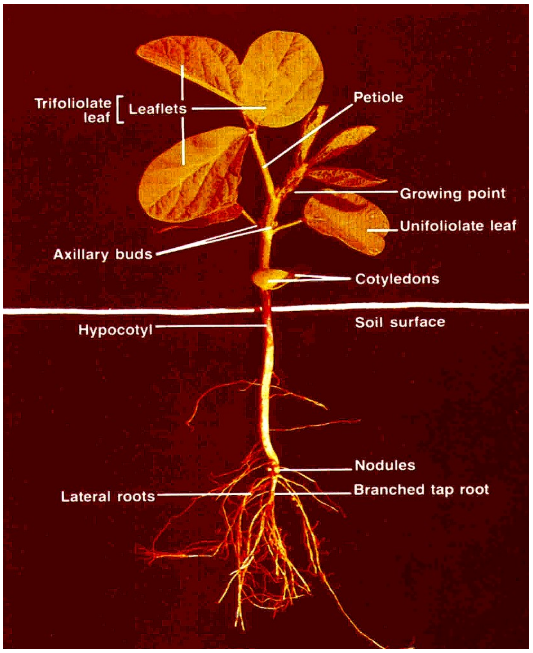

On our own trials over the past three years we have shown consistently 5 to 10 bu/acre yield increase when a planter mix is used. Also in areas where we have tested for nematodes it has been observed that in rows where a planter mix has been used compared to the check, there is a significantly lower population of SCN. This needs more work before we can say that the observation is consistent or that it definitely reduces SCN population but the observation thus far is encouraging.

The planter mix that was used on this site was as follows:

N	P	K	Mn	Zn
10	**30**	**30**	**4**	**3**

The make up of this planter mix with Manganese was to address a Manganese deficiency in the soil in areas of this field. The level of N,P,K placed 2x2 is not high enough in salts to cause a problem and the combination of the 3 major nutrients will give the plant an excellent start in cold spring conditions. Additional nutrients such as Sulfur and Magnesium could be included depending on the soil test levels.

From what I have discussed this far and the importance of early emergence and root growth a properly placed and balanced planter mix makes good sense. However caution has to be raised here in that soybeans are more sensitive to salts then other crops and too much fertilizer next to the seedling can be more damaging than beneficial.

The biggest potential for soybean yield increase comes from proper placement and application of Potassium (K). As I mentioned earlier based on Flannery's work, it has been found that a bean requires 4.3 pounds of Potassium per bu. produced. Guelph research by Tony Vyn and Greg Stewart has shown a significant response to Potassium both from a side dress application and from residual Potassium in the soil following Corn where Potassium application trials increase the amount of applied Potassium.

On our own research trials we have seen yield response in soils where the percent saturation of Potassium was greater than 4%. In a demonstration field that was harvested with a yield monitor and sampled by site specific sampling we saw variability across Potassium ranges. Yield varied from as low as 20 bu per acre up to 88 bu per acre. Examination of the data in areas of the field showed yields of 38.8 bu in soil with 3.2 % saturation of Potassium and not far from that point in soils where the % saturation of Potassium exceeded 4% yields where greater than 62 bu. per acre. This trend was consistent across the field.

The understanding of the demand for Potassium by the soybean per unit produced and the response demonstrated by researchers on Potassium management would suggest that there is a need to address Potassium management on soybeans and stop treating the crop as a secondary low input crop.