Effect of Different Densities of *Isachne globosa (Thunb.) O.Ktze* on Growth and Yield of Rice (*Oryza sativa* L.)

D.D. Witharana, H.K.S.G. Gunadasa
Uva Wellassa University, Badulla, Sri Lanka

and

A.S.K. Abeysekara
Rice Research and Development Institute, Batalagoda, Sri Lanka

Introduction

Weeds are the major biotic stress in rice production while act as a universal pest in agriculture. Weed management is the key factor towards achieving high productivity in rice cultivation. It has been reported in Sri Lanka that 30-40% of rice yields are generally lost due to weed competition in Sri Lanka (Abeysekera, 2001). Degree of loss due to weeds could be varied, depending on type of weed species, weed density, duration of crop weed interference, rice cultivar and cultural practices. Weeds grow quickly in direct seeded wetland rice cultivation compared with the weeds growth in wetland transplanted rice cultivation and other crops. *Isachne globosa* is one of the major noxious weed associated with the yield reduction of rice, across all agro ecological zones of the country. Even more present of *I. globosa* on rice field may not be economic to control and contemplate on herbicide spraying also depends on the density of weeds. No scientific study has conducted to find out the competitiveness of *I. globosa* and its effect on growth and yield of rice. Hence, the objective of this study was to find the effect of different densities of *I. globosa* on growth and yield of rice.

Methodology

A field experiment was conducted in an open ground at the Weed Science Division of Rice Research and Development Institute, *Batalagoda* which is in the Low country Intermediate Zone of Sri Lanka, during Dry season (*Yala*) from May to September 2013. The pots were filled with puddle soil which was directly taken from the field, with a pH of 5.95, cation exchange capacity 115µS/cm, soil organic matter 1.80%, available N 18meq/100g, lsen's P 1 ppm, and available K 0.11meq/100g. In this experiment, 30cm*30cm pots were used in Complete Randomized design (CRD) with three replicates. The treatments were consisted with seven different densities of naturally occurred *I. globosa* 22, 43, 65, 86, 108, 129, 151 plants/m^2 and control. Three months old rice variety Bg 300 was used in the study and sprouted seeds were sown in the 7.5cm*7.5cm and *I. globosa* stem cuttings were planted surrounding the rice seedlings maintaining equal distance. The un-introduced weeds were uprooted time to time to maintain the desired weed density. All the other plant protection and agronomic practices were adopted according to the recommendations of the Department of Agriculture. Plant growth parameters were collected in two weeks interval and 56 days old weeds were uprooted to measure the dry weight. The number of panicles per square meter, number of grains per panicle, filled grain percentage, thousand grain weight and grain yield per square meter were recorded after harvest. The data were statistically analyzed using the statistical package Minitab15.

Results and Discussion

Plant Growth Characters

Height of rice plants (Bg 300) showed significant reduction with increase weed competition in 4WAS. Moorthy (1996) reported similar observation. The least value observed under 151 weeds/m^2 and 43 -151 weeds/m^2 showed a significant delay of rice plant growth as per the height parameter. Number of leaves per plant and number of tillers per plant were also significantly affected by weed competition (Table 1). Weed density was critically affected on

growth parameter where density above 43 plants/m^2. Growth parameters were significantly affected for interaction effect of weed density and the time duration. The dry matter accumulation of weeds showed a significant increase with increased weed competition. Data further indicate that rice plant dry weight decrease with increase weed density of *I. globosa* at 4 WAS.

Table 1. Plant growth parameters of rice under different weed densities.

Weed density (weeds/ m^2)	Dry weight of weeds (*10^{-3}kg /m^2)	Plant height (cm)	No. of Leaves (plant^{-1})	No. of Tillers (plant^{-1})	Dry weight of Bg 300 (*10^{-3}kg/plant)
0	00.00	65.72	41.77	12.00	9.08
22	213.48	56.78	31.44	8.11	7.45
43	314.49	48.53	25.77	5.77	4.37
65	390.74	46.24	18.66	3.44	2.95
86	513.05	45.04	16.88	3.11	3.75
108	549.60	44.85	14.66	2.66	3.67
129	609.90	43.47	11.77	2.55	2.26
151	668.35	41.64	11.11	2.00	1.83

Yield Components

In this study the effect of weed density significantly affect on the panicles/m^2. Consequently the inter-specific competition with weeds rendered the number of effective tillers (Table 2).

Table 2. Yield and yield components of rice under different weed densities.

Weed density (weeds/ m^2)	No. of panicles /m^2	Grains/panicle	Filled grain %	1000 grain weight (*10^{-3}kg)	Grain yield (*10^{-3} kg/m^2)	% yield loss over control
0	624.33	115.3	94.32	25.008	1214.5	0.00
22	484.39	89.27	92.34	24.315	999.7	17.69
43	419.81	80.07	91.67	20.777	879.9	27.555
65	387.51	78.17	90.44	20.971	821.5	32.358
86	312.16	69.57	88.20	19.725	798.8	34.228
108	312.16	68.93	87.69	18.714	777.5	35.983
129	236.81	65.53	84.70	18.72	762.3	37.233
151	226.05	66.27	85.19	17.513	661.0	45.573

Mamun et al. (1986) found similar reduction of panicle plant^{-1} due to the competition from weeds. The number of grains per panicle and grain filling percentage were significantly reduced due to the severe competitive effect of weeds. Thus thousand grain weights showed a decrease trend with increased weed density but Rao and Moody (1992) reported that weed competition did not affect the grain weight of rice. Grain yield of Bg 300 plants have showed a significant negative correlation over the *I. globosa* density. But increased weed density rendered the decrease rate of the yield due to inter species competition of weeds. Weed density of *I. globosa* of 22 plants/ m^2 and 151 weeds/ m^2 reduce yield 17.69 - 45.57% respectively. Islam et al. (2003) recorded the same result with increased weed competition.

Conclusions

The results showed that the growth parameters and yield was significantly affected by *I. globosa* competition. The growth parameters affected after the early vegetative stage (4WAS) and yield

parameter recorded a significant negative interaction with weed density more over the growth parameters.

References

Abeysekera, S.K., 2001. Management of *Echinochloa spp*. in rice in Sri Lanka. Paper presented at the FAO workshop on *Echinochloa* spp. control, Beijing, China, 13.

Mamun, A.A., Ahmed, S., Sarker, A.U., 1986. Critical period of crop weed competition in direct seeded Aus rice. Bangladesh Journal of Agricultural Science, 13, 61-66.

Islam, F., Karim, S.M.R., Haque, S.M.A., Islam, S., Islam, S. 2003. Effect of population density of *Echinochloa crusgalli* and *Echinochloa colonum* on rice. Journal of Agronomy, 2: 120-125.

Moorthy, B.T.S., Das, T.K., 1996. Threshold level of weed umbrella sedge (*Cyperus irria*) in upland rice (*Oriza sativa*) under rain-fed direct-seeded condition. Indian Journal of Agricultural Science, 68(1), 7-8.

Rao, A.N., Moody, K., 1992. Competition between *Echinochloa glabrescens* and rice (*Oryza sativa*). Tropical Pest Management, 38(1), 25-29.