

A Review

Weed control in rice through micro herbicidal approach

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ABSTRACT

Successful weed management for rice crop becomes much more important in order to exploit its maximum production potential as it is a serious constraint. Herbicides are effective tools in man's eternal struggle with weeds in rice field. When properly used, herbicide can safely and effectively accomplish their objective. An array of integrated and selective herbicides provide farmer with a wide choice of practices to control a broad spectrum of weeds in continuously shifting weed population. The use of herbicides is likely to remain an important component in the overall control strategy, as much of the progress in crop protection has been made possible through use of highly effective agrochemicals. The intensive use of high doses herbicides is held responsible for environmental pollution, shift in weed flora and evolution of resistant weed biotypes, which jeopardize herbicides utility, availability and longevity and impose the threat to productivity of world agriculture. However, selective micro herbicide of eco-friendly nature will be a key ingredient in effective weed management system. Use of low dose high efficiency herbicide of sulfonylurea group is relatively new group of compound, which control grassy, non-grassy and sedges in cereals. Further, an environmental advantage derives from their very low application rates, which markedly reduce the "Chemical load" in the environment resulting from herbicide usage. Also most of low doses herbicides are non toxic to animals (both vertebrate and invertebrate) and soil micro-organisms.

Key words : Weed, Rice, Herbicide, Weed control.

INTRODUCTION

Rice (*Oryza sativa* L.) is the most important cereal crop and extensively grown in tropical and subtropical regions of the world, and is staple food for more than 60 per cent of the world population. Rice plays unique role in providing calories to the majority of Asian and Latin American countries. It is grown in 112 countries in the world, covering every continent, and is consumed by 2500 million people in developing countries. Among cereals, rice is the major source of calories for about 40% of the world population and every third person on earth eats rice every day in one form or other (Datta and Khushi, 2002; Mukherjee, 2002). In India rice is cultivated on an area of 43.40 million hectares with an annual production of 86 million tons. Its production is found to be distributed as 73 million tons in *kharif* and 13 million tons in *rabi* season. However, rice productivity in India is very low (1,780 kg ha⁻¹) as compared to other rice growing countries like Japan (6,352 kg ha⁻¹), Australia (6,220 kg ha⁻¹), Spain (6,160 kg ha⁻¹), Egypt (5,000 kg ha⁻¹) and China (5,200 kg ha⁻¹). There are several reasons for its low productivity, and out of that losses caused due to weeds is one of the most important (GOI, 2003).

The yield losses due to uncontrolled weed growth in rice ranges from 12 to 81 per cent from low land to upland situation (Chopra and Chopra, 2003). Weed infestation reducing grain yield directly and indirectly. Rice and rice-weeds have similar requirements for growth and development. Competition occurs when one of the resources (nutrients, light, moisture and space) fall short of total requirement of rice and weeds. Weeds by virtue of their high adaptability and faster growth dominate the crop habitat and reduce the yield potential. The degree of rice-weeds competition depends on crop factors cultivars, crop density, crop age, plant spacing etc. (Moody, 1990). In general, weed problem in transplanted rice is slightly lower than that of direct seeds dry sown rice. But in some cases where continuous standing water cannot be maintained particularly for the first 45 days, weed infestation may be as high as direct seeded dry sown rice. Again continuous flooding controls grassy weeds but invites the infestation of sedge and broad leaved weeds (Mukherjee and Singh, 2005). The dwarf rice plants (high yielding variety) with it erect leaf habit promotes more weed growth and suffers yield losses relatively more than the tall variety (traditional variety) of rice in transplanted condition.

In recent decades, the predominant weed control method in many parts of the world has been the use of effective and reliable chemical herbicide. Further it has been seen that hand weeding,

which is in practice, is very effective if followed in time, though it is tedious, time consuming and costly. Whereas effective dose of herbicides not only save valuable time and money, but also allow coverage of more area in short period in carrying out timely weeding. However, repeated use of any single herbicide in crop generates a shift in the composition of weed flora with a result that secondary weeds become of primary concern. Thus, there is a great need for the use of wide spectrum herbicides. In addition their efficacy should be enough to cover the critical period of crop-weed competition. In this context, combination of different herbicides may widen the spectrum of weed control. However, most of herbicide which are commonly used in rice field were quite large amount of active ingredient such as butachlor (1-1.50 kg ha⁻¹), anilofos (0.60 kg ha⁻¹) and pretilachlor (1.00 kg ha⁻¹). Use of such huge amount of these herbicide increase chemical density into the environment and pollute soil and ground water resources, which ultimately distort whole ecology system. So, presently a new concept comes into existence i.e. micro herbicidal approach of weed management. In this approach herbicide dose are quite low usually 2-25 g ha⁻¹ and they are very eco-friendly.

Weed flora in rice field

Rice field colonized by terrestrial, semi-aquatic or aquatic weeds depending on the types of rice culture and season. In recent years, rice production has increased with the introduction of high yielding varieties, but their maximum yield potential has not been fully realized owing to improper weed management. Weeds emerged three days to seven days after irrigation in wet seeded plots. However in upland situation it starts to grow at very early stage of crop growth. A common knowledge of weed flora, their time of emergence, density and growth duration is essential for formulating sound weed control measures. Weeds belonging to various species of grasses, sedges and broad-leaved weeds were found to be associated with rice culture. Mukherjee and Singh (2004 b) observed that transplanted paddy, fields were commonly infested with different types of grasses, viz. *Echinochloa colona* (L.) Link., *Echinochloa crusgalli* (L.) Beauv., *Cynodon dactylon* (L.) Pers., *Panicum repens* (L.), sedges viz., *Cyperus rotundus* (L.), *Cyperus iria* (L.), *Fimbristylis miliacea* (L.) Vahl. and broad-leaved weeds viz., *Caesulia axillaris* Roxb., *Phyllanthus niruri* (L.), *Ammania baccifera* (L.) Rottb., *Commelina benghalensis* (L.), *Amaranthus viridis* (L.), *Corchorus acutangulus* Lamk. Similar kind of observation was reported by Madhu and Nanjappa (1997) at Bangalore.