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How many seeds does it really take to get 100,000 plants per acre at harvest?

Palle Pedersen
Iowa State University, palle@iastate.edu

Jason De Bruin
Iowa State University

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Abstract
In last week's article, Soybean seeding rates: The balance between cost and yield, the case was made that 100,000 plants per acre at harvest was sufficient to reach both full yield potential and economic return. An important question that is often asked is, "how many seeds need to be planted to attain this final stand at harvest?" In a perfect world, the relationship would be 1:1, indicating that every seed planted would correspond to a plant at harvest. We all know this is not the case. Since 2003, Iowa State University Extension researchers have conducted more than two dozen experiments with the checkoff and the Iowa Soybean Association at multiple locations across Iowa.

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How many seeds does it really take to get 100,000 plants per acre at harvest?

by Palle Pedersen and Jason De Bruin, Department of Agronomy

In last week's article, Soybean seeding rates: The balance between cost and yield, the case was made that 100,000 plants per acre at harvest was sufficient to reach both full yield potential and economic return. An important question that is often asked is, "how many seeds need to be planted to attain this final stand at harvest?" In a perfect world, the relationship would be 1:1, indicating that every seed planted would correspond to a plant at harvest. We all know this is not the case. Since 2003, Iowa State University Extension researchers have conducted more than two dozen experiments with the checkoff and the Iowa Soybean Association at multiple locations across Iowa.

In extension studies, seeding rates used are typically between 75,000 and 225,000 seeds per acre. Planting 225,000 seeds per acre is not cost effective. Planting 75,000 seeds per acre is too risky and will often not give the maximum attainable yield.

Row spacing

Plant mortality (% reduction in harvest population compared to seeding rate) was 9.1 percent greater in 30" rows compared to 15" rows averaged across four seeding rates. When the seeding rate was 125,000 seeds per acre the final populations were 108,000 and 96,000 plants per acre at harvest for 15" and 30" rows, respectively. Planting 175,000 seeds per acre increased final plant populations equally but did not increase yield.

Planting date

When planting the last week of April, mortality was 25 to 35 percent and decreased 10 to 15 percent by planting in early June (Figure 1). Data collected from six locations consistently showed that planting 125,000 seeds per acre the last week of April gave a final stand of 93,000 plants per acre at harvest. Planting 175,000 seeds per acre increased final stand to 124,000 plants per acre. Based on Figure 2, seeding 140,000 seeds per acre the last week of April would give a final stand of 100,000 plants per acre at harvest. Planting 125,000 seeds per acre the first week of May was enough to achieve a final stand of 100,000 plants per acre. There are "worst case scenarios" that are difficult to prepare for. Early planting into a tilled seed bed, followed by hard rainfall, can cause soil crusting. Reduced seeding rates can be risky and knowledge of field conditions and previous history should be taken into account to minimize the potential for reduced plant establishment. This is especially the case when you want to increase yield potential by early planting.

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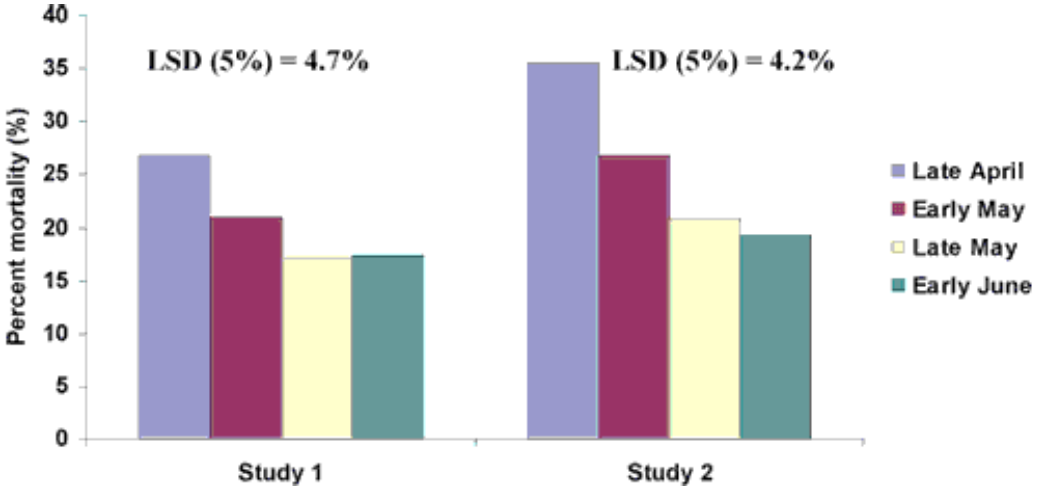
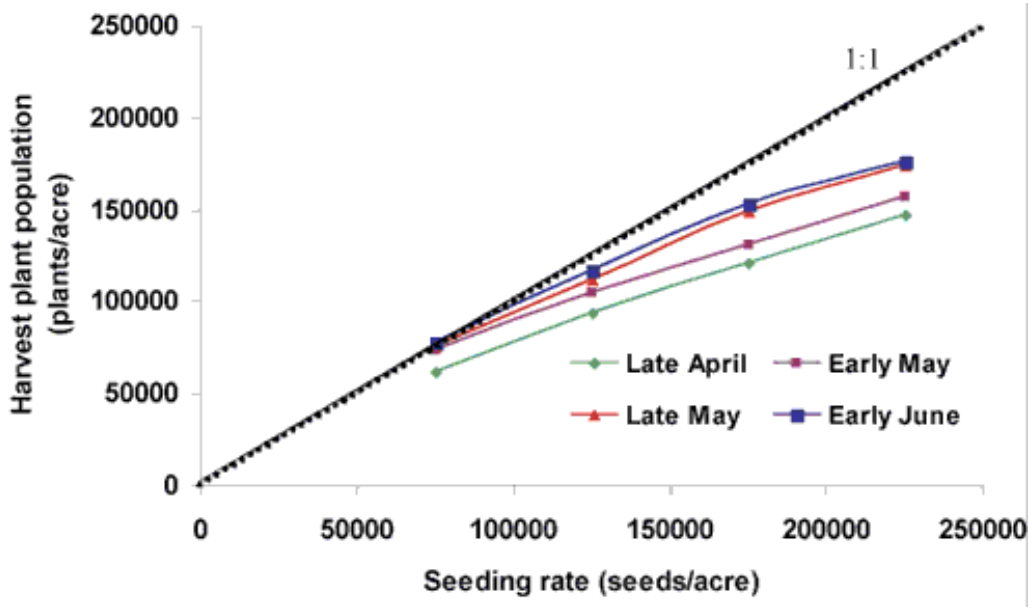


Figure 1. Percent mortality for four seeding rates planted between late April and early June averaged across Ames, Crawfordsville, and Nashua in Study 1 and DeWitt, Nevada, and Whiting in Study 2.



Relationship between seeding rate and harvest plant population four planting dates for a study conducted at DeWitt, Nevada, and Whiting between 2004 and 2006 in 15-inch row spacing.

Seed treatment

Adding a fungicide or fungicide/insecticide seed treatment can be used to increase plant establishment. Iowa State University Extension has conducted research at five locations for three years and, on average, use of a fungicide seed treatment improved plant establishment by 8,000 plants per acre and 17,000 plants per acre using a fungicide/insecticide seed treatment.

Variety

Many different varieties have been evaluated. There is a wide range in plant establishment for these varieties but no characteristic common to the varieties with poor establishment. Purchasing high-quality seed will help a lot.

Other considerations

In order to reduce seeding rates and still achieve 100,000 plants per acre at harvest, equipment setting, residue management, planting depth, and planting speed are more important than anything else. Seedbed conditions are a critical component as well. Plant early but only when seedbed conditions are adequate. Poor field conditions will reduce emergence and increase gaps in the stand, potentially reducing yield. No data are available for no-tillage; beginning this year, a new study will determine seeding rate recommendations in a no-tillage system. Based on previous reports, mortality is greater under no-tillage conditions.The recommendation is to seed between 125,000 and 140,000 seeds per acre, regardless of row spacing, planting date, or seed treatment. However, it is important that you recognize that it will vary from year to year, field to field, and farmer to farmer. Start to reduce your seeding rate on just a few acres this year. You are the only one who will know how low you can go on your farm to achieve an even stand of 100,000 plants per acre at harvest.

Palle Pedersen is an assistant professor of agronomy with research and extension responsibilities in soybean production. Jason De Bruin is an assistant scientist with research responsibilities in soybean production.

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