Università degli Studi di Padova

Proocedings of the 51st National conference of the Italian Society for Agronomy

Botanical garden – University of Padova

19 - 21 September 2022

Edited by
Anna Dalla Marta
Carmelo Maucieri
Domenico Ventrella

Società Italiana di Agronomia (SIA)
www.siagr.it

ISBN: 978-88-908499-5-4

Employing The Correct Duration Of Stale Seedbed In Rice

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Introduction
Weed control is complex in rice cultivation. Stale seedbed, a technique performed to control weeds before rice sowing, offers many advantages, such as a significant reduction of weed emergence, density and biomass production, and a decrease in weed-crop competition in the early growth stages (Ceseski et al., 2022). Moreover, stale seedbed can improve weed management of problematic weeds (i.e. resistant populations) (Ferrero et al., 2020). The soil is prepared for sowing, and weeds are allowed to grow and then controlled by chemical or mechanical methods before crop sowing. The factors most influencing the effectiveness of this technique are the methods used for seedbed preparation, the water management and the duration. The duration of stale seedbed must be a compromise between obtaining the highest percentage of weed emergence and not delaying crop sowing too much. Until now, stale seedbed duration was based solely on the farmer's experience or on the recommended rice sowing time for the variety used. Therefore, there is often a tendency to anticipate the termination with the risk of the technique's efficacy reduction. This study aims to select the best timing for the termination of the stale seedbed using a weed emergence predictive model. Knowing the emergence dynamics offers the possibility to terminate stale seedbed by waiting for when most of the weeds are already in the field to avoid acting either too early or too late.

Materials and Methods
The experiment was carried out in 2021 at the Braggio and Carnevale Miacca farm (Zeme, PV). Six plots, ranging from about 0.5 to 4 ha, with similar weed flora, cultivation practices and soil characteristics were selected. The experiments involved comparing two stale seedbed termination timings, with three fields per each method: a) traditional stale seedbed, according to farm practices; b) delayed one, terminating one week after. The seedbed was prepared with minimum tillage on 27 March 2021. Traditional stale seedbed ended on 21 May, while the delayed one ended on 28 May. Emerged weed seedlings were controlled in both cases with a herbicide treatment.Water-seeding was conducted on 29 May (a) and 1 June (b). Post-emergence weed control included a single treatment carried out on 19 and 21 June for traditional and delayed stale seedbed, respectively.The rice was harvested on 15 October. Soil temperature data were acquired during stale seedbed using sensors placed at a depth of 5 cm in the fields, while weed emergence was monitored every 3-4 days in each plot casting 30×30 cm squares 10 times and noting the seedling number for each species. After the termination of stale seedbed, the infestation dynamic was monitored to assess the efficacy of the weed control strategy.

Results
Rice yield did not differ between the two compared termination timings, although sowing was delayed by one week in the case of delayed termination. The weed emergence data showed an infestation made by about 85% by *Oryza sativa* var. *sylvatica* (ORYSA) and by about 3% by *Echinochloa crus-galli* (ECHCG). Figure 1a shows the evolution of the cumulated density of ORYSA over time. At the time of the traditional termination timing (21 May), the density was about 60 plants/m^2, corresponding to 86% of the final emergence (Figure 2a). At the survey on 27 May, before delayed termination timing, cumulated emergence had already reached almost 100% (about 70 plants/m^2). Figure 1b shows the

emergence dynamic of ECHCG, which was much less aboundant than ORYSA, with a density of about 10 plants/m^2. At the traditional termination timing, ECHCG was still at about 50%, while at the delayed timing, the species had reached 100% emergence. If the density of ECHCG had been higher than 10 plants/m^2, the early termination of stale seedbed in traditional date would have had a much less efficacy on this species than the delayed termination. These results confirm that the second date would be the best one. Using an emergence predictive model for the two weed species (ORYSA and ECHCG) would allow to know the percentage of emergence in advance and choose the correct date of intervention. If such a model had been available as early as 2021, it would suggest waiting until at least 80-90% of the ECHCG emergence before terminating the stale seedbed.

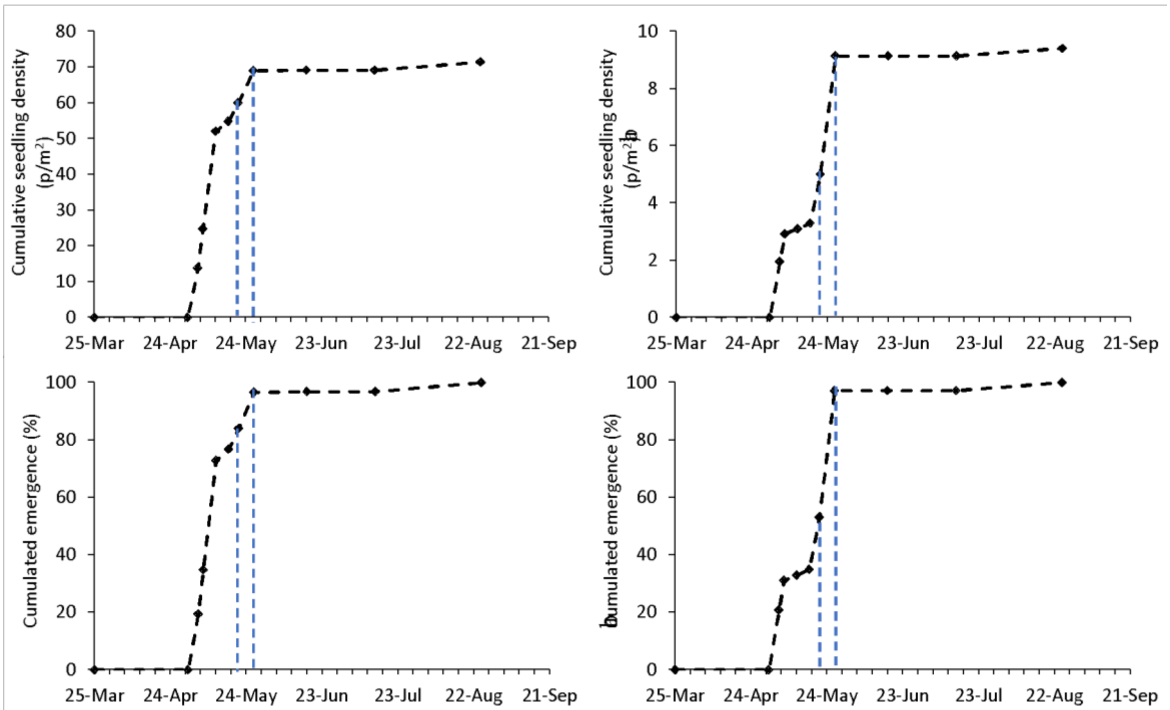

Figure 1. Cumulated density (plants/m^2) of *Oryza sativa* var. sylvatica (a) and *Echinochloa crus-galli* (b) during rice cultivation in 2021. Vertical lines showed the date of traditional and delayed stale seedbed.

Figure 2. Cumulated emergence (%) of *Oryza sativa* var. sylvatica (a) and *Echinochloa crus-galli* (b) during rice cultivation in 2021. Vertical lines showed the date of traditional and delayed stale seedbed.

Conclusions

Stale seedbed was an effective technique for weed control, and water-seeding and the use of a late sowing variety probably favoured the technique's success. The delayed termination date of the stale seedbed allowed for more effective weed control, particularly of ECHCG. Although this did not result in higher yields in the experiment due to the low infestation density of this species in the experimental fields, it is to be expected that in the case of higher densities, good post-emergence control would have been crucial to avoid yield losses with the traditional timing of termination. A comparison of the emergence dynamics of ORYSA and ECHCG in the field showed that the two species have different timing of emergence and that the best time of control has to be defined to achieve high emergence rates for both. Predicting their emergence with a model could guide the farmer in identifying this timing and further improve the efficacy of this technique.

Literature

Ceseski AR. et al. 2022. Combining stale seedbed with deep rice planting: a novel approach to herbicide resistance management? Weed Tech., 36: 261-269.

Ferrero A. et al. 2020. Relationship between weedy rice (*Oryza sativa*) infestation level and agronomic practices in Italian rice farms. Weed Sci, 69: 565-574.