

Research Paper

Effect of Non-Chemical Weed Management Options on the Yields and Profitability of Direct Seeded Rice Cultivation

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Abstract

The prominent method of weed management in direct seeded rice (DSR) cultivation in Sri Lanka is herbicide application. However, excessive use creates environmental hazards and increase the risk of developing the resistance in weeds to the herbicides. Therefore, six selected non-chemical weed management options: using power weeders to form rows in one direction, and in opposite directions, flooding on the date of sowing, at 3 days after sowing (DAS), and on the date of sowing + saturation at 3 DAS and hand weeding were investigated against the herbicide applications (pre-emergent and pre + post-emergent herbicide applications) and no weeding treatments for weed suppression, paddy grain yields and profitability of paddy cultivation. Herbicides reduced more than 90% of the weed density and the weed biomass compared to that of the no weeding treatment. The weed density and weed biomass of weeder applied and flooding treatments were significantly higher ($p < 0.05$) than those of the herbicide applied treatments. The highest yields (5 - 6 t ha⁻¹) were recorded in the hand weeded, the herbicide applied and the power weeded treatments. Pre-emergent herbicide application generated the highest profit (Rs. 231,900 ha⁻¹). Power-weeded, flooded (on the date of sowing) and hand-weeded treatments were 10%, 29% and 52% less profitable than to that of the pre-emergent herbicide applied treatment. Hence, integrated weed management approaches could be recommended to manage the weeds in DSR cultivation as the non-chemical methods are less efficient in weed suppression, obtaining higher yields and profit generations.

Keywords: Flooding, Hand weeding, Herbicides, Power weeder

Introduction

Weed infestation is the most disastrous constraint in direct-seeded rice (DSR) cultivation; (Gunawardena *et al.*, 2013). Globally, weeds contribute to 10% of the yield losses, which may go up to 32% in DSR cultivation (Shekhawat *et al.*, 2020). In Sri Lanka, the paddy yield loss caused by uncontrolled weeds ranges from 20-40% (Marambe *et al.*, 2015). Even though, various strategies are available, farmers generally use herbicides to manage weeds in DSR cultivation. In India, almost all the DSR practicing farmers apply herbicides (Rao *et al.*, 2017) and therefore, the