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Effects of Trash Mulching Associated with Fungicide and Urea Spraying on First Ratoon Cane Production

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ABSTRACT

The experiment was conducted at Bangladesh Sugarcane Research Institute (BSRI) farm, Ishurdi, Pabna in first ratoon cane under irrigated condition during 2008-2009 cropping season to find out the effects of trash mulching associated with urea and fungicide spraying on stubbles of the preceding cane crop to increase yield and economic benefit. There were eight different treatments viz. Existing ratooning practice (T_1, control), T_1 + Trash mulching, T_1 + Fungicide spraying, T_1 + Urea spraying, T_1 + Trash mulching + Fungicide spraying, T_1 + Trash mulching + Urea spraying, T_1 + Fungicide spraying + Urea spraying and T_1 + Trash mulching + Fungicide spraying + Urea spraying. The highest number of tillers (219.00 × 10^3 ha^{-1}), millable cane (144.00 × 10^3 ha^{-1}) and cane yield (88.58 t ha^{-1}) were found in T_1 + Trash mulching + Fungicide spraying + Urea spraying treatment combination. Germination enhances 15 to 20 % by using fungicide (Bavistin 50 WP) and 10 to 15 % by using urea solution spraying. The trash mulching increased cane yield 20 % as compared to control plot. The highest gross return (Tk. 91,900.80 ha^{-1}) with maximum benefit cost ratio (BCR) of 2.44 was also obtained in T_1 + Trash mulching + Fungicide spraying + Urea spraying treatment.

Key words: Ratoon cane, trash mulching, urea & fungicide spraying

INTRODUCTION

Ratooning of sugarcane is common practice in cane growing countries of the world. Barma *et al.* (2006) reported that about 20 % area is under ratoon cane in Bangladesh while in developed sugarcane growing countries like Mauritius, Cuba, Barbados, Ethiopia, Tanzania, Jamaica, Guyana, Argentina, Venezuela, Egypt, Australia, South Africa, Brazil and Philippines generally keep 50-70% of their total cane area under ratoon which produces almost equal yield to that of plant cane. In India about 50% of total cane areas are under ratoon and it saves about 30-35% cost of cultivation (Singh, *et al*, 2003). Ratoons are profitable because nothing is spent on land preparation, planting operation, seed materials etc. Besides saving cultivation cost, ratoons have an additional advantage in giving better juice quality and sugar recovery in comparison to plant crop of the same variety under similar conditions (Yadava, 1993). The main advantage of ratooning in sugarcane lies in its reduced crop life and cost of production as well as higher sugar recovery (Verma, 2002). Therefore, to make sugar industry profitable more cane areas should be brought under ratoon. In Bangladesh per hectare yield of sugarcane is about 41 tons (46 t ha^{-1} in sugar mills zone areas and 36 t ha^{-1} in non-mill zone areas) (BBS, 2008), whereas on an average 71.5 t ha^{-1} in other sugar producing countries (FAOSTAT, 2009). Recovery percentage in Bangladesh is 6.61-8.4% while 8.5-

11.0% in other countries viz. Brazil, Australia, Thailand and Mauritius and even in some provinces of neighbouring country like India and Pakistan (Alam *et al.*, 2009). The national average cane yields and recovery are greatly influenced by low ratoon yields. This low yield and recovery of cane depend mainly for management factors in the production level. Ratoons yield can be improved by proper attention and adoption of proper technologies. To burn all sugarcane trash after harvesting is a very common tradition in Vietnamese sugar cane production for many years. The advantages of trash burning are to destroy some harmful diseases and insects in the cane field, to provide some small amounts of potassium and phosphate for cane growing and to make the ratoon preparation easier after harvesting. But trash muching has proved advantageous in conserving soil moisture, in soil protection (against erosion and nutrient leaching), in controlling the weeds, and especially in increasing organic matter and nitrogen fixation by soil micro-organisms (Patriquin, 1982). Phan (1995) reported that trash mulching on the soil surface increased biomass production, improved soil fertility and increased the amount of carbon sequestered in soil; application of urea to the soil, up to a level of 150 kg N/ha, increased biomass yield and the nutritional quality of the sugar cane for animal feeding. Many sugarcane producing countries in the world have obtained higher yields with ratoon crops by application of trash mulching in the cane field after harvesting. Srivastava (2006) stated that trash management, fungicide and urea spraying in ratoon field enhance germination of cane, overcoming drought, weed control, adds organic matter and improved soil fertility. So the study was undertaken to evaluate the effects of trash mulching in association with urea and fungicide spraying on stubble of first ratoon cane to increase yield and economic benefit.

MATERIALS AND METHODS

The experiment was conducted during 2008-2009 cropping seasons at Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna in first ratoon cane under irrigated condition. The site represents the High Ganges River Floodplain soil under Agro-Ecological Zone-11 with medium high land of typical sandy loam with pH 7.6. The following treatments were included in this experiment:

T_1 : Existing ratooning practice (control)
T_2 : T_1 + Trash mulching
T_3 : T_1 + Fungicide spraying
T_4 : T_1 + Urea spraying
T_5 : T_1 + Trash mulching + Fungicide spraying
T_6 : T_1 + Trash mulching + Urea spraying
T_7 : T_1 + Fungicide spraying + Urea spraying
T_8 : T_1 + Trash mulching + Fungicide spraying + Urea spraying

The experiment was laid out in a randomized complete block design with three replications. The plot size was 12.0m x 10.0m. Sugarcane variety Isd 34 was used as the test crop. Chemical fertilizers viz. N, P, K, S and Zn @ 150, 50, 90, 34 and 3.5 kg ha^{-1} were applied respectively (BARC, 2005). In addition with the above dose, 40 kg N ha^{-1} was applied immediately after the harvest of plant crop. Fungicide (Bavistin 50 WP) @

one gram per liter water and urea 10g per liter water solution were sprayed on left over stubbles of the preceding plant crop. Furadan 5G was applied @ 40 kg ha^{-1} three times during December, March and May to control insect infestation. Other intercultural operations like irrigation, weeding, mulching, earthing-up, tying etc were done as and when required. Data on yield and yield contributing characters were recorded. Chemical analysis of sugarcane juice was done at harvest. The collected data were statistically analyzed following the procedures as outlined by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Germination% (clump basis)

Trash mulching, fungicide and urea spraying enhance germination buds on the left over underground stubbles of the preceding cane crop. Germination depends on temperature and soil moisture status. Optimum temperature required for good germination ranges from 25°c to 35°c and soil moisture 70-80% of field capacity (Barnes, 1974 and Miah *et al.*, 1988). The highest germination was recorded (99.00%) in T_8 treatment (existing ratooning practice + Trash mulching + Fungicide spraying + Urea spraying) followed by T_6 (94.00%) while the lowest was (70.00%) in T_1 treatment (existing ratooning practice, control plot) (Fig. 1). Germination enhanced 15 to 20 % by using fungicide (Bavistin 50 WP) and 10 to 15 % by using urea solution spraying.

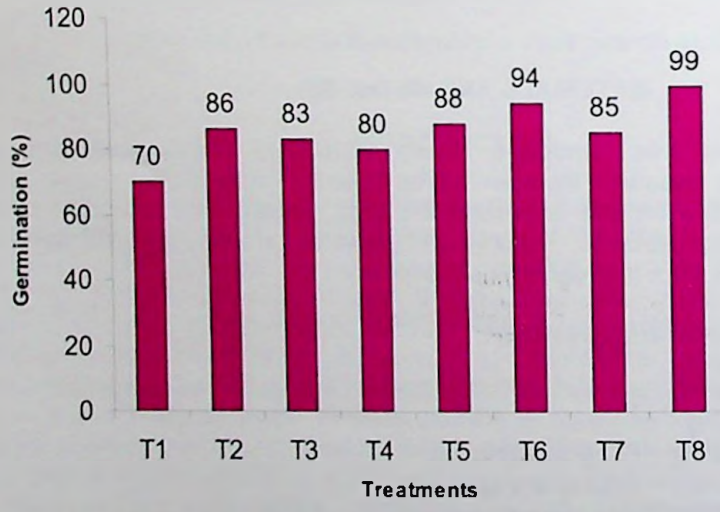

Fig. 1. Germination (%) on clump basis as affected by different treatment combinations

Tiller populations

Significantly maximum tiller population of 219.00 × 10^3 ha^{-1} was recorded from the T_8 treatment (T_1 + Trash mulching + Fungicide spraying + Urea spraying) followed by

the T_7 treatment (T_1 + Fungicide spraying + Urea spraying). It may be due to adequate moisture present in surface soil and very few infestations of disease and pest. The lowest tillers of 171.00 × 10^3 ha^{-1} was from the T_1 (existing ratooning practice, control) treatment (Table 1).

Table 1. Effects of trash mulching associated with urea and fungicide spraying on tiller, millable cane and yield in first ratoon crop

Treatments	Tiller (10^3 ha^{-1})	Millable cane (10^3 ha^{-1})	Yield (t ha^{-1})
T_1 : Existing ratooning practice (control)	171.00	121.00	65.94
T_2 : T_1 + Trash mulching	180.00	125.00	79.02
T_3 : T_1 + Fungicide spraying	185.00	126.00	80.00
T_4 : T_1 + Urea spraying	187.00	129.00	81.83
T_5 : T_1 + Trash mulching + Fungicide spraying	190.00	133.00	81.00
T_6 : T_1 + Trash mulching + Urea spraying	190.00	134.00	83.28
T_7 : T_1 + Fungicide spraying + Urea spraying	202.00	138.00	86.94
T_8 : T_1 + Trash mulching + Fungicide spraying + Urea spraying	219.00	144.00	88.58
CV %	8.66	9.07	15.30
LSD (0.05)	28.91	20.83	21.65

Millable cane stalks

The numbers of millable cane stalks were also significantly increased by trash mulching, fungicide and urea spraying. The highest number of millable cane stalks (144.00 × 10^3 ha^{-1}) was recorded from the T_8 (T_1 + Trash mulching + Fungicide spraying + Urea spraying) followed by the T_7 treatment (T_1 + Fungicide spraying + Urea spraying) and the lowest number of millable cane (121.00 × 10^3 ha^{-1}) was from the T_1 (Existing ratooning practice, control) treatment. The maximum number of millable cane production in the T_8 plot might be due to the higher number of tiller production compared to other plots. The reasons for lower number of millable cane production in the existing ratooning practice might be due to poor germination and higher tiller mortality.

Cane yield

Significantly the highest cane yield of 88.58 t ha^{-1} was recorded from T_8 (T_1 + Trash mulching + Fungicide spraying + Urea spraying) and followed by the T_7 (T_1 + Fungicide spraying + Urea spraying) while the lowest (65.94 t ha^{-1}) from T_1 (existing ratooning practice, control). The trash mulching increased cane yield 20 % as compared to the control plot. Positive effects of mulching with dead leaves on yield of sugarcane in Philippines were reported by Mendoza (1988); the effect was more marked in the ratoon crop.

Pol % cane

There was no significant effect on pol % cane among the different treatment combination (Fig. 2).

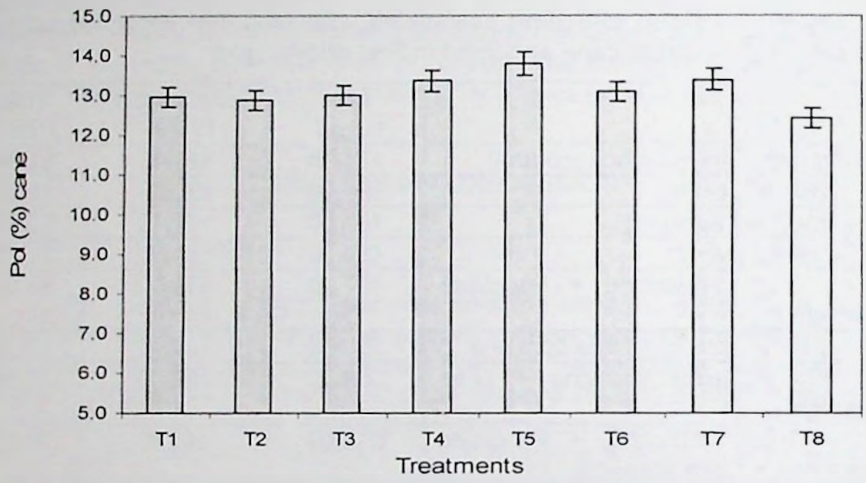

Fig. 2. Pol (%) cane as affected by trash mulching on ratoon cane

The highest pol% cane (13.79 %) was recorded from the T_5 (T_1 + Trash mulching + Fungicide spraying) followed by the T_7 treatment (T_1 + Fungicide spraying + Urea spraying). On the other hand, the lowest pol% cane (12.40 %) was from the T_8 (T_1 + Trash mulching + Fungicide spraying + Urea spraying) treatment. This finding was agreed with Nguyen Thi Mui (1994) who found that the pol % value was less for sugar cane managed with trash mulching to the soil surface.

Economics

The economic analysis of the experiment under different treatment combinations is shown in Table 2. Among the treatment combinations, the highest total production cost of Tk. 64,000 ha^{-1} was for treatment T_8 followed by Tk. 63,000 ha^{-1} for treatment T_7 while the lowest of Tk. 61,000 ha^{-1} for treatment T_1 existing ratooning practice only . The total production costs varied due to variation of cost of production of different treatment combinations.

Table 2. Economics of trash mulching with urea and fungicide spraying on first ratoon cane

Treatments	Total variable cost (Tk. ha^{-1})	Gross return (Tk. ha^{-1})	Gross margin (Tk. ha^{-1})	BCR
T_1 : Existing ratooning practice (control)	61,000	1,16,054.40	55,054.40	1.90
T_2 : T_1 + Trash mulching	62,000	1,39,075.20	77,075.20	2.24
T_3 : T_1 + Fungicide spraying	62,500	1,40,800.00	78,300.00	2.25
T_4 : T_1 + Urea spraying	61,500	1,44,020.80	82,520.80	2.34
T_5 : T_1 + Trash mulching + Fungicide spraying	63,500	1,42,560.00	79,060.00	2.25
T_6 : T_1 + Trash mulching + Urea spraying	62,500	1,46,572.80	84,072.80	2.35
T_7 : T_1 + Fungicide spraying + Urea spraying	63,000	1,53,014.40	90,014.40	2.42
T_8 : T_1 + Trash mulching + Fungicide spraying + Urea spraying	64,000	1,55,990.80	91,900.80	2.44

Price of sugarcane: Tk. 1,760 t^{-1}

The highest gross return (Tk.1,55,990.80 ha^{-1}) was recorded from T_8 treatment followed by T_7 (Tk 1,53,014.40.ha^{-1}) and the lowest (Tk.1,16,054.40 ha^{-1}) was from the T_1 (control plot). In case of gross margin, the highest value (Tk.91,900.80 ha^{-1}) was recorded from T_8 treatment followed by T_7 (Tk.90,014.40 ha^{-1}) and the lowest (Tk.55,054.40 ha^{-1}) was from the T_1 treatment. The highest benefit-cost ratio (BCR) of 2.44 was recorded from T_8 and the lowest BCR (1.90) was from T_1 treatment.

The overall results revealed that existing ratooning practice with trash mulching, fungicide and urea spraying was found superior compared to other treatments. About 5 to 10 tonnes of more cane yield was obtained in the trash mulched plots at Anakapalle, Andhra Prodesh (Sundara, 1987). Therefore, trash mulching associated with fungicide and urea spraying on the ratoon crop can be practiced for large-scale adoption in farmers' field.

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