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EVALUATION OF MECHANICAL AND CHEMICAL WEED MANAGEMENT IN RICE

Gangwar, S. K. & Reyaz Ahmad
KVK, Madhopur, (RPCAU) West Champaran, Bettiah, Bihar
Corresponding Authors email: drskgangwar3@gmail.com

ABSTRACT
The economical method for weeding has a significant role in reducing cost of operation and enhance timeliness of operation. In this study T1 (Farmers practice, weeding by khurpi), T2 (Bispyribac sodium) and T3 (Weeding by grubber developed by KVK, Madhopur) were observed in plot size of 500 m^2 and data recorded for different parameters i.e. Field Capacity (ha/day), Weed mortality, Man-days/ha, Cost of operation (Rs /ha), Yield (q/ha), Cost of cultivation (Rs./ha), Gross return (Rs/ha), Net return (Rs./ha) and BC ratio for this experiment. The result showed that T3 better resulted in Gross return (Rs.62800/ha), Net return (Rs. 36700 /ha) and BC ratio (2.4) respectively.

KEY WORDS: Rice, economical method, weeding, cultivation cost, net return.

INTRODUCTION

Half of the world population is using Rice (*Oryza sativa* L.) as a food (Sinha and Talati, 2007; Ginigaddara and Ranamukhaarachchi, 2009). In most countries, focusing the presence of different elements in important foodstuff such as (Samadi- Maybodi and Atashbozorg, 2006). Wheat, rice and barley are the most important cereals cultivated in India but rice production in India is adversely affected by such inhibiting factors as traditional modes of production, small-scale operations, irrigation difficulties, lack of appropriate tools and equipment for mechanized farming, all preventing the rapid growth of rice production. These problems necessitate the introduction of mechanized rice transplanting to achieve timelier establishment and better crop stands (Hemmat and Taki, 2003). Weeds decrease about 25% of ground's potential yield in the developing countries like India and they are serious threat for agricultural products. Besides, weeds compete to crop plants in catching vapor, light and food in growth season and causing disturbance in cultivation, maintenance, yield withdrawal and reduction in quality and quantity of products (Tamado and Milberg, 2000). Anaya (2003) showed in an experiment that almost 12% of the total waste production is related to the lack of weeds control in fields. In order to control weeds, there are different ways all over the world such as hand weeding methods, chemical weeding, mechanical weeding and a combination of them. Remington and Pasner, (2000) have done a research about weeds control in the direct cultivation of rice in Gambia and they found that every day delay in weeding causes 25 kg ha-1 decrease in rice yield crop in direct cultivation. Fernandes and Uphoff, (2002) found that application of rotary weeders in American rice fields can play as a key factor of weed controlling. They showed that rotary weeders cause an increase in ventilation and give air to the soil and finally the better growth of root, stem and claw. Mahadi et al. (2006) reported that the lack of weed control in rice fields causes 80-100% yield resuction in Nigerea. Senthillkumar (2003) compared the rotary hand weeders with the common methods of weeding in India. In that study the mechanical weed control significantly increased the grain yield of rice plants. Mechanical weeding has an advantage of 10.9% of increase per hectare in yield crop rather than using hand weeding. Many researchers such as Moody (1990), Shibayama (1991), Uphoff (2003), Ramamoorthy et al. (1993), Rajkhowa (2008) studied the influence weeding on weeds/crop production. Atajuddin (2004) reported that the cost of mechanical weeding is almost 30% to 50% less than hand weeding. Today weeds management has an important role in increasing agricultural products all over the world (Ashton and Monaco, 1991). Rice production has some problems and seems that weed is one of them with major effect and cause 75 to 100% decreases in production (Imeokparia, 1989). Some of the effective factors in weeds population are rice genotype (variety), humidity, cultivation pattern, ploughing method, cultivation system, technology of weed controlling and etc. (Azmi and Baki, 2002). Acceptability of herbicides increased rapidly after 1980 due to the easiness of use and lack of need to costly labor. Therefore, weed control in rice is strongly dependent on herbicides (Kim et al., 2006; Khizar et al., 2003; Ishaya et al., 2007; Awan et al., 2000). Nowadays, finding the suitable methods of weed control has been aimed beside the consideration of environmental hazards. The purpose of this research is to examine the probability metrics of using weeder machines in order to control rice field weeds and compare the effects of mechanical, chemical and traditional ways on growth characteristic, yield and the yield components of rice.

About 15-20% of the weed population emerges in the period between one month and two months after transplanting (Zhang, 1996). Weeds decrease crop yields by 15 to 50 % depending on species, density and weeding time through competition with main crop for light, water and nutrition (Hasanuzzaman *et al.*, 2009). Patel *et al.* (1998) concluded that when the weeds were allowed to grow with the crop, the

production was reduced by 48.6%. Presence of weeds may also help in increased population of insects and diseases that cause major losses to farmers. Therefore, timely weeding is very essential and can only be done by using mechanical weeders which perform the job of weeding in less time with reduction in cost of operation. The objective of weeding and inter cultivation operation is to provide best opportunity for the crop to establish and grow vigorously and to get the good yield. Common ways for controlling weeds include cultural, mechanical, biological and chemical ones. Mechanical control is performed by hand and mechanical weeders are having importance from agronomical and environmental condition points of view (Gite and Yadav, 1990). Mechanical control not only kills the weed between rows, but also loosen soil surface, ensuring better soil aeration and water intake capacity. Manual hand weeding can give more effective weeding but it is a slow and more labour consuming method (Biswas, 1990). Moody (1990,1998,) suggested that the first weeding operation is done 3 to 4 weeks after transplanting and required 25 to 34 labours per ha depending on the weed density and second weeding is generally done 15 to 30 days after first weeding and usually required 12 to 15 labours per ha. As labourers are expensive and chemical measures affect environment causing soil and water pollution, therefore manually operated weeders like cono weeder, rotary weeder and power weeder/ Grubber may be used for controlling weeds. The efficiency of these weeders should be compared within themselves and also with hand weeding. Parida (2002) modified IRRI conical weeder and evaluated its field performance in paddy fields. He found that, field capacity and field efficiency of the weeder were 0.2 ha/h and 80%, respectively. Senthil Kumar (2003) compared the use of rotary weeder with the conventional hand weeding for wet season. Mechanical weed control significantly increased grain yields. Weeder use alone increased the plant height and enhanced the grain yield by 10.9 % as compared to manual hand weeding.

MATERIALS AND METHODS

The experiment was conducted in rice during Kharif season. The weeding implements were selected on the basis of their field utility, availability, economic conditions of farmers etc. Number of treatments was kept 3 with seven replications.

T_1= Farmers practice, weeding by khurpi
T_2= Bispyribac sodium
T_3= Weeding by grubber developed by KVK, Madhopur
Size of plot= 500 m^2

OBSERVATION

1.Weeding efficiency/ % Weed mortality

Number of weeds was counted before and after the operation

% Weed mortality= $(W_1-W_2)/W_1$ X100

Where W_1= Number of weeds before operation

W_2= Number of weeds after operation

2. Damage factor, DF (%)

DF (%) = (A / B) x 100

Where,

DF = plant damage, %

A= No. of injured plants (Cut or damaged) in 100 m length

B= Total No. of plants in 100 m length

Other parameters recorded i.e. Time required for weeding, h/ ha, Field capacity ha/ day, Economics

RESULTS AND DISCUSSION

Weeding efficiency

The maximum weeding efficiency was observed in the plots of T_3 (98%) followed by T_1 (95%). Weeding efficiency of Bispyribac sodium was observed to be 90%.

Plant damage

Highest percentage of plant injury was found in case of T_3 (0.25%) followed by T_1(0.10%), and Bispyribac sodium (0%).

Field capacity

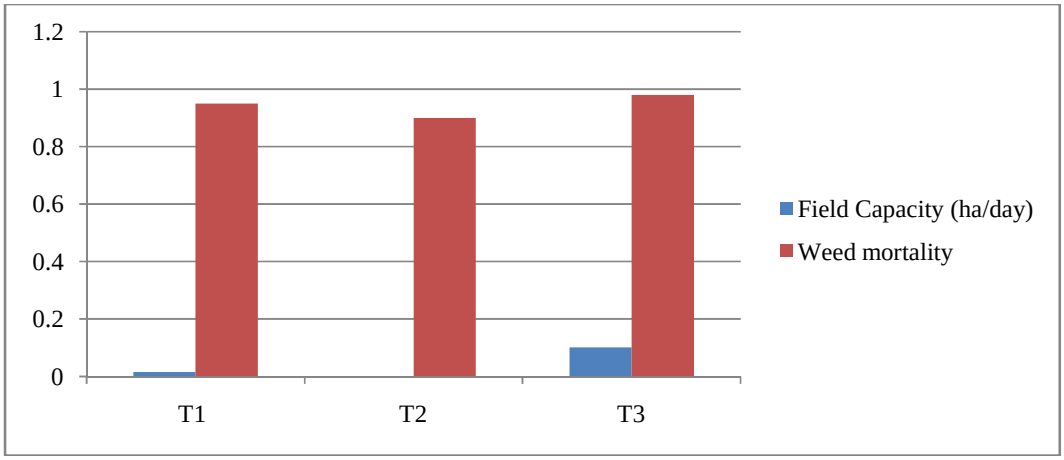
Field capacity 0.1 ha/day was achieved in case of T_3 followed by T_1 (0.016 ha/day). The wide difference in field capacity of different tools/ implements is because of difference in width of soil cutting parts i.e blades of implements as well as forward speed. Number of labourers required for weeding by grubber was 10 man-days/ha. In case of Bispyribac sodium number of labourers was 5 man-days/ha. Maximum labourers requirement was in case of khurpi (62 man-days/ha)

Economics

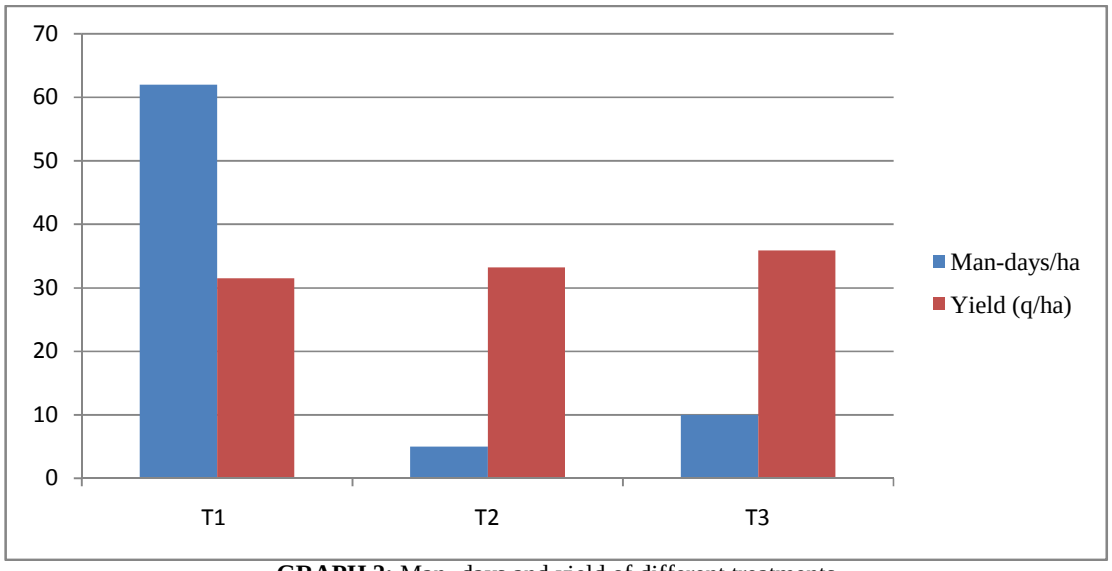
It is obvious from Table- 1 that maximum cost of operation was in case of T_1 (Rs 12000/ha) and minimum in case of T_2 (Rs. 2100/ha). Thus Rs 9900/ha could be saved by use of KVK Madhopur grubber. Cost of use of Bispyribac sodium (Rs 2900/ha) was slightly more against that of KVK Madhopur grubber. T_3 gave maximum yield (35.89 q/ha) which was at par with that of Bispyribac sodium (33.2 q/ha)) and significantly superior to that of khurpi (31.51 q/ha). Cost of cultivation was maximum in case of T_1 (Rs 36000/ha) and minimum in case of T_3(Rs 26100/ha). Thus reduction in cost of cultivation was 27.5%. Cost of cultivation in case of T_2 was slightly higher than that of T_3. Net return was maximum in case of T_3 (Rs 36700/ha) and minimum in case of T_1 (Rs 19140/ha). Thus net return was enhanced by 91.75 %. Grubber resulted in maximum B.C. ratio (2.4), whereas khurpi resulted in minimum B.C. ratio (1.5).

TABLE 1: Performance of parameters observed with different Treatments

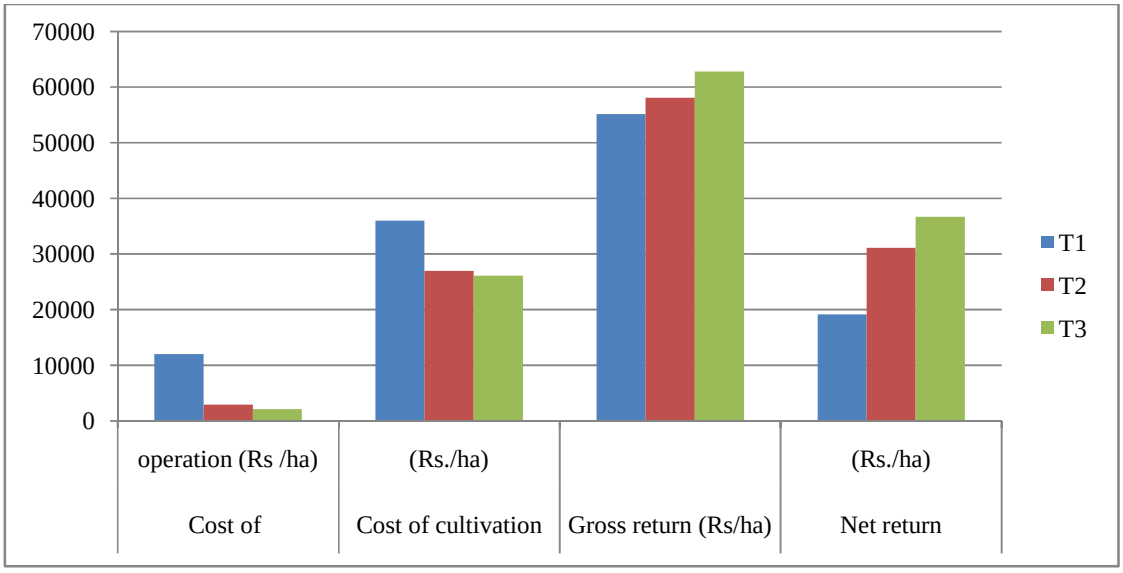
Technology option	Field Capacity (ha/day)	Weed mortality	Man-days/ha	Cost of operation (Rs /ha)	Yield (q/ha)	Cost of cultivation (Rs./ha)	Gross return (Rs/ha)	Net return (Rs./ha)	BC ratio
T_1	0.016	95%	62	12000	31.51	36000	55140	19140	1.5
T_2	-	90%	5	2900	33.2	27000	58100	31110	2.2
T_3	0.1	98%	10	2100	35.89	26100	62800	36700	2.4
					$CD_{5\%}$=3.52				
					CV= 11.03%				



GRAPH 1: Field capacity and weed mortality of different treatments



GRAPH 2: Man- days and yield of different treatments



GRAPH 3: Comparison of parameters for different treatments

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