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Effect of Herbicides on Weed Control, Growth and Yield of Direct Seeded Rice in Chitwan, Nepal

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Abstract A field experiment was conducted during the 2024 growing season in Chitwan, Nepal, to evaluate the effects of different herbicides and herbicide combinations on growth and yield of direct-seeded rice (DSR). The experiment was laid out in a randomized complete block design (RCBD) with nine treatments and three replications using the rice variety Hardinath-5. Treatments included pre-emergence herbicides, post-emergence herbicides, combinations with 2,4-D, a weedy check, and a weed-free treatment. Weed management treatments significantly affected plant height, dry matter production, crop growth rate (CGR), yield attributes, grain yield, straw yield, harvest index, and weed index. Bispyribac sodium alone and bispyribac sodium + 2,4-D produced the greatest values for effective tillers, panicle length, filled grains per panicle, and grain yield, but their grain yields were not significantly different. Grain yield was 6.1 t/ha with bispyribac sodium, 6.0 t/ha with bispyribac sodium + 2,4-D, and 5.9 t/ha with the weed-free treatment, whereas the weedy check produced 2.1 t/ha. The results indicate that both bispyribac sodium treatments were effective under the conditions of this single-location, single-season study. Multi-location, multi-season, and economic studies are needed before making a broader recommendation for DSR production in Nepal.

Keywords Direct-seeded rice; Weed management; Bispyribac sodium; 2,4-D; Grain yield; Weed index

1 Introduction

Rice is the principal staple cereal crop in Nepal. It occupies about 1.42 million hectares, with average productivity of 4.19 t/ha and annual production of approximately 5.955 million tons in 2024/25 (MoALD, 2026). Improving productivity on existing farmland is increasingly important because further expansion of cultivated area is constrained by conversion of agricultural land to non-agricultural uses and by increasing pressure on farm labor and production resources.

Conventional puddled transplanted rice has long been the dominant production system in Nepal. Rural-to-urban migration and associated labor shortages, particularly during transplanting, have encouraged interest in direct-seeded rice (DSR). Compared with transplanted rice, DSR can reduce labor demand and water use, promote earlier crop establishment and harvesting, and facilitate timely planting of succeeding crops. These advantages have increased interest in DSR as a resource-efficient production system in Nepal and other parts of Asia (Chauhan, 2012; Adhikari, 2021; Sharma et al., 2021).

Weed infestation is one of the most serious biological constraints in DSR because weeds and rice emerge together and compete for nutrients, water, light, and space. The absence of standing water during early crop establishment further favors weed emergence and growth (Hossain et al., 2016; Raj and Syriac, 2017). Yield losses can be severe when weed control is delayed or incomplete (Chauhan and Johnson, 2011). Chitwan, in the Inner Terai, provides a relevant rice-growing environment for evaluating DSR weed-management options, but herbicide performance cannot be assumed to be identical across locations because weed communities, soil conditions, weather, and field-management histories vary.

Herbicides are widely used in DSR because they can provide timely and economical weed control. However, reliance on a single application may not provide season-long suppression, and treatment response may vary with