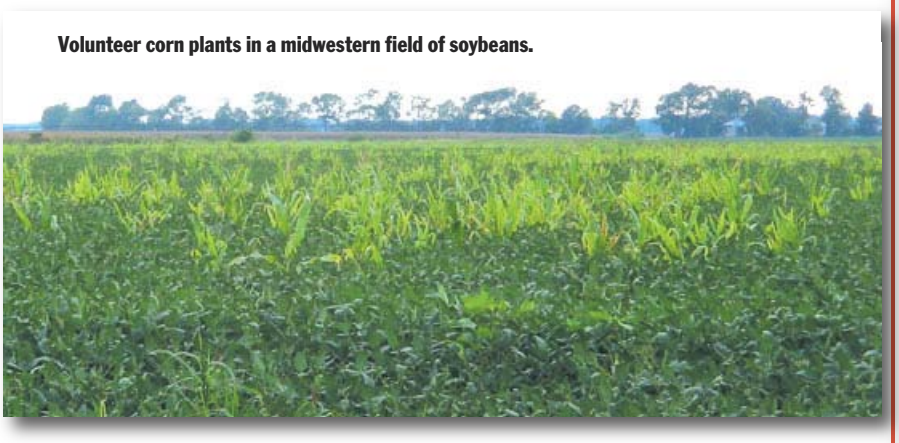
Volunteer Corn Can Be More Than An Eyesore

URBANA, ILL.

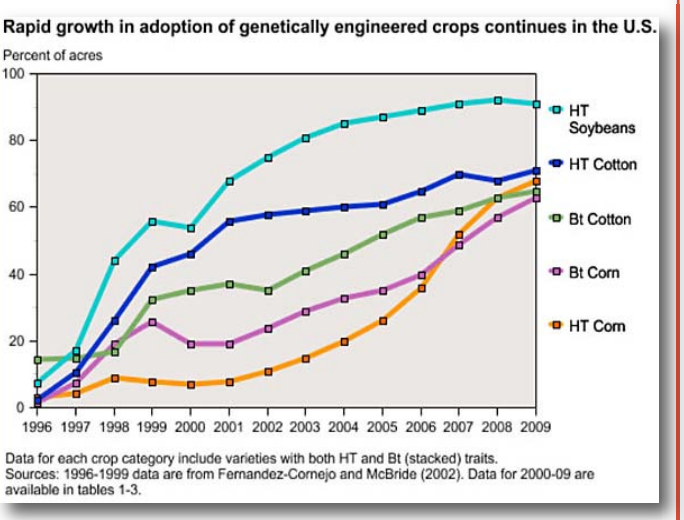
A person has not needed to drive very far around the Midwest in recent weeks to realize that unsightly volunteer corn plants are one of the most prevalent weeds in soybean fields.

Volunteer corn is certainly not a new weed in soybean, given that corn and soybean have long been annually rotated in Illinois and the greater Midwest. But there are some new and rather interesting nuances about the nature of its weediness. I thought it would be a good time to review some causes, impacts, and interesting differences about this "new" weed challenge. While it might be too late for most farmers to do much about volunteer corn this season, this article may provide some perspective and thoughts to ponder while planning to avoid the problem next year.



Volunteer corn plants in a midwestern field of soybeans.

The complete collection of corn during fall harvest--100 percent harvest efficiency – is never achieved. Some corn is always left in the field due to deteriorating cornstalk qualities beyond physiological maturity, which allow for dropped ears and/or lodged and broken stalks prior to harvest. Also, some corn is always left due to the harvest operation itself. Whole corn ears can escape the combine header, or corn kernels can manage to travel all the way through the combine but exit the back of it rather than catch the right elevator to the grain tank. The amount of corn left behind can certainly be lessened or exacerbated by factors including hybrid selection, late-season disease pressure, harvest timing in relation to corn maturity, windy fall weather conditions, and combine settings. Nonetheless, a portion of the corn seeds left behind will survive winter and establish themselves the next spring as weeds in a succeeding soybean crop.



Graph produced by the USDA-Economic Research Service (USDA-ERS); available online at www.ers.usda.gov/data/biotechcrops/.

So what's so "new"? Glyphosate is an effective, broad-spectrum herbicide with excellent activity on grass, including volunteer corn, providing the corn does not also have the genetic trait that confers resistance to glyphosate. So controlling volunteer corn was easy for many years due to the widespread adoption of glyphosate-resistant soybean fields that were primarily rotated with corn hybrids susceptible to glyphosate (lacking the glyphosate-resistant gene).

As the adoption of glyphosate-resistant corn hybrids has gained popularity more recently, so has the prevalence of volunteer corn in soybean increased. A field survey conducted in northern Indiana showed a high correlation between the presence of volunteer corn and the adoption of glyphosate-resistant corn, from 3 percent of soybean fields sampled in 2003 to 12 percent sampled in 2005 (Davis et al. 2008). Volunteer corn was found in both tilled and no-till fields, but it was found in tilled fields twice as often. Although I am sure these results still reflect current observations, much more than 12 percent of our current soybean acres (in Illinois at least) is infested with volunteer corn. This points up nuance number one: if you have to use additional herbicides to control volunteer (weedy) herbicide-tolerant crop plants, in a crop grown with the same herbicide resistance, the increased cost is a direct result of using the first herbicide-tolerant crop. In contrast, the evolution of herbicide-resistant weeds is more of an indirect result.

What is the impact? Volunteer corn can reduce soybean yield through competition and crop quality due to contamination of corn kernels in soybeans at harvest. Yield reduction from volunteer corn can be difficult to estimate because it depends not only on plant density but on "clump" density. If the plants originate from a dropped ear, there tend to be many plants growing in a clump. Furthermore, volunteer corn loses plant vigor and competitiveness because it is two generations from the cross that produced the hybrid you purchased, and its competitiveness also depends on residual nitrogen levels of the soil. Work done here in Champaign by Beckett and Stoller (1988) found that soybean yield decreased 7 percent, 19 percent, 27 percent, 31 percent, and 32 percent for clumps that had 1, 4, 7, 10, and 13 plants, respectively, at a constant clump density of 1 per 20 square feet. They also found that soybean yield decreased in a linear trend up to 51 percent at a clump density of 2 per 20 square feet at a constant clump size of 10 plants. Recent research in Lafayette, Indiana, found that significant soybean yield reductions started at about 12 plants per 20 square feet (Marquardt et al. 2008), and in Brookings, South Dakota, Alms et al. (2008) found that soybean yields were reduced between 50 percent and 60 percent for approximately 26 plants per 20 square feet.

However, in addition to yield impact, it is the genetically modified insect resistance (Bt) traits that give volunteer corn its second interesting nuance. Research published in the most recent Agronomy Journal raises the question of the potential impact volunteer corn plants may play in the resistance management for western corn rootworm (Krupke et al. 2009). Their work showed that many volunteer corn plants in Indiana fields not only contained genes to make them resistant to glyphosate, but they also contained the genetically modified genes to make them express Bt toxin at reduced levels. They express lower Bt levels for the same reasons: they are not as large, or as competitive, as the corn planted in your designated corn fields. The authors suggested this consequence may facilitate more rapid evolution of Bt resistance in corn rootworm populations. While an arguable notion, it is certainly plausible and warrants careful thought. After all, the attention given to governing the appropriate levels of refuge requirements for the sustainable use of Bt corn products reflects the importance of this issue.

How might I avoid this next year? With increasing genetic technologies in your farming toolbox, planning your crop rotations will require more thought to help avoid this weed problem. This fall it might be very helpful to do the following:

1. Make note of the pressure of volunteer corn in your soybean fields and determine how dire changes in your harvest practices need to be this fall in regard to timing and combine settings.
2. Make note of corn fields that you may expect will have more volunteer corn pressure next year because of increased amounts of "downed" corn or dropped ears, then adjust your crop and/or herbicide plans as necessary to possibly avoid an additional herbicide in your postemergence program for those fields.
3. Carefully assess the density of volunteer corn early in the growing season next year. Volunteer corn doesn't look as "thick" early in the growing season before it starts to tower over the soybean canopy. That is the stage when the eyesore begins to prompts the question we're asking now: What is the impact of this weed problem?

I hope I have provided some angles of thought regarding this "new" problem weed in soybean and the greater implications of what you're currently observing in many soybean fields, as well as ways you might plan to ameliorate this for the future. Δ