SOYBEAN FACTS

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Neonicotinoid Seed Treatments for Soybeans

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Two neonicotinoid seed treatments have been registered for use on soybean since 2004, Cruiser, (thiamethoxam, Syngenta Crop Protection) and Gaucho (imidacloprid, Bayer Crop Science). This class of insecticide has chemical qualities amenable for use as a seed treatment including a relatively high water solubility and reduced toxicity to humans and animals. Manufacturers of these seed treatments claim these products provide early season protection against several different insect pests, as well as contribute to the overall health of the plant. Advertised plant health benefits include greater stands, plant height, and root, stem, and leaf development. At Michigan State University we conducted field and greenhouse research to evaluate soybean yield response and alleged plant health benefits of these seed treatment products. Studies were performed at a total of 14 sites between 2004 and 2006. Both thiamethoxam and imidacloprid insecticides were also tested in tandem with Apron Maxx fungicide. For the duration of the study, thiamethoxam and imidacloprid treatments were used in a total of 168 plots each. Harvest yields were taken, along with plant stands and early plant height at each site. Chlorophyll indices, harvest plant height, and pods per plant samples were taken at two sites each year. Finally, periodic aphid population counts were taken at two sites during the 2005 growing season as aphid pressure increased in July and August.

Use of neonicotinoid seed treatments resulted in significant soybean yield increases at three of fourteen site-years during the study. Thiamethoxam provided a 5.0 bu./acre yield increase at Ingham in 2004. However, no other sites in 2004 or in 2006 saw a significant yield increase due to insecticidal seed treatment. Two of four site years saw significant yield increases during 2005, when soybean aphid pressure was extremely high. Thiamethoxam and imidacloprid had early season efficacy on soybean aphid. Thiamethoxam and imidacloprid provided a 5.7 and 7.7 bu./acre advantage at Hillsdale in 2005, and a 12.7 and 9.0 bu./acre advantage at Sanilac in 2005. The Hillsdale site had no foliar insecticide application, while the Sanilac site had an application made to all treatments well beyond when soybean aphid had reached threshold, to allow the seed treatment to exhibit its effectiveness. However, a well timed foliar insecticide application is more effective at protecting soybean grain yield than seed treatments when aphid pressure is high. Aphid population count data in 2005 revealed that soybean aphid populations were suppressed through R2, but significant population differences were not observed after R2. This corroborates the observation by Pedersen and Lang, that soybean seed treatments can be expected to provide some level of aphid suppression up to 60 days after planting. Late R2 was approximately 57 and 69 days after planting at the two sites where counts were taken. However, one must remember that soybean aphid arrived extremely early in 2005, and the effectiveness of these treatments on soybean aphid will depend on soybean planting date and on how early aphid pressure occurs. Early planted soybean may not see the level of aphid control that a late planted soybean would see as a result of neonicotinoid seed treatments.

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Plant vigor effects were not observed on a wide-spread basis in this trial. Slight and isolated plant height effects were observed, and no leaf chlorophyll or pod count effects were observed. One site saw a significant increase in stand count from neonicotinoid treated soybean, and this was a site which was planted relatively early in 2004 (April 30), with near record rainfall following the planting. A Minnesota study found an advantage in seedling emergence from neonicotinoid seed treatment in early planted soybean, but not in soybean planted three weeks later.

In conclusion, neonicotinoid seed treatments did not appear to improve crop health or provide wide-spread significant soybean yield increases in the absence of soybean aphid. However, these trials were performed in a conventional tillage system without early season insect pressure from bean leaf beetle (*Certoma trifurcata*). Expected bean leaf beetle and other insect pressure should be considered when deciding whether to use these seed applied insecticides. These treatments may perform better in a no-till system, where increased crop residue may lead to increased insect pressure. Thiamethoxam and imidacloprid can provide soybean aphid suppression through R2, but will not hold soybean aphid under threshold for an entire growing season if pressure is near levels experienced in 2005.

References:

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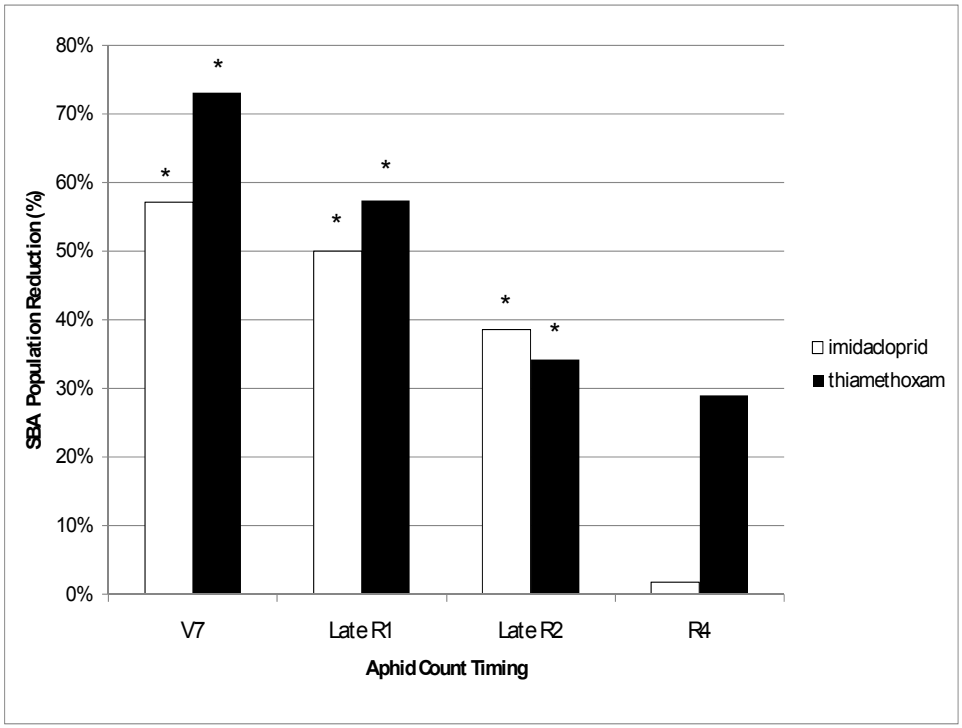

Figure 2.2- Insecticide effects on soybean aphid populations as affected by soybean growth stage, Ingham 2005 (% aphid reduction vs. untreated). *denotes significance at P<0.05