Performance of INTERCOM for predicting rice-barnyard grass interference in dry seeded rice systems

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Summary Crop yields on-farm rarely approach their production potential, partly as a result of growth reduction due to weed interference. Cost-effective weed management requires accurate estimates of yield and the potential yield loss resulting from weed infestations. However, crop yield and the effects of weeds are highly variable across weed density and their time of emergence. This may be accomplished through early crop vigour or delaying the weed emergence. An ecophysiological model of rice-barnyard grass competition (INTERCOM) may be useful for predicting the effects of weed density and their time of emergence on crop and weed growth and competitive ability. To evaluate the ability of the model to predict rice growth and yield, the effect of barnyard grass interference on rice yield loss was evaluated using two season data sets collected at the IRRI experimentation field. Predicted and observed monoculture leaf-area-index, leaf, stem, aboveground, and panicle biomass of both rice and barnyard grass were in close agreement. For inter-competition between species, height is very important, and the model captured the height very well. The normalised deviation for all values was near zero, which means the model calibration efficiency is good. Model-simulated results were very much similar to our field-observed results. Predicted and observed weed-free rice yields were ranged from 6.42–7.47 t ha^{-1}. The simulated results depicted that rice panicle yield was affected by the increasing weed density at early emergence. As weed emergence was delayed, there were no observed effects of different densities as the weed was usually unable to survive and did not cause much reduction in panicle yield. Percentage yield reduction decreased with the decrease in weed density and the delay in their emergence. Barnyard grass at 70 plants m^{-2}, emerging 2 days after rice emergence (DARE), reduced the grain yield by 65–70%. When the weed emergence was delayed to 45 DARE, the reduction in grain yield was only 2–5%. This reduction in yield was not so much different from the reduction caused by the weed density of 10 plants m^{-2} (0.7–3.2%) having the same emergence time as with rice. The model predicted that barnyard grass emergence with any densities at 45 DARE had negligible effect on rice growth and yield. The model suggests that the use of competitive rice cultivars or delaying the weed emergence may reduce the need for chemical weed control.

Keywords Economic threshold, integrated weed management, weed ecology, IPM, weed-crop interference.