# Is Parachute Method an Eco-Friendly Weed Management Method for Paddy?

**RMUS Bandara[1*], AP Bentota[1], RSK Keerthisena[1], V Kumar[2], KR Thilakasiri[1], MD Abeysundara[1], MUN Pushpakumara[1] and HMMKKH Dissanayaka[1]**
[1]Rice Research and Development Institute, Batalagoda, Ibbagamuwa, Sri Lanka
[2] International Rice Research Institute, Philippine

**Abstract**
Weeds, affecting both quality and quantity of the production are recognized as the major biotic constraint in rice in Sri Lanka. The production losses incurred due to weeds have been estimated as 20%-40% (valued 200-400 million USD/annum) that depend on the climate, crop management and efficacy of adapted weed management practice. Thus, weed management would contribute a lot in closing the yield gap of rice cultivation. This study was conducted to demonstrate farmers how yield is maximized through proper weed management in Kalinga-ela and Ambanganga of Polonnaruwa District in 2015 Yala Season. Herbicides namely Pretilachlor 300g/l+ Pyribenzoxim 20g/l EC, Bispyribac sodium 40g/l + Metamifop 100g/l SE, Pretilachlor 300g/l EC, Pretilachlor 170g/l + Propanil 330g/l EC were evaluated against no-herbicide control in demonstration plots. Parachute method without herbicide, Row seeding with weeders and Farmers' Practice (Random Seed Broadcasting with herbicides) were evaluated in another set of demonstration experiments. When obtaining samples in order to have replicates, 03 samples were taken randomly in each plot so that data were analyzed as a RCBD. Initial weed flora was observed and recorded in the experimental site. Weed counts at 06 weeks after treatment, weed dry weight at 06 weeks after treatment and final grain yield were recorded. Weed control efficacy or weed control efficiency was calculated for each treatment using the standard equation. Pretilachlor 300g/l+ Pyribenzoxim 20g/l EC, Bispyribac sodium 40g/l + Metamifop 100g/l SE, Pretilachlor 300g/l EC, Pretilachlor 170g/l + Propanil 330g/l EC showed a significantly lower weed dry weight and a significantly higher grain yield than the control. Parachute method followed by no-herbicide performed well in equally with Random Seed Broadcasting Method followed by herbicide. It is clear that Parachute method is an alternative for herbicides.

***Keywords:*** Weed Control Efficacy, Yield Gap, Parachute Method
***Corresponding author:*** rmusbandara@gmail.com

## Introduction

Weeds are the major biotic constraint, both quality and quantity of the production of rice in Sri Lanka. The production losses incurred due to weeds have been estimated as 20%-40% (valued 200-400 million USD/annum) that depend on the climate, crop management and efficacy of adapted weed management practice (Abeysekera et al., 2006). Thus, weed management would contribute a lot in closing the yield gap of rice cultivation. *Closing Rice Yields Gap in Asia (CORIGAP)* project was implemented under funds from *International Rice Research Institute, Philippine* to reduce the yield gap of farmers which resulted due to poor management practices. Under the project weed management is one of the key areas. This demonstration study was conducted to demonstrate farmers how the yield is maximized through proper weed management in *Kalinga-ela* and *Ambanganga* of *Polonnaruwa* District in *2015 Yala* Season.

## Materials and methods

Four farmer fields were selected. As it was difficult to do a replicated experiment with many treatments in the farmer field already bunded paddy plots ("Liyadda"s) located closely and similar in elevation were taken as blocks. Each treatment was applied into each paddy plots as per the recommendation of Department of Agriculture, Sri Lanka. Variety Bg 352 was used in the study. All crop management practices were as the recommendation of Department of Agriculture, Sri Lanka except treatments. Herbicides namely Pretilachlor300g/l+ *Pyribenzoxim 20g/l EC, Bispyribac sodium 40g/l + Metamifop 100g/l SE, Pretilachlor 300g/l EC, Pretilachlor 170g/l + Propanil 330g/l EC*were evaluated in comparison to no-herbicide control in a one set of demonstration experiments. Seedling Broadcasting Method (Parachute) followed by No -herbicide, Row Seeding followed by weedering and Farmers' Practice (Random Seed Broadcasting Method followed by herbicide) were evaluated in another set of demonstration experiments. When obtaining samples in order to have replicates randomly 03 samples were taken in each plot so that data were analyzed as an *RCBD*. Initial weed flora was observed and recorded in the experimental site. Weed counts at 06 weeks after treatment, weed

dry weight at 06 weeks after treatment and final grain yield were recorded. Weed control efficacy or weed control efficiency was calculated for each treatment using following standard equation.

$$WCE = \left(\frac{(NW - T)}{NW}\right)100$$

WCE= Weed Control Efficacy or Weed Control Efficiency
NW= Weed dry weight of No Weeding Control
T=Weed dry weight of treatment concerned

Data were analysed employing *ANOVA* using *SAS* software. *DUNCAN* method was used for mean separation.

## Results and discussion

Grasses were the abundant weeds at the experimental site (Table 1). Sedges came second. Grasses are the most competitive weeds with *Oryza sativa* because they all belong to same family, *Poaceae*. Therefore, weed management is very critical in the area.

All selected herbicide treatments namely *Pretilachlor 300g/l+ Pyribenzoxim 20g/l EC, Bispyribac sodium 40g/l + Metamifop 100g/l SE, Pretilachlor 300g/l* EC, *Pretilachlor 170g/l + Propanil 330g/l* EC reported significantly lower weed dry weight and a significantly higher grain yield than the control (Table 2). They showed a higher WCE.

**Table 1**: Species found in the experimental site

| Species | Common Name | Family |
|---|---|---|
| **Grasses** | | |
| *Leptochloachinensis* | *Ashwa-waligaya/Red sprangletop* | Poaceae |
| *Ischaemumrugosum* | *Gojarawalu/ Wrinkle duck beak* | Poaceae |
| *Isachneglobosa* | *Batadella/* Swamp millet | Poaceae |
| *Echinochloa crus-galli* | *Bajiri/* Barnyard grasss | Poaceae |
| *Paspalumdistichum* | *Gira-thana/Buffalo grass* | Poaceae |
| *Panicumrepens* | *Atawara* | Poaceae |
| **Sedges** | | |
| *Cyperusiria* | *Digatimal-Thunessa/ Umbrella sedge* | Cyperaceae |
| *Cyperusrotundus* | *Kalanduru* | Cyperaceae |
| **Broadleaves** | | |
| *Marsileaminuta* | *Hatarapetiya* | Marsileaceae |

**Table 2:** Weed dry weight, Weed Controlling Efficacy and Grain Yield of different herbicide treatments of 01st demonstration

| Treatment | Weed Dry Weight ($g/m^2$) | WCE% | Grain Yield (t/ha) |
|---|---|---|---|
| *Pretilachlor300g/l+ Pyribenzoxim 20g/l EC (1.25l/ha)* One-shot post-emergent herbicide | 75.00$^b$ | 87 | 4.10$^a$ |
| *Bispyribac sodium 40g/l + Metamifop 100g/l SE (625ml/ha)* One-shot post-emergent herbicide | 75.33$^b$ | 87 | 3.89$^a$ |
| *Pretilachlor 300g/l EC (1.6l/ha)* One-shot pre-emergent herbicide | 78.25$^b$ | 86 | 4.00$^a$ |
| *Pretilachlor 170g/l + Propanil 330g/l EC(2l/ha)* One-shot post-emergent herbicide | 87.00$^b$ | 85 | 3.13$^a$ |
| Control (No Herbicide = No Weeding) | 575.00$^a$ | --- | 1.20$^b$ |

As shown in the *Table 3,* all treatments were as good as Parachute method followed by No-herbicide showed the lowest Weed Dry Weight and the highest Grain yield. Weed Control Efficiency of Parachute method followed by No-herbicide was 61%. Compared to *01st demonstration, 02nd demonstration* showed a higher yield. These dissimilarities may be due to fertility status of paddy fields of two different experiments.

**Table 3**: Weed dry weight, Weed Controlling Efficiency and Grain Yield of different treatments of 02nd demonstration

| Treatment | Weed Dry Weight ($g/m^2$) | WCE% | Grain Yield (t/ha) |
|---|---|---|---|
| Seedling Broadcasting Method (Parachute) followed by No-herbicide | 55.03[a] | 61 | 10.66[a] |
| Row Seeding followed by weedering (at 14 and 28 days after sowing) | 76.23[a] | 46 | 8.73[a] |
| Farmers' Practice (Random Seed Broadcasting Method followed by herbicide) | 139.97[a] | --- | 8.36[a] |
| | *CV=56.99* | | *CV=21.53* |

**Means with the same letter are not significantly different ($\alpha$=0.05).

As shown in the Table 3, all treatments were as good as Parachute method followed by No-herbicide showed the lowest Weed Dry Weight and the highest Grain yield. Weed Control Efficiency of Parachute method followed by No-herbicide was 61%.

Compared to 01st demonstration, 02nd demonstration showed a higher yield. These dissimilarities may be due to fertility status of paddy fields of two different experiments.

## Conclusion

*Pretilachlor300g/l+ Pyribenzoxim 20g/l EC, Bispyribac sodium 40g/l + Metamifop 100g/l SE, Pretilachlor 300g/l EC, Pretilachlor 170g/l + Propanil 330g/l EC* showed a significantly lower dry weight of weeds and a significantly higher grain yield than the control. Parachute method followed by no-herbicide performed well in equally with Random Seed Broadcasting Method followed by herbicide. It is clear that Parachute method is an alternative for herbicides. Farmers of the CORIGAP project site were made aware of these and they are presently using the technology.

## References

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