THE SOYBEAN APHID/POTASSIUM RELATIONSHIP

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Soybean aphid population dynamics are influenced by a number of factors, most notably the "top down" effects of natural enemies (predators, parasitoids, and pathogenic fungi) and the "bottom up" effects of the host soybean plant. As for the latter, host plant effects can include things such as plant stage or maturity, and plant nutritional status. For example, plant nitrogen has been found to be an important factor in cotton aphid growth and reproduction on cotton plants (Nevo and Coll, 2001). In the case of the soybean aphid, following the 2000 discovery of this pest in Wisconsin, entomologists and agronomists noticed that infestations in soybean seemed to be more severe in potassium deficient fields.

Subsequent research has proved the association of potassium deficiency with soybean aphid infestations, plus we now have a better understanding of why this occurs (Myers et al., 2005; Myers and Gratton, 2006; Noma et al., 2010). What happens is that low potassium actually makes soybean plants more nutritious for soybean aphids, promoting higher aphid reproduction and leading to more rapid aphid population increase. To give an idea of how this might work, under field conditions in a potassium deficient field an aphid infestation can increase from 10 per plant to 230 per plant in 10 days; in a field with adequate potassium, that same population would increase from 10 to 150 aphids per plant. Further research (Walter and DiFonzo, 2007) suggests that potassium deficient beans have a greater percentage of asparagine in the plant phloem where the aphids are feeding. Asparagine is known to be an important amino acid for aphid nutrition. We also think the yellowing associated with potassium deficient soybean leaves may preferentially attract migrating soybean aphids, placing potassium deficient fields at a further disadvantage. The color yellow has been generally shown to be highly attractive to aphids.

References

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