Chemical Weed Management in Direct Seeded Rice (DSR)

Dharani Dhar Pradhan[1], Suchismita Tripathy[2], Rabiratna Dash[2] and Prekshya Das[3]

[1]Ph.D Scholar, [2]Associate Professor, [3]M.Sc. Scholar, Department of Agronomy
College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha

Corresponding Author
Dharani Dhar Pradhan
Email: dpradhan027@gmail.com

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ABSTRACT

The switch to grow rice in DSR decreases adverse environmental impacts, labor requirements, and the amount of water needed to reach maturity. Farmers can gain greatly from the direct-seeded rice system, but the key drawback is lack of standing water encourages the growth of weeds, which significantly reduces rice output. Notwithstanding all of the benefits, the potential yield losses due to massive weed growth threats DSR and might lower output by as much as 50%. The trend for an increase in herbicide use has been reinforced by the spread of DSR. Many researchers working on weed management in DSR are in opinion that suitable herbicides are feasible choice as compared to hand weeding. Weeds compete with crops for nutrients, moisture, light, and space, which drastically reduces crop productivity and development. Weed floras have quick response to management practices and environmental conditions, hence various herbicides are vital for managing weed problems.

INTRODUCTION

The most crucial and unavoidable component of crop management for increasing rice output is weed control. In many rice cultures today, applying chemical herbicides to control weeds has become common practice. Lack of a standing water

inhibits weeds at the time of rice emergence, and the fact that both weed and rice seedlings emerge at the same time, controlling weeds is difficult in DSR systems. Despite these benefits, weeds remain a considerable constraint associated with direct-seeded rice production, causing losses up to the extent of 80% of grain yield in South-East Asia (Chauhan *et al.,* 2012). Weed dynamics change with the alter in the rice establishment methods. Easy accessibility to short-duration rice varieties and availability of cost-effective selective herbicides have encouraged farmers to adopt direct seeding method of establishing rice crop. In a study it was obtained that, rice yield losses due to natural weed growth were least (12%) in puddled transplanted rice and highest (58%) in DSR (Singh *et al.,* 2011). In another study, when weeds were not controlled, 57-82 % rice yield losses was recorded in dry DSR (Mahajan *et al.,* 2009). In many rice cultures in recent times, applying chemical herbicides to control weeds has become a normal practice. Hand weeding becomes more difficult as the crop's morphology resemblances several grassy weeds.

Different weeds associated with DSR

Major weed flora recorded by various workers (Chhokar *et al.,* 2014; Rao *et al.,* 2007) under DSR consisted of *Echinochloa crus-galli*, *Echinochloa colona*, *Leptochloa chinensis*, *Eragrostis tenella*, *Brachiaria reptans*, *Dactyloctenium aegyptium*, *Paspalum sp.*, *Digitaria ciliaris*, *Eleusine indica* among grasses and *Trianthema portulacastrum*, *Eclipta alba*, *Caesulia axillaries*, *Commelina sp.*, *Lindernia crustaceae*, *Euphorbia hirta*, *Phylanthus niruri*, *Amaranthus viridus*, *Celosia argentia*, *Digera arvensis* among broad leaf weeds and *Cyperus rotundus*, *C. diffotmis*, *C. iria*, *Fimbristylis miliaceae* among sedges.

(Fig. 1: *Echinochloa sp.*, major grassy weed in DSR)

Pre and post emergence herbicide used in DSR

Fewer studies have highlighted the higher efficacy of sequential applications of pre- and post-emergence herbicides on weeds compared to their sole applications (Awan *et al.*, 2015, Chauhan *et al.*, 2015). Selective post-emergence herbicides are used to manage late-emerging weeds, whereas pre-emergence herbicides are used to suppress weeds that are just beginning to germinate. Herbicides must be assessed in many areas, because herbicide response varies by location and is influenced by soil, climate, and weed species.

Table 1: Recommended Herbicide for DSR System

Herbicide	Dose (g ai ha^{-1})	Application time (DAS)	Strengths and weaknesses
Pendimethalin	1000	1-3	Good control of most grasses, some broadleaves and annual sedges. Has residual control. But sufficient moisture is needed for its activity.
Oxadiargyl	90	1-3	Broad-spectrum weed control of grasses, broadleaves and annual sedges. Has residual control. But sufficient moisture is needed for its activity.
Bensulfuron methyl + Pretilachlor	10	7	Mixed population of weeds

Bispyribac-Sodium	25	15-25	Broad-spectrum weed control of grasses, broadleaves and annual sedges. Excellent control of *Echinochloa* species. But it is poor on grasses other than Echinochloa species, including *L. chinensis*, *Dactyloctenium aegyptium*, *Eleusine indica*, *Eragrostis* species. No residual control.
Penoxsulam	22.5	15-20	Broad-spectrum weed control of grasses, broadleaves and annual sedges. But it is poor on grasses other than *Echinochloa* species, including *L. chinensis*, *D. aegyptium*, *Eleusine indica*, *Eragrostis* species.
Fenoxapropethyl	60	25	Excellent control of annual grassy weeds. Does not control broadleaves and sedges. Not safe on rice if applied at early stage (before 25 DAS).
Fenoxapropethyl + safner	60-90	15-20	Excellent control of annual grassy weeds, safe on rice at early stage. Does not control broadleaves and sedges.
Azimsulfuron	17.5-35	15-20	Broad-spectrum control of grasses, broadleaves and sedges. Excellent control of sedges, including *Cyperus rotundus*. Poor on *Echinochloa* species.
Ethoxysulfuron	18	15-20	Effective on broadleaves and annual sedges. Does not control grasses and poor on perennial sedges such as *C. rotundus*.
Triclopyr	500	15-20	Effective on broadleaf weeds. Does not control grasses.
2,4-D ethyl ester	500	15-25	Effective on broadleaves and annual sedges. Very economical. It has no residual control.

(Source- Kumar and Ladha, 2011)

Effect of herbicide on weed growth and crop yield

Both mechanical and cultural approaches to weed management are often labor intensive, time-consuming, and clumsy. Furthermore, the potential for weeds to escape or re-grow from leftover roots or rhizomes makes them frequently less effecvtive. According to research by Maity and Mukherjee (2008), weed infestation lowers grain production by 96% in dry DSR, 61% in wet DSR, and 40% in transplanted rice. The longer weed free periods, up to 45 days after the emergence of rice seeds contributes to increase rice yield. Weeds emerged thereafter are poor in growth due to their exposure to severe competition and they can be easily suppressed by the crop. A preferable option could be using chemical weed control measures. Compared to manual or mechanical techniques of weed management, herbicides offer improved weed control and are more labor-efficient. According to Jacob *et al.* (2014) the main benefit of using herbicidal weed management in DSR is the decrease in cultivation costs. Because of poor weather conditions and sowing pressure, pre-emergence herbicide treatment is not always feasible. According to Paswan *et al.* (2012), mixing herbicides with several modes of action prevents target site resistance in vulnerable species by binding to various target sites in weeds. Bensulfuron methyl + pretilachlor is a new herbicide combination reported to be used as a pre-emergence herbicide providing effective control of grasses, sedges, and broad-leaved weeds in rice without any phytotoxic symptoms in the crop. Bispyribac sodium is popularly used as a post-emergence herbicide in rice, it acts on the enzyme acetolactase synthetase (ALS), which in turn inhibits the

production of amino acids such as valine, isoleucine, and leucine that inhibit protein synthesis in weeds, causing their death. Researchers at ICAR-NRRI, Cuttack, recorded the highest weed control efficiency with the application of bensulfuron methyl. Significantly higher number of panicles per m2 and grain yield were recorded with application of metsulfuron methyl (Saha and Rao, 2010).

CONCLUSION

It is better to integrate as many weed management strategies as possible to achieve effective, sustainable, and long-term weed control in DSR. Continuous monitoring to identify the emergence of new weed species and changing weed flora is necessary for economically viable integrated weed management system in DSR.

REFERENCES

Awan, T.H., Cruz, P.C. and Chauhan, B.S. (2015). Efficacy and economics of different herbicides, their weed species selectivity, and the productivity of mechanized dry-seeded rice. Crop Protection 78: 239–246.

Chauhan, B.S., Singh, R.G. and Mahajan, G. (2012). Ecology and management of weeds under conservation agriculture: a review. Crop Protection.

Chhokar, R.S., Sharma, R.K., Gathala, M.K. and Pundir, A.K. (2014). Effect of crop establishment techniques on weeds and rice yield. Crop Protection 64: 7-12.

Jacob, G., Menon, M.V., Abraham, C.T. (2014). Comparative efficacy of new herbicides in direct seeded rice. Journal of Tropical Agriculture, 52:174-177.

Kumar, V. and Ladha, J.K. (2011). Direct seeded rice: Recent development & future research needs. Advances in Agronomy 111: 297-413.

Maity, S. K. and Mukherjee, P. K. (2008). Integrated weed management in dry direct seeded rice (*Oryza sativa*). *Indian Journal of Agronomy*, 53: 116-120.

Paswan, A., Kumar, R., Kumar, P. and Singh, R. (2012). Influence of Metsulfuron-methyl and carfentrazone ethyl either alone or in combination on weed flora, crop growth and yield in wheat (*Triticum aestivum*). Madras Agricultural Journal, 99:560-562.

Rao, A.N., Johnson, D.E., Sivaprasad, B., Ladha, J.K. and Mortimer, A.M. (2007). Weed management in direct seeded rice. Advances in Agronomy 93: 153–255.

Singh, R., Singh, D. K., & Kumar, L. (2011). Performance evaluation of DSR and DSDV routing protocols for wireless ad hoc networks. *International Journal of Advanced Networking and Applications*, 2(4): 732-737.

Saha, S. and Rao, K. S. (2010). Evaluation of Bensulfuron-methyl for weed control in wet direct sown summer rice. Oryza. 47 (1): 38-41.