Effect of weeds Diya siyambala (*Aeschynomene indica*), Kudamatta (*Fimbristylis miliacea*) and Thunassa (*Cyperus iria*) on growth and yield of Rice (*Oryza sativa L.*) variety Bg 379-2, Ld 365, Bg 357

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Abstract- *Aeschynomene indica* (Fabaceae) (Singhala: *Diyasiyambala*) is a nitrogen-fixing weed commonly found in paddy fields. This study was undertaken to determine the effect of *A. indica* on growth and yield of rice variety Bg 357 in comparison with two non-nitrogen fixing weeds *Fimbristylis miliacea* (Singhala: *Kudamatta*) and *Cyperus iria* (Singhala: *Thunassa*).

Observations were made on the growth and yield of the potted rice with *A. indica*, *F. miliacea* and *C. iria* separately. Shoot length, number of panicles per plant, number of seeds per panicle, weight of hundred seeds were measured. The experiment was conducted in a Complete Randomized design (CRD) with 3 replicates. Statistical analysis was carried out using the Student Newman-Kuells Means Separation Test of SAS program (9.1.3). Bg 379-2, Ld 365, Bg 357 plants grown with *A. indica* (1:1) had 14.55%, 25.8% and 14.87% higher shoot length, 43.33%, 29.4% and 27.27% more number of tillers per plant, 43.33%, 29.4% and 10.48% number of panicles per plant, 29%, 61.6% and 9.23% more number of seeds per panicle and 5.3%, 13% and 9.58% higher seed weight than control respectively. Furthermore, rice cultivars grown with other weeds negatively affected on growth and yield of rice plant. Rice is Nitrogen (N) demanding crop for better growth and higher yield, therefore N-fixing weeds could be integrated into rice ecosystem for better productivity with less fertilizer inputs.

Index Terms- *Oryza sativa, Aeschynomene indica, Fimbristylis miliacea, Cyperus iria,* N fixation

I. INTRODUCTION

Rice (*Oryza sativa* L.; Family Graminae) is the staple food of around 30-40% of the world population. Over 90% of rice is cultivated in Asia. It is an important source of carbohydrate for human consumption and also provides feed and forage. The rice production has been increasing worldwide by large-scale adoption of modern high-yielding rice varieties and improved cultural practices. In modern world usage of chemical fertilizer for crop improvement is highly adopted and Urea, TSP (Triple Super Phosphate), MOP (Murate of Potash) was introduced to paddy cultivation. Long term use of chemical fertilizer may cause environmental pollution and health problems (Department of government information, 2013). Nitrogen is the most important and limiting nutrient to rice cultivation in Sri Lanka. As basal dressing 50Kg/ha and top dressing 37.5 Kg/ha nitrogen requirement is supplying by urea fertilizer in paddy cultivation.

Diyasiyambala (*Aeschynomeneindica*; Family fabaceae) is a mycotrophic plant and freely nodulating nitrogen fixing species which grown in paddy lands as a weed. Diyasiyambala can be used as green manure and livestock feed. This species bear nodules on the aerial parts of the stems under natural condition. Thunassa (*Cyperusiria* L, Family Cyperaceae) is sedge grown in paddy field that is competed with rice plant throughout the growing season. Yield and quality of the rice goes down due to weeds in the cultivated lands. Kudamatta (*Fimbristylismiliacea*, Family Cyperaceae) is a serious and widespread weed that are competed with rice. This affect negatively on rice yield and quality of seeds. Andalso Kudamatta acts as an alternate host for pest and disease. Therefore, the objective of this study was to evaluate the effect of Diyasiyambala, Thunassa and Kudamatta on growth and yield of rice varieties Bg 379-2, Ld 365 and Bg 357.

II. METHODOLOGY

Experimental location

Study was conducted at Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya. Mapalana is located in the low country wet zone (WL_2) where the annual rainfall is > 1900 mm. The mean monthly temperature is 27.5 ^{0}C and relative humidity is around 72%.

Oryza sativa (variety Bg 379-2, Ld 365, Bg 357) seeds were obtained by Department of Agriculture. Pots (1.5x1.5x1.5 ft^3) were filled with paddy mud. After 14 days of nursery period healthy same size (7 cm) rice seedlings were transplant to the pots. After 24days of nursery period same size (12 cm) Diyasiyambala seedlings were transplanted to the pots with rice plants. Same size Kudamatta and Thunassa seedlings were taken from the existing paddy land separately and transplant them to the recommended pots. Throughout the experiment maintained 4 plants per pot. The treatments were; 4 rice seedlings (control T 1),Two rice seedlings with 2 Diyasiyambala seedlings (T 2), two rice seedlings with 2 Kudamatta (T 3) and two rice seedling with 2 Thunassa seedlings per pot (T 4) (fig. 1). Basal dressing applied to the soil before sowing seeds Urea 50 Kg /ha, Triple Super Phosphate 62.5 Kg/ha, Murate Of Potash 50 Kg /ha. After 3 ½ months paddy were harvested. Shoot

length, number of panicles, no of tillers, no of seeds, thousand seed weight was measured.

Each treatment was replicated three times. All management practices were conducted according to recommendation of the department of Agriculture from seed germination to harvesting. Data was analyzed using SAS program (9.1.3**).** Mean separation was determined by Duncan's multiple range test at (P=0.05).

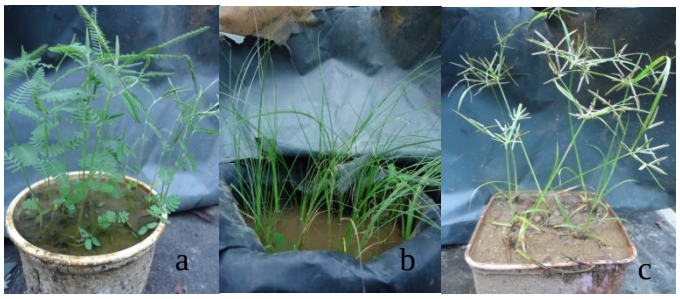

Figure 1: Selected weeds for the experiment. a. Diyasiyambala, b. Kudamatta, c.Thunassa

III. RESULT & DISCUSSION

Result indicates that there is a significant effect of weeds for yield (quality and quantity) and growth of all rice varieties. Highest growth and yield performance of rice was observed with Diyasiyambala where least was observed with Kudamatta and Thunassa compare to control.

Diyasiyambala (Legume) significantly affects on the plant growth and yield of rice plants at (P< 0.05). Comparing to the control, shoot length (14.55%), number of tillers per plant, number of panicles per plant (44.33%), number of seeds per plant (29%) and hundred seed weight (5.3%) were increased in rice variety Bg 379-2 with Diya siyambala. It was reduced by other weeds kudamatta and Thunassa; shoot length (19.18%, 19.18%), number of tillers per plant/number of panicles per plant (22.33%, 33.33%), number of seeds per plant (27.03%, 31.25%) and hundred seed weight (2.66%, 3.42%) respectively (Table 1**)**.

Table 1. Rice growth and yield performance (variety Bg 379-2)

Treatment	Height of rice per plant	No. of tillers per plant	No. of panicles per plant	No. of seeds per plant	Hundred seed weight (g)
T1 (rice + rice)	57.3 b	3.0 b	3.0 b	331.7 b	2.6 b
T2(rice+Diyasiyambala)	65.7 a	4.3 a	4.3 a	428.0 a	2.8 a
T3 (rice + Kudamatta)	46.3 c	2.3 c	2.3 b	242.0c	2.6 c
T4 (rice + Thunassa)	43.3 c	2.0 c	2.0 b	228.0 c	2.5 c

Column values followed by the same letter are not significantly different as determined by Duncan's multiple range test (P=0.05).Values in same column with same letter denoted non- significant difference.

Comparing to the control, shoot length (25.8%), number of tillers per plant, number of panicles per plant (29.4%), number of seeds per plant (61.6%) and hundred seed weight (13%) were increased in rice variety Ld 365 with Diya siyambala. It was reduced by other weeds kudamatta and Thunassa; shoot length (36.6%, 39%), number of tillers per plant, number of panicles per plant (23.5%, 29%), number of seeds per plant (34%, 37%) and hundred seed weight (10%, 10.3%) respectively (Table 2**)** (Figure 2).

Table 2. Rice growth and yield performance (variety- Ld 365).

Treatment	Height of rice per plant	No. of tillers per plant	No. of panicles per plant	No. of seeds per plant	Hundred seed weight (g)
T_1 (rice + rice)	46.3 b	2.8 b	2.8 b	301.3 b	3.0 b
T_2 (rice+Diyasiyambala)	58.2 a	3. 7 a	3.7 a	486.8 a	3.4 a
T_3 (rice + Kudamatta)	29.3 c	2.2 c	2.2 c	198.3 c	2.7 c
T_4 (rice + Thunassa)	28.2 c	2.0 c	2.0 c	189.0 c	2.7 c

Column values followed by the same letter are not significantly different as determined by Duncan's multiple range test (P=0.05).Values in same column with same letter denoted non- significant difference.

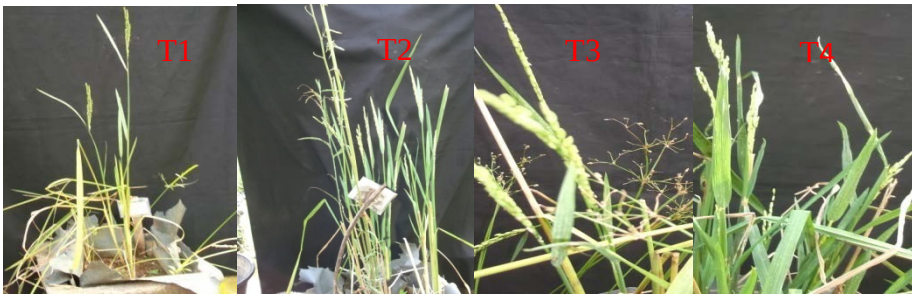

Figure 2: Growth of rice plant with Diyasiyambala, Kudamatta and Thunassa

Comparing to the control, shoot length (14.87%), number of tillers per plant (27.27%), number of panicles per plant (10.46%), number of seeds per plant (9.23%) and hundred seed weight (9.58%) were increased in rice variety Bg 357 with Diyasiyambala. It was reduced by other weeds kudamatta and Thunassa; shoot length (5.40%, 6.19%), number of tillers per plant(36.37%,36.37%), number of panicles per plant (30.2%, 39.5%), number of seeds per plant (24.5%, 26.5%) and hundred seed weight (11.75%, 11.75%) respectively (Table 3).

Table 3.Rice growth and yield performance (variety Bg 357)

Treatment	Height of rice per plant	No. of tillers per plant	No. of panicles per plant	No. of seeds per plant	Hundred seed weight (g)
T1 (rice + rice)	63.3 b	3. 7 b	7.2 a	453.0 b	2.8 b
T2 (rice + Diyasiyambala)	72.7 a	4. 7 a	6.4 a	494.8 a	3.2 b
T3 (rice + Kudamatta)	59.8 c	2.3 c	5.0 b	342.0c	2.5 c
T4 (rice + Thunassa)	59.3 c	2.3 c	4.3 b	332.7 c	2.5 c

Column values followed by the same letter are not significantly different as determined by Duncan's multiple range test(P=0.05).Values in same column with same letter denoted non- significant difference.

IV. CONCLUSION

Diyasiyambala (*Aeschynomene indica*- legume weed) in the paddy field increase the growth and yield of selected rice varieties (variety Bg 379-2, Ld 365, Bg 357) in the case of Diyasiyambala increase the soil fertility by adding nitrogenous organic matter to the soil.

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