



Purdue Methods: Optimizing Greenhouse Rice Production

What is the best fertilization schedule?

Over the course of two studies, we compared a standard greenhouse fertilizer solution applied once per week, twice per week, and constantly by keeping a 3-cm tray filled with 1-3 cm of the solution. We concluded that twice weekly fertilization resulted in more vigorous plants than once weekly or constant fertilization.

In the studies, we compared results using the root medium we had determined the best for rice production, Profile “Greens” calcined clay granules. Our results may not apply to other root media. Likewise, results may not apply if using a different fertilizer formulation or strength. See our Materials and Methods report for details of the 15-5-15 fertilizer used.

In the first study, plants fertilized twice weekly had greater height and tiller count than once weekly, and less chlorosis when fertilized twice weekly.

In the second study, the twice weekly fertilization frequency resulted in greater seed weight over the constant fertilization. Panicle count was higher under the twice weekly regime for two of the three pot sizes compared. Seed yield was highest in the 4-inch square pot for the set fertilized twice weekly, and highest for the 5-inch azalea pot for the constantly fertilized set.

Plants in both studies were more responsive to fertilizer in the first half of their life cycle, particularly in maintaining leaf color during rapid phase of vegetative growth. This suggests that plants could be constantly fertilized for this early cycle (30-45 days), then fertilizer reduced by applying twice weekly until maturity. Further study is needed to confirm this possibility.

Seed yields of plants fertilized twice weekly were at least double of corresponding plants fertilized constantly. It is difficult to determine if the constantly fertilized plants had less yield due to a toxicity of some element or excess salt damaging roots, or if it was the result of lower light due to the lush tiller growth. Whatever the explanation, the constant fertilization treatment does appear sub-optimal.

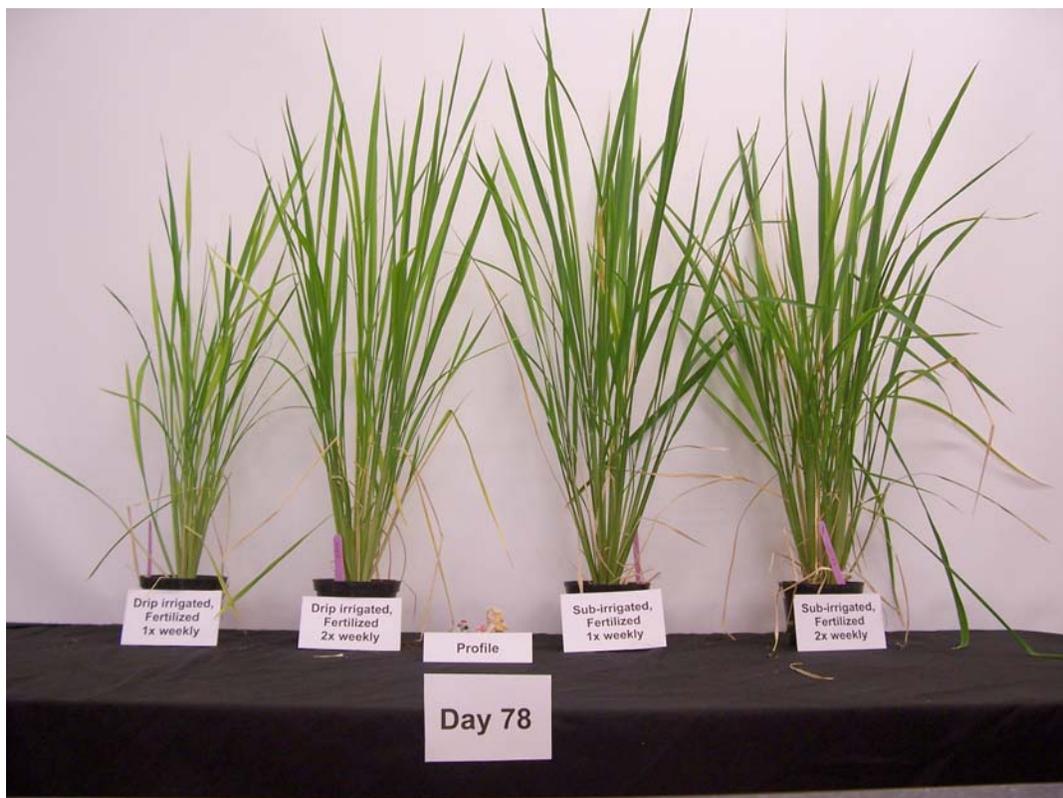


Figure 1. Rice plants at day 42 (top) and 78. From left: drip irrigated once weekly; drip irrigated twice weekly; sub-irrigated once weekly; sub-irrigated twice weekly.



Figure 2. Rice plants in three pot sizes fertilized twice weekly (top) and under constant fertilization at seed stage (day 110). Note the necrotic leaves and the reduced seed panicle amount under constant fertilization.

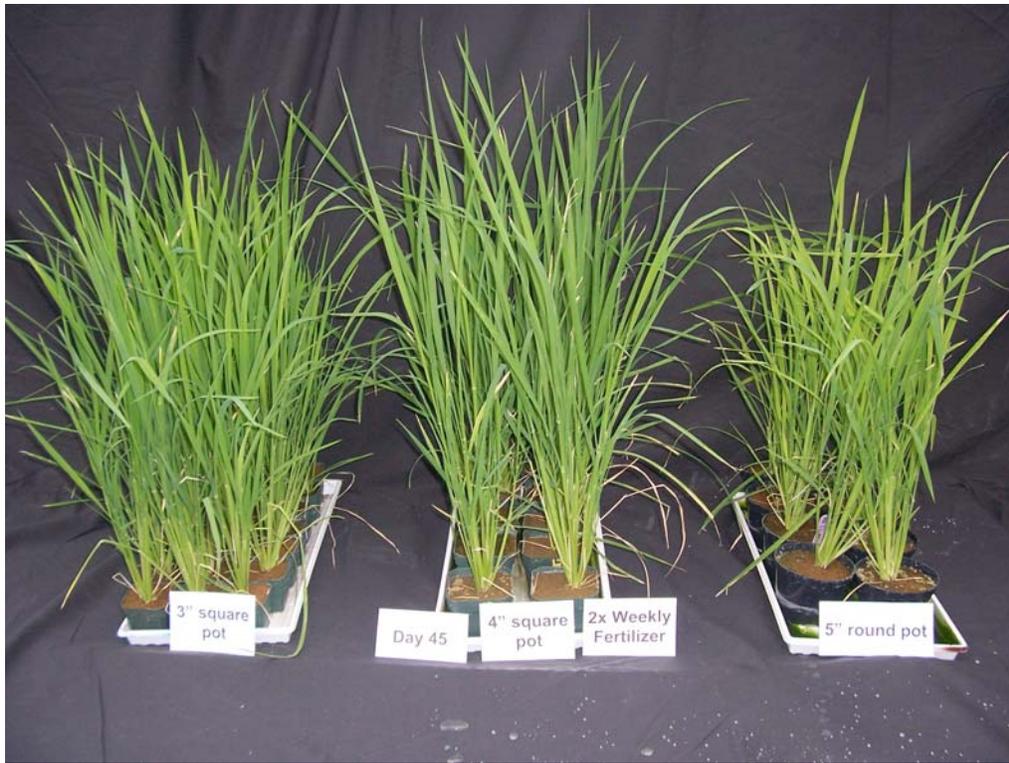


Figure 3. Rice plants in three pot sizes fertilized twice weekly (top) and under constant fertilization during vegetative stage (day 45). These are the same plants as in Figure 2 above. Note the vigor and dark green color of the constant fertilized plants (except for 7-cm pot on left), indicating this fertilization practice may be suitable for early growth.

Panicle Count and Seed Yield

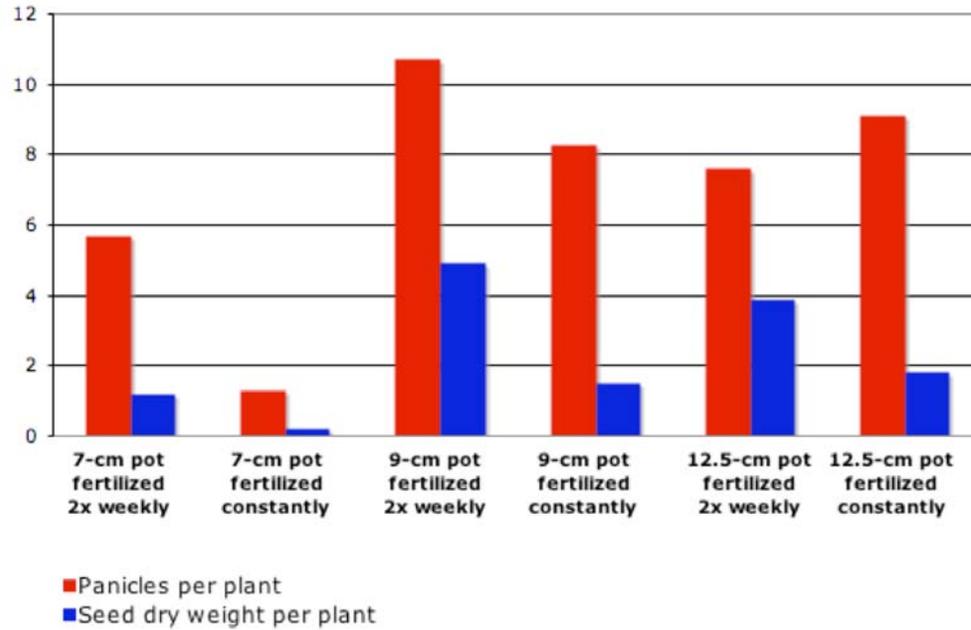


Figure 4. Rice plant panicle count and seed dry weight in three pot sizes under two differing fertilizer schedules.