IMPACT OF ROOT CLIPPING ON SHOOT AND ROOT GROWTH OF TRANSPLANTED RICE SEEDLINGS UNDER LOW COUNTRY WET ZONE CONDITIONS

A.H.G. MITHRASENA AND I. DISSANAYAKE
Regional Agricultural Research & Development Centre,
Bombuwela.

Rice cultivation in the Low Country Wet Zone (LCWZ) under transplanted conditions is very limited due to unavailability of labour. It is believed that no substantial yield difference between direct seeded (broadcasting) and transplanted rice exists if the stand establishment of the direct seeded rice crop is satisfactory (Mabbayad and Obordo,1970). However, either unusual heavy rains or flash floods prevail mostly during the sowing time in the LCWZ which is a critical factor that is generally associated with the poor crop stand resulting from wash off and/or rotting of seeds. These situations finally lead to severe yield losses in the direct seeded rice crop. As a result, establishment of rice under transplanted condition is still popular among some farmers in the areas where unfavorable weather conditions are experienced during the periods of crop establishment. Since the cost of rice cultivation is going up day by day, increasing grain yield in transplanted rice crop is immensely important to compensate the additional cost involved in transplanting. Accordingly, the preliminary objective of this study is to understand how root clipping of rice seedlings effects the shoot and root growth in the transplanted rice crop and the knowledge grained from this study could be subsequently utilized to determine whether the proposed technique would be beneficial to get an economical yield increase of the transplanted rice crop under LCWZ conditions.

MATERIALS AND METHODS

Locally bred 3.5 month, white pericarped, high yielding rice variety; Bg 395 was used as test variety. The 2 week old rice seedlings were planted in plastic pots by removing roots at different proportions as shown in figure 1. Accordingly, the seedlings with entire root system (i.e. No Root Clipping

–NRC), 1/3 root of clipping from the bottom of the root mass (i.e. 1/3 Root Clipping Treatment – 1/3 RCT) and 2/3 root of Clipping from the bottom of the root mass (i.e. 2/3 Root Clipping Treatment - 2/3 RCT) were tested as treatments. All growth measurements were statistically analyzed using CRD replicated five times.

Soils (pH 6.5 and organic matter less than 5) collected from research field was used to fill up the pots under similar soil compaction. Before filling, soils were fertilized with NPK fertilizer mixture (i.e. approximately 50 Kg of soils mixed with 6.0 grams Urea, 4.5 grams Triple Supper phosphate and 4.0 grams Muriate of Potash). The 14 days old seedlings obtained from the wet bed nursery were planted one seedling per pot. They were allowed to grow for just 24 days before seedlings were taken for shoot and root growth studies. During this period of seedling growth, they were fully exposed to natural sun light. The seedlings were well watered twice a day by maintaining about 2 mm water level in the pots. Furthermore, weed growth in the plots was managed by hand weeding and appropriate control measures recommended by Department of Agriculture were also taken to protect seedlings from diseases and pests until the seedlings were removed from the pots. The roots were carefully washed several times with tap water for complete detachment of soil particles before they were ready for photography as well as shoot and root growth measurements. Dry weight of the root and shoot were measured after oven drying of the plant samples at 60^0 C for a period of three days. Just after removal of plant samples from the oven, they were kept in a desiccator in order to avoid the moisture absorption from the oven dried plant samples until they were taken for weighing.

RESULTS & DISCUSSION

It was observed that production of tillers as well as roots per seedling with respect to two different proportions of root clipping has substantially increased compared to unclipped transplanted seedlings (control). Furthermore, comparison of oven dried root samples of the different treatments has further proven that root weight of the root clipped rice seedlings is significantly higher

than that of the control (Table 1). Therefore, these observations further suggest that acceleration of root and shoot growth of the root clipped rice seedlings take place. This may be due to physiological changes develope inside the root clipped seedlings. Furthermore, development of adventitious roots at 24 days after transplanting clearly illustrates the vigor in the root clipped rice seedlings (Fig. 2). In addition, comparison of shoot root ratios of the different treatments indicate that no significant differences could be seen among them (Table 1). It is obvious that excess root growth of the root clipped rice seedlings tend to produce a greater aerial biomass and a higher crop growth compared to control so that the shoot root ratio remains unchanged (Table 1). Therefore, further studies have already been initiated to refine this technique so that root clipping may be recommended for a higher economical yield of the transplanted rice crop in the LCWZ.

CONCLUSION

Based on this study, it can be concluded that significant improvement of root and shoot growth of the rice seedling can be obtained by application of root clipping in transplanted rice seedlings.

ACKNOWLEDGEMENT

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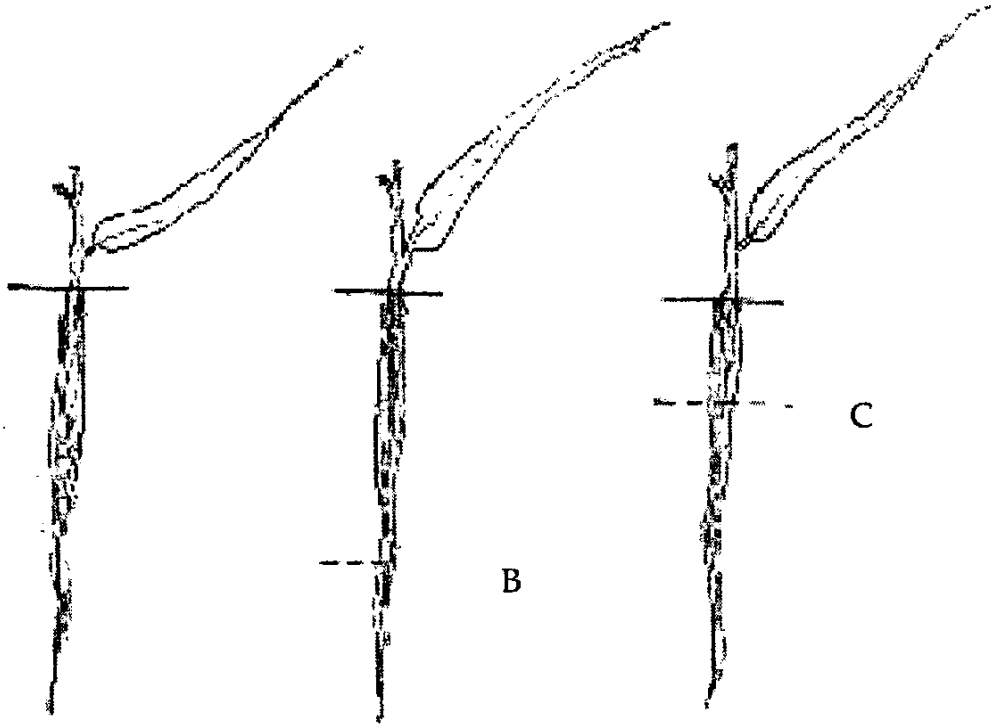


Figure 1. Method of root clipping applied to 2 week old rice seedlings (A- seedling with entire root system used the as control, B-1/3 root clipping from the bottom of the root mass C-2/3 root clipping from the bottom of the root mass)

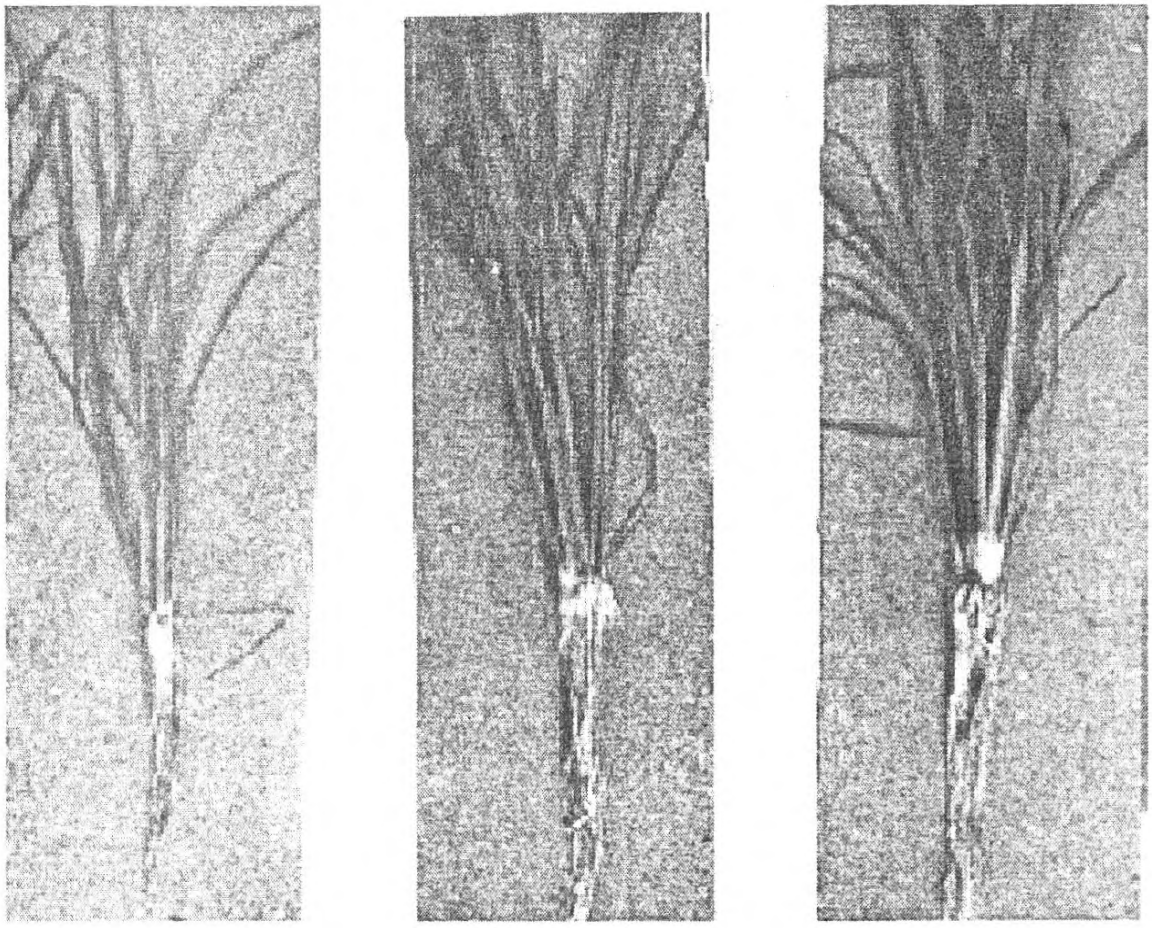
Table 1. The effect of root clipping on growth of the root and shoot of 2 week old rice seedlings observed at 24 days after transplanting

Treatment	Tiller number per seedling	Shoot dry weight (g)	Root dry weight (g)	Shoot/root ratio
NRC	8.4	0.68	0.38	2.03
1/3RCT	12.6	1.25	0.57	2.12
2/3 RCT	13.8	1.32	0.71	1.90
LSD (p=0.05)	1.45	0.19	0.15	ns *
CV%	9.04	12.93	18.78	9.66

* ns- not significant

NRC – No Root Clipping

RCT - Root Clipping Treatment



No root clipping 1/3 root clipping 2/3 root clipping

Fig. 2. **Differences of root and shoot growth of the 2 week old rice seedlings observed in pot experiment at 24 days after transplanting**

REFERENCES

Mabbayad, B.B and R.A. Obordo, 1970. Methods of planting rice. Pages 84-88 in University of the Philippines Collage of Agriculture in cooperation with the International Rice Research Institute. *Rice production manual*. Los Banos, Philippines

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