

4-1-2012

# Optimizing Greenhouse Corn Production: What Is the Best Pot Size?

Derek Gambrel

*Purdue University*

Robert Eddy

*Purdue University*, [robbeddy@purdue.edu](mailto:robbeddy@purdue.edu)

Daniel T. Hahn

*Purdue University*, [dhahn@purdue.edu](mailto:dhahn@purdue.edu)

Follow this and additional works at: <http://docs.lib.purdue.edu/pmcg>



Part of the [Horticulture Commons](#)

---

## Recommended Citation

Gambrel, Derek; Eddy, Robert; and Hahn, Daniel T., "Optimizing Greenhouse Corn Production: What Is the Best Pot Size?" (2012). *Purdue Methods for Corn Growth*. Paper 16.  
<http://docs.lib.purdue.edu/pmcg/16>

This document has been made available through Purdue e-Pubs, a service of the Purdue University Libraries. Please contact [epubs@purdue.edu](mailto:epubs@purdue.edu) for additional information.



**Purdue Methods:  
Optimizing  
Greenhouse  
Corn  
Production**

## What is best pot size?

Our goal was to design a growing system for corn using automated drip irrigation to apply a fertilizer solution several times daily. No drought stress or nutrient stresses would occur, maximizing growth. We determined that calcined clay granules made the best root medium for this system. Traditional greenhouse culture of corn typically requires a nursery container with an approximate volume of 11 -19 liters (3-5 gallons). We learned quickly that frequent auto-watering produced corn over 4 meters high (13 feet) if grown in containers this large, so we reduced pot size in most of the experiments. We were also motivated to reduce the size of the pot to offset the higher cost of calcined clay.

We chose an 8.3 liter volume nursery container (2.2 gal.) as pictured in Figure 1. Many of our experiments were conducted using a 3.8 liter pot referred to as an “8-inch standard-style,” but we found that tall plants easily tipped over without the support frames we had used in those experiments. Interestingly, the Cary Mitchell laboratory in Purdue HLA department found no difference in corn seed yield between the 3.8 liter pot and a 11.3 liter nursery container (personal communication). Pot styles with drainage holes along the side of the pot were problematic (see Figure 2). The calcined clay granules leaked out, especially the smaller sized granules that are about the size of coarse sand. See our ePub “How do I prevent calcined clay from leaking out of container?” for help with this.

We tried smaller pots in Experiments 5, 9 and 18 (see Materials and Methods) but tipping and/or lodging was a problem. It’s worth noting how small a pot corn will grow in if water is not limiting. We grew corn in containers as small as 5-cm in diameter with a volume of 147 ml! The plants were short and did not produce seed, but plants seemed otherwise healthy. Seed yield of pots with a 10-cm diameter and 644 ml volume was 261 seeds per plant. There may be research value in using small pots if seed yield doesn’t matter.

Large tubs can also be used to grow corn (see Figure 7). This is useful for drought stress research where several replicate plants need to be exposed to the exact same drying conditions, or likewise for nutrient uptake studies.



**Figure 1. Left: 20-cm diameter pot with volume of 3.8 liter (1 gal). Support required for tall plants. Right: Optimum 8.3-liter (2.2 gal.) nursery pot.**



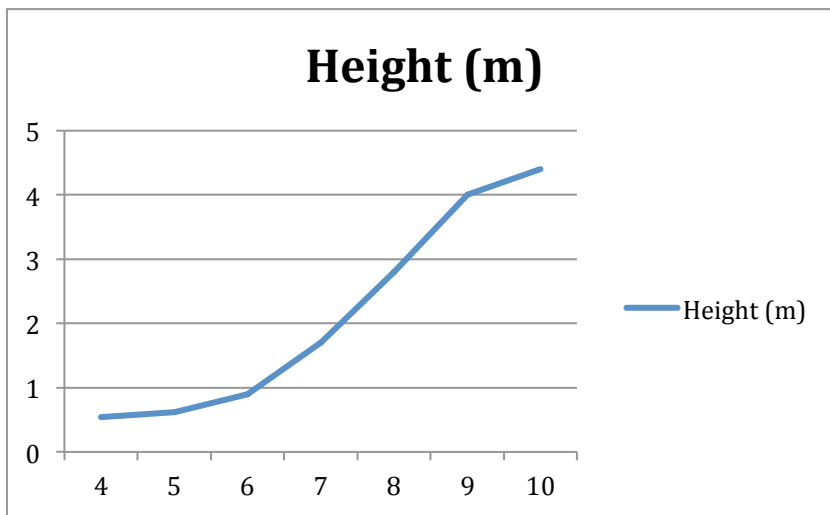
**Figure 2. Avoid large side drainage holes such as seen on pot on right if using calcined clay granules.**

**Table 1. Typical height of hybrid corn plants under automated watering with fertilizer solution, by pot size. Compiled from Experiments 5, 9 and 18.**

Industry name of pot	Diameter (cm)	Approx Volume (l)	Final plant height (m)
606 tray insert	5	.15	1.5*
3" square	7.6	.22	2.1*
4" square	12.7	.61	2.1*
5.5" azalea	14	1.0	2.3
8" standard	20.3	3.8	3.3

\*Plant spacing was not controlled, so light competition caused stretching and lodging.

**Figure 3. Height of hybrid corn in auto-watered 20-cm diameter pot from weeks 4 to 10 in Experiment 9. Exponential growth rate during weeks 6-9 is typical of field corn.**



**Figure 4. Corn grown in a large pot using auto-watering can get too tall.**



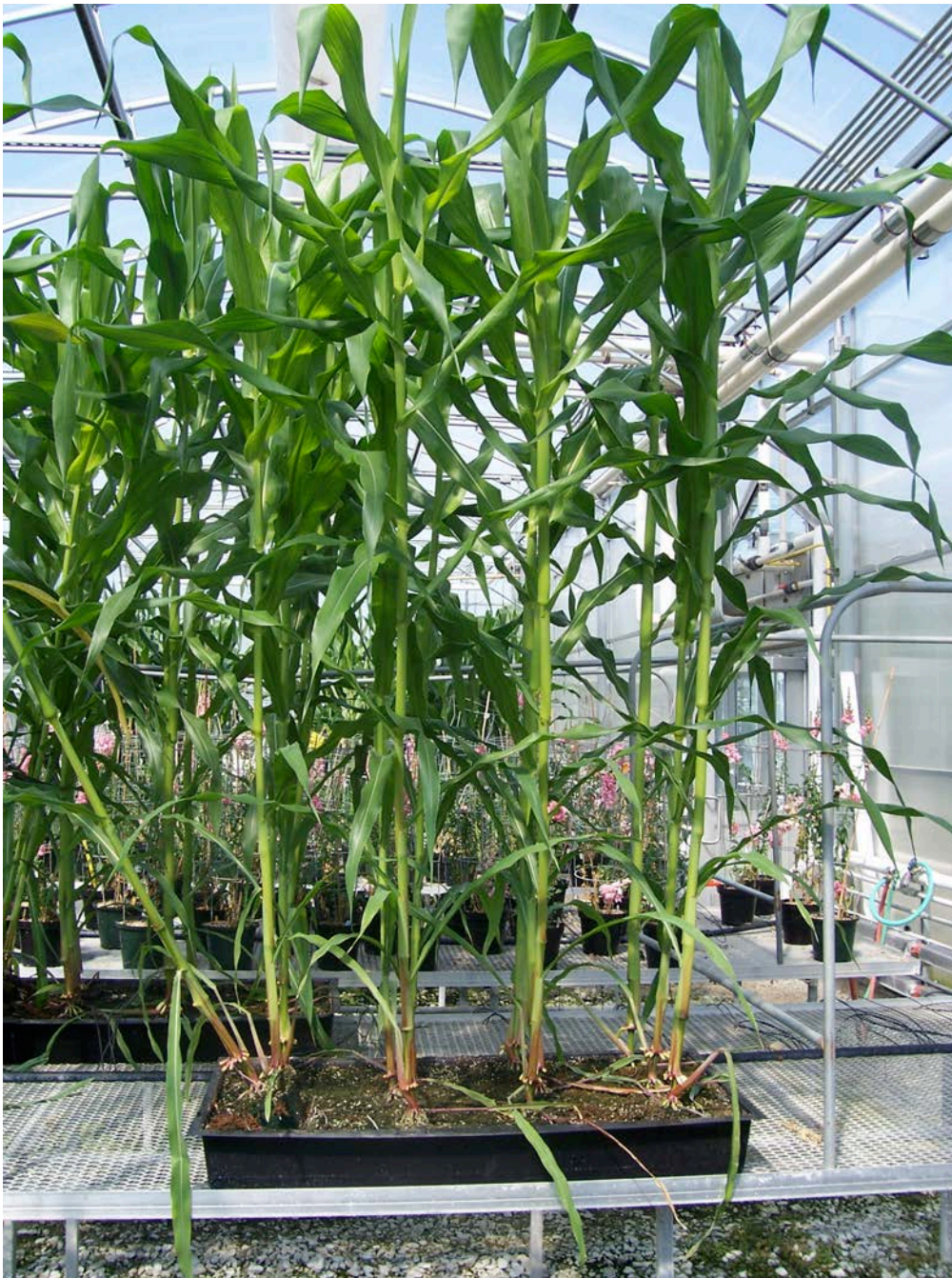


**Figure 5. Left to right: Plants from a teaching demonstration in pots of diameter 8, 10, 13, 15 and 20-cm (3, 4, 5, 6 and 8-inch).**



**Figure 6. An inbred corn line grown by graduate student Thomas Hartwig in small tray inserts. Right: close up of ears in silk.**





**Figure 7. Corn plants growing in tub container, using 1:1 soilless mix: Surface calcined clay root medium.**