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Optimizing Greenhouse Rice Production: What Is the Best Watering Method?

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Purdue Methods: Optimizing Greenhouse Rice Production

What is the best watering method?

In this study, we compared drip irrigation and constant sub-irrigation by keeping a 3-cm tray filled with 1-3 cm solution. Constant sub-irrigation resulted in best growth.

Drip irrigation was a suitable watering method but did not result in plants as vigorous as those using the sub-irrigation method. Plant height was greater in sub-irrigated plants over drip-irrigated plants in all but three root media and fertilizer frequency treatments. Tiller number was greater in sub-irrigated plants over drip-irrigated plants in all but two root media and fertilizer frequency treatments. Likewise, chlorosis occurred less in sub-irrigated plants over drip-irrigated plants in all but two treatments. The only plants that grew better with drip-irrigation over their sub-irrigated counterparts were grown in Pro-Mix.

One likely explanation for the less vigorous growth using drip irrigation was that the twice daily irrigation with clear water leached away nutrients. A growing system could most likely be devised utilizing drip irrigation for rice if the problems of wasted water and nitrogen run-off could be addressed, perhaps with one or a combination of slow-release fertilizer, water recirculation or low-volume application. Our findings go against the conventional wisdom that rice requires constant sub-irrigation—simulating paddy culture—to survive.

Because of the poor suitability of the drip-irrigation used in this study, results discussed in this and other reports of “Optimizing Greenhouse Rice Production” for root media and fertilizer application frequency will be solely from the sub-irrigated plants. Plant responses to root media and fertilizer frequency were relatively similar between the two irrigation types, only less vigorous for the drip irrigation group except where noted.

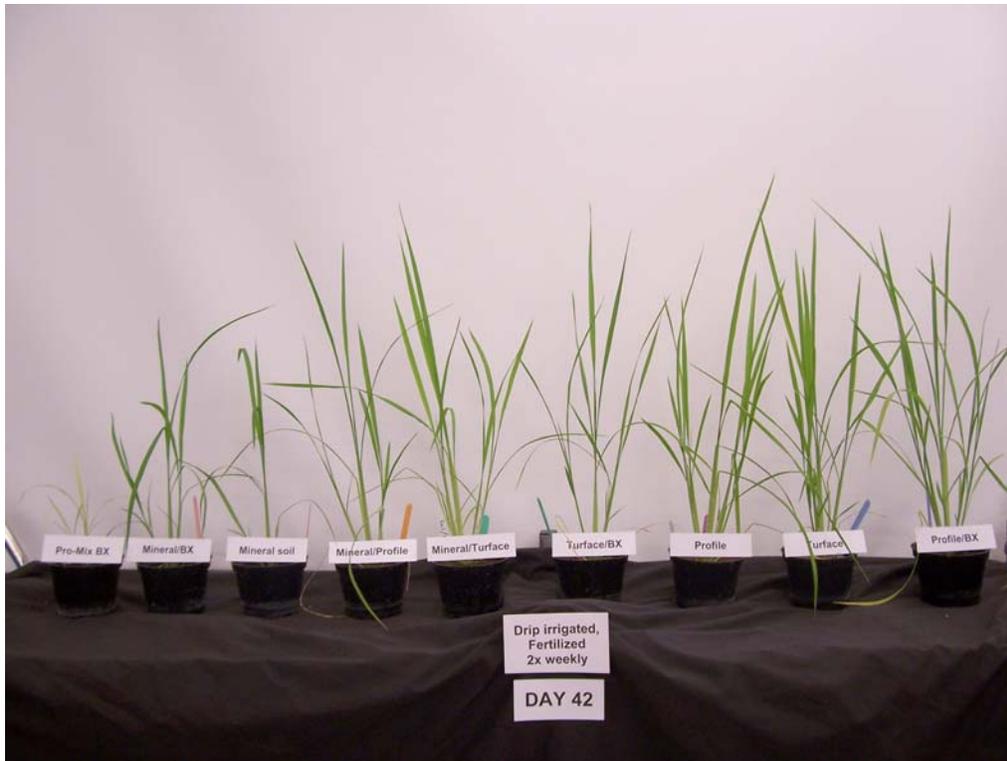


Figure 1. Rice growing in nine differing soil media irrigated by drip irrigation (top) and constant sub-irrigation.

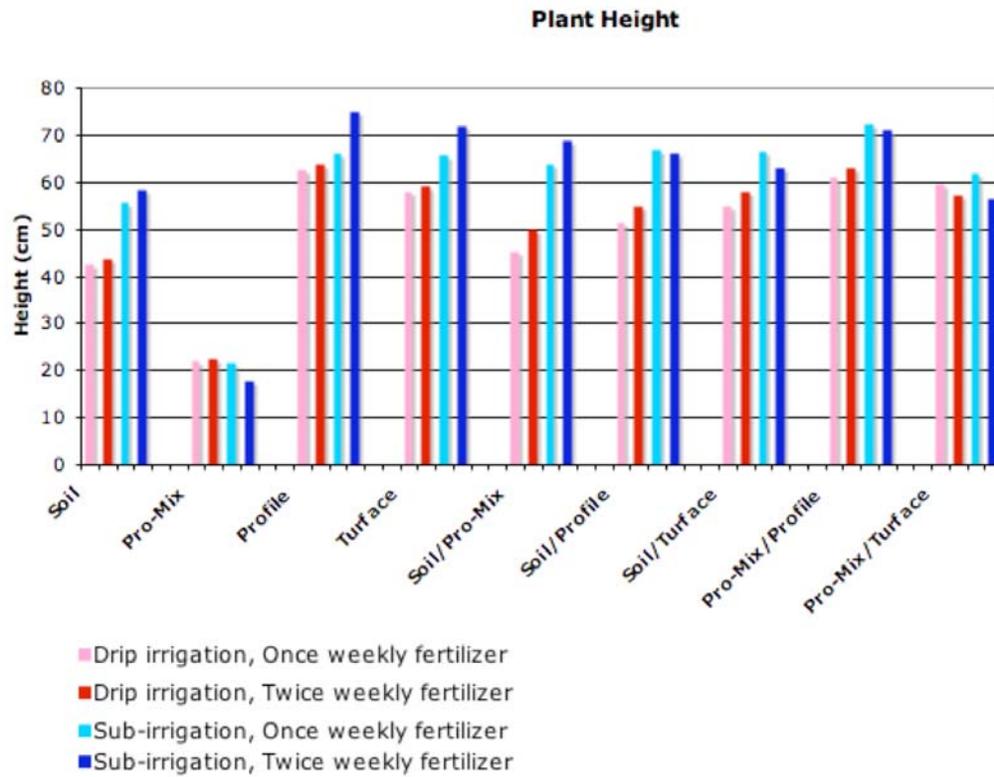


Figure 2. Rice plant height at day 78 in differing media, fertilization schedules and irrigation practices.

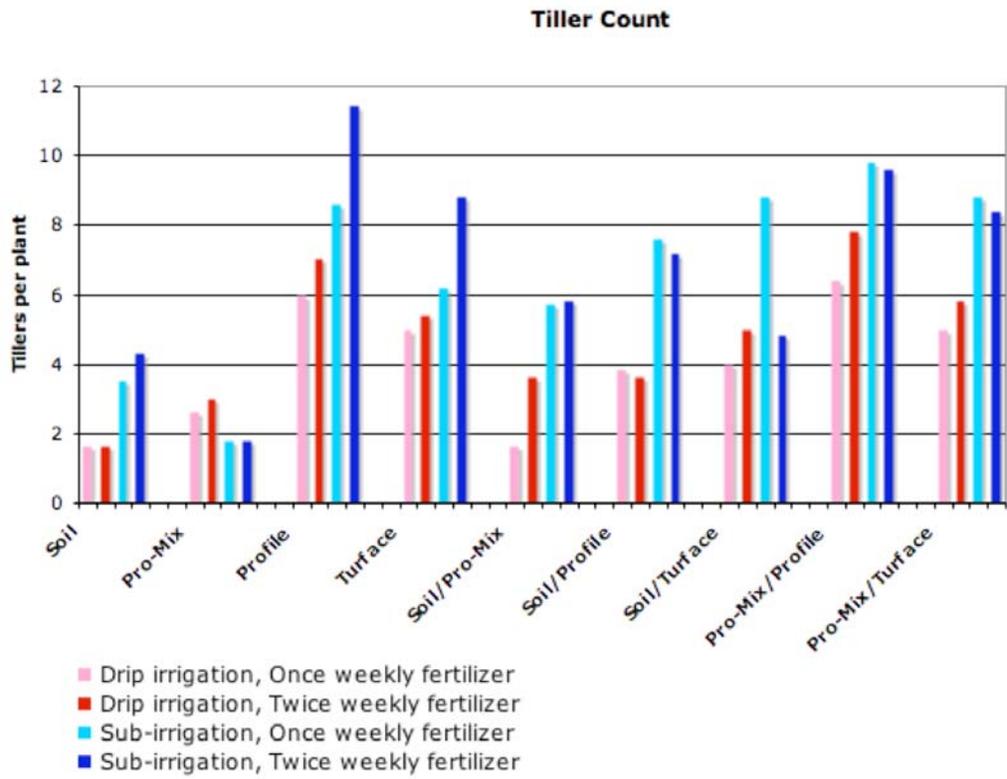


Figure 3. Rice plant tiller count at day 78 in differing media, fertilization schedules and irrigation practices.

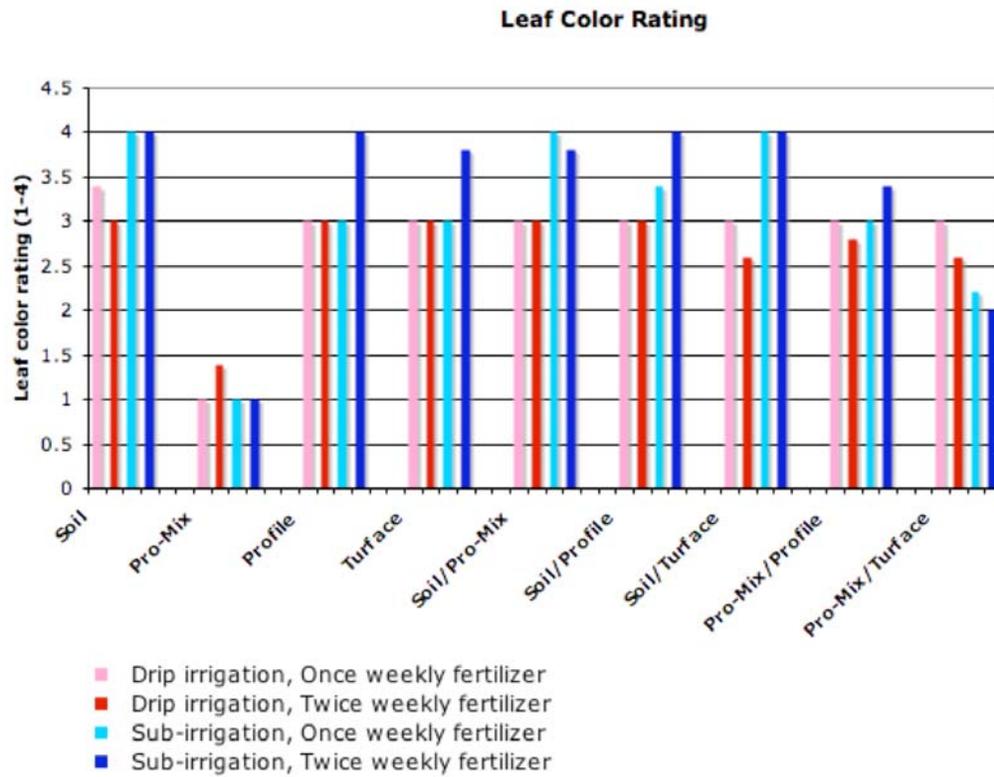


Figure 4. Rice plant leaf color at day 78 in differing media, fertilization schedules and irrigation practices. Color rating: 1=severe chlorosis; 2=moderate; 3=mild; 4=no chlorosis.