Effect of sowing time on parasitic weeds in rain-fed rice production eco-systems

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Background
- Root parasitic weeds are a severe problem in rain-fed rice production ecologies in Sub-Saharan Africa. Heavy infestations lead to considerable yield losses, and in some cases they make farmers decide to abandon their rice fields.
- In upland rain-fed rice production eco-system, the most important parasitic plant species is the obligate Witchweed, Striga asiatica (L.) Kuntze. In lowland, the facultative Rice vampire weed, Rhamphicarpa fistulosa (Hochst.) Benth is an emerging problem.
- Farmers frequently hypothesize that sowing time can be used as a strategy to minimize parasitic weed infection in rice.

Objective
- To investigate the effect of sowing time on infestation and growth of parasitic weeds and rice grain yield.
- Field experiments were conducted in both upland (S. asiatica) and lowland (R. fistulosa) rain-fed rice eco-systems during three cropping seasons in Kyela district, south-west, Tanzania.
- Five sowing times were evaluated, in which the first sowing time coincided with the start of the rainy season and two weeks intervals were used for the rest. Sowing time was combined with three rice varieties differing in growth duration.

Conclusion
- In both upland and lowland rice eco-systems, sowing time can be used as a feasible control strategy to minimize parasite infestation.
- To minimize S. asiatica infection in uplands, rice sowing can be delayed with maximum of 4 weeks after the first rainfall. Preferably use short growth duration varieties.
- In lowlands, the best strategy is to sow rice at the onset of rain, as in this way R. fistulosa infection of rice is delayed, resulting in the highest rice grain yield.

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Results
- Sowing time influenced parasite infestation, parasite growth and rice grain yield, but the effect was different for the two ecologies.
- In upland, S. asiatica number decreased with delay in sowing time. Effect on rice grain yield was less clear cut, but with traditional long duration varieties (Mwangulu and Supa India), rice yield reduced if sowing time was delayed too much, due to drought stress during grain filling. As a result, the best yields were obtained at intermediate (S2, S3) sowing times.
- In lowland, R. fistulosa number didn’t reflect a clear pattern, but its biomass increased with delay in sowing time. Early sowing resulted in partial escape of parasite infection in rice. This was reflected in lower parasite biomass and higher rice grain yield with early sowing.

Fig. 1. Striga asiatica (left) and Rhamphicarpa fistulosa (right) infested rice fields in south-west Tanzania.

Fig. 2. Maximum Striga asiatica number (plants m⁻²) in upland rice as affected by sowing time. Data are averaged over three rice varieties (Mwangulu, Supa India and NERICA-14)

Fig. 3. Rhamphicarpa fistulosa biomass (g m⁻²) as affected by sowing time during three cropping seasons (2012-14). Data are averaged over three rice varieties - (Supa India, IR64 and NERICA-L20)

Fig. 4. Rice grain yield (t ha⁻¹) for different varieties in upland and lowland as affected by sowing time during three cropping seasons (2012-14) in parasite infested fields.