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Performance of Spices-Mungbean Intercropping in Paired Row Transplanted Sugarcane

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ABSTRACT

The experiment was conducted at Bangladesh Sugarcane Research Institute (BSRI) farm under irrigated condition during 2003-2004 cropping season to study the performance of seven spices viz. black cumin, fenu greek, aniseed, carum, dill, firingi and corriander as first intercrops followed by mungbean as second intercrop in paired row cane (PRC). Intercrops fenu greek and fringi increased cane yield while carum, dill and coriander decreased slightly. However, firingi and fenu greek gave higher gross return compared to other intercrops. The highest cane yield of 125.56 t ha-1 was recorded from PRC + fenu greek-mungbnean followed by PRC + firingi-mungbnean (121.25 t ha-1) while the lowest yield of 106.25 t ha-1 from PRC + coriander-mungbnean. Maximum benefit cost ratio of 3.28 was found from PRC + firingi-mungbnean combination. Growing mungbean as second intercrop with PRC generated an additional income from the same field. Therefore, intercropping spices like firingi, fenu greek and black cumin as the first intercrops and mungbean as the second intercrop in paired row transplanted sugarcane is found to be a profitable intercropping practice with sugarcane.

Key words: Intercropping, transplanted sugarcane, spices, mungbean

INTRODUCTION

Sugarcane (*Saccharum officinarum* L) is a long duration crop. From planting to harvest it requires 12 to 14 months. The growth of sugarcane is slow in earlier stages and it takes about 3 to 5 months to establish the full canopy of the crop (Yadava, 1991). During the early stage of sugarcane growth, some short duration crops viz. vegetables, pulses, oil seeds and spices can be grown as intercrop in the vacant spaces between two cane rows. To make intercropping more profitable per unit area and time with sugarcane, it is necessary to produce more than one intercrop (Hossain et al., 1995 and Khan *et al.*, 1995). Ali *et al.* (1989) observed that there was no significant adverse effect of row arrangement on the growth, yield and sucrose content of sugarcane. Successfully intercropping of various crops with sugarcane has been reported by many researchers (Rathi *et al.*, 1974; Behhi and Narwal, 1977; Verma *et al.*, 1981 and Imam *et al.*, 1990). Previous results on intercropping identified potato, onion, garlic and cabbage as most profitable intercrops with sugarcane which might help to get interim benefit for the poor farmers (Matin *et al.*, 2001 and Alam, 1999). Spice crops are very popular and favourite in Bangladesh but its present production is far below than actual requirement. Only 0.15 million hectare of land is used for cultivation of a good number of spices producing only 0.32 million tons indicating a deficit of 0.28 million tons. Expecting the possibilities of intercropping spices with sugarcane in paired row system may help to produce substantial amount of spices crops which will help to meet the growing demand of the crop and earn additional benefit of the farmers. Paired row system of sugarcane planting has been designed to keep two rows of cane at 60 cm apart leaving 120-140 cm between two such paired rows for growing intercrops (Roach, 1977). The practice of intercropping may be more productive and economic through adoption of paired row systems following spaced transplanting of sugarcane which provides desired optimum plant population and increases space for intercropping. Furthermore, the rate for spices consumption is increasing day by day with rising population but there is a scope to increase spices production by hardly any horizontal expansion of land. Therefore, immediate technological interventions are necessary for increasing the spices production through adoption of with paired row sugarcane. After harvesting of first intercrop, the system facilitates growing a second intercrop like mungbean or green manuring crops. In view of the above situation the present experiment has been designed to grow sugarcane and spices from the same piece of land with better economic return.

MATERIALS AND METHODS

An experiment was conducted at Bangladesh Sugarcane Research Institute (BSRI) farm, Ishurdi, Pabna during 2003-2004 cropping season under irrigated condition. The site represents High Ganges River Floodplain under Agro-ecological Zone-11, with medium high land of typical sandy loam soil having pH 7.6. Seven different spices as first intercrops viz. black cumin (*Nigella sativa*), fenu greek (*Trigonella foenum-graecum*), aniseed (Foeniculum vulgare), carum (Carum roxburghianum), dill (*Peucedanum graveolens*), firingi and corriander (*Coriandrum sativum*) followed by a second intercrop mungbean (*Vigna radiata L*) variety Binamoog-5 were grown with sugarcane variety Isd 31 to find out the most suitable spices intercrop combinations for sustainable sugarcane production. The experiment was laid out in randomized complete block design (RCBD) with three replications. The unit plot size was 8m x 6m and the treatment combinations were as follows:

T_1 : Paired row cane (PRC), control
T_2 : PRC + black cumin (kalo jira)-mungbean
T_3 : PRC + fenu greek (methi)-mungbean
T_4 : PRC + aniseed (mouri)-mungbean
T_5 : PRC + carum (radhuni)-mungbean
T_6 : PRC + dill (soluk)-mungbean
T_7 : PRC + firingi-mungbean
T_8 : PRC + coriander-mungbean

Single budded settlings of sugarcane variety Isd 31 raised in soil bed were transplanted in each plot during mid November, 2003 with 30 cm interplant spacing in paired row of 60 cm intra row spacing. Spacing between two paired rows was 140 cm. Fertilizer for sugarcane Urea, TSP, MP and Gypsum were applied @ 347, 244, 184 and 222 kg ha^{-1} respectively (BARC, 1997). All TSP, Gypsum and one third (1/3rd) of MP were applied in trench and thoroughly mixed with soil prior to transplanting of settlings. The basal dose of Urea (1/3rd) was applied as side dressing at 21 days after transplanting (DAT) of settlings. The second dose of 1/3rd Urea and 1/3rd MP were applied as first top dressing at 90 DAT. Final top dressing of rest Urea and MP were applied at 150 DAT. In case of intercrops, Urea, TSP, MP and Gypsum for black cumin were applied @ of 60, 55, 45 and 30 kg ha^{-1}, for fenu greek @ of 50, 60, 50 and 40 kg ha^{-1}, for aniseed @ 50, 45, 40 and 25 kg ha^{-1}, for carum @ 50, 60, 50 and 40 kg ha^{-1}, for dill @ 50, 60, 50 and 40 kg ha^{-1}, for firingi @ 50, 60, 50 and 40 kg ha^{-1}, for coriander @ 50, 60, 50 and 40 kg ha^{-1} and second intercrop for mungbean only TSP and MP were applied @ 47 and 30 kg ha^{-1}. To control insect pests, furadan 5G was applied @ of 40 kg ha^{-1} in three splits in December, 2003, March and May, 2004. Other intercultural operations like irrigation, gap filling, weeding, mulching, earthing-up, tying, cross tying, etc. were done in time. Collection of data on yield and various yield contributing parameters of cane and intercrops were done. The yields of first and second intercrops were recorded at harvest. Tiller population of sugarcane was recorded at 90, 120, 150 and 180 DAT. Millable cane and yield were recorded at harvest. The cane equivalent yield for the intercropped plot were calculated by adding the cane yield with the equivalent cane yield obtained from the intercrops on the basis of sale value. Economic and statistical analysis on different parameters for sugarcane and intercrops were done following the standard procedures.

RESULTS AND DISCUSSION

Tiller and millable cane production:

Data on tiller and millable cane production under different treatments are presented in Table 1. There was no significant effect on tiller and millable cane production among the different treatment combinations. Similar result was also reported by Matin et al. 2001, in case of cauliflower, potato, carrot and knolkhol intercropped in paired row sugarcane. However, the highest tiller population of 179.03 $x10^3$ ha^{-1} was found from the control plot T_1 followed by T_2 (PRC + black cumin - mungbean) and T_3 (PRC + fenu greek - mungbean) while the lowest tiller was from T_4 (PRC + ani seed - mungbean). This indicated that intercropping with any spices crop has the tendency to suppress tiller production at early stage. But such effect was over come during millable stalk formation. In case of millable cane production, the maximum millable cane stalks (116.81 $x10^3$ ha^{-1}) was recorded from T_3 plot followed by T_7 (115.00 $x10^3$ ha^{-1}) and the minimum (103.61 $x10^3$ ha^{-1}) was from T_5 plot. But the figure does not differ significantly under different treatment.

Table 1. Tiller, millable cane, cane, intercrops and adjusted cane yield under different intercrops combinations. BSRI, 2004.

Treatments	Tiller (x103 ha-1)	Millable cane (x103 ha-1)	Cane yield (t ha-1)	Intercrop yield (t ha-1) 1st	2nd	Cane equivalent yield (t ha-1)	Adjusted cane yield (t ha-1)
T_1 =Paired row cane (PRC)	179.03	113.89	119.45	-	-	-	119.44 cd
T_2 =PRC+black cumin – mb	176.36	112.86	113.47	0.24	0.28	17.03	130.58 bc
T_3 = PRC + fenu grrek – mb	176.39	116.81	125.56	0.28	0.13	12.95	138.31 b
T_4 = PRC + ani seed – mb	145.00	111.66	111.39	0.49	-	26.36	137.57 b
T_5 = PRC + carum – mb	155.55	103.61	109.03	0.28	-	12.55	121.72 cd
T_6 = PRC + dill – mb	174.31	112.50	109.58	0.31	-	6.95	116.53 d
T_7 = PRC+firingi–mb	170.56	115.00	121.25	0.62	0.24	33.18	154.50 a
T_8 = PRC+coriander–mb	169.72	107.28	106.25	0.77	0.26	21.2	125.74bcd
LSD 5(%)	NS	NS	NS	-	-	-	13.38

Values having common letter(s) in a column do not differ significantly at 5% level
Mungbean = mb

Yield of cane

Intercropping of spices crops with sugarcane does not make significant differences in yield production of cane. Intercropping with cabbage, cauliflower, potato, carrot, knolkhol and broccoli in paired row sugarcane similar result was found by Matin et al. 2001. However cane yield was affected by different types of first intercrop viz. black cumin, fenu greek, ani seed, carum, dill, firingi and coriander and second intercrop mungbean were grown with paired row cane (Table 1). Intercropping of black cumin, ani seed, carum, dill and coriander decreased cane yield (5-11%) while intercropping of fenu greek and firingi increased cane yield. Among different intercrop combinations, the highest cane yield of 125.56 t ha^{-1} was obtained from T_3 treatment followed by T_7 (121.25 t ha^{-1}) while the lowest cane yield of 106.25 t ha^{-1} was recorded from T_8. Intercropping of fenu greek and firingi induced to produce higher yield compared to paired row cane only. Where as other spices influenced to reduce sugarcane yield under paired row system. Decreased cane yield due to intercropping of black cumin (T_2), ani seed (T_4), carum (T_5), dill (T_6) and coriander (T_8) might be related to the reduced millable cane production and lower unit weight compared to T_3, T_7 and T_1 treatments.

Pol % cane

There was no significant effect on pol % cane among the different treatment combinations (Fig. 1). The highest pol % cane of 12.05 was obtained from treatment T_8 (PRC + coriander-mungbean) followed by treatment T_4 (PRC + mouri-mungbean) and the lowest pol % cane of 10.49 was recorded from treatment T_6 (PRC + soluk-mungbean). Intercropping spices with sugarcane under paired row does not have adverse effect on pol % of cane as the intercrops were harvested before start of grand growth period of cane.

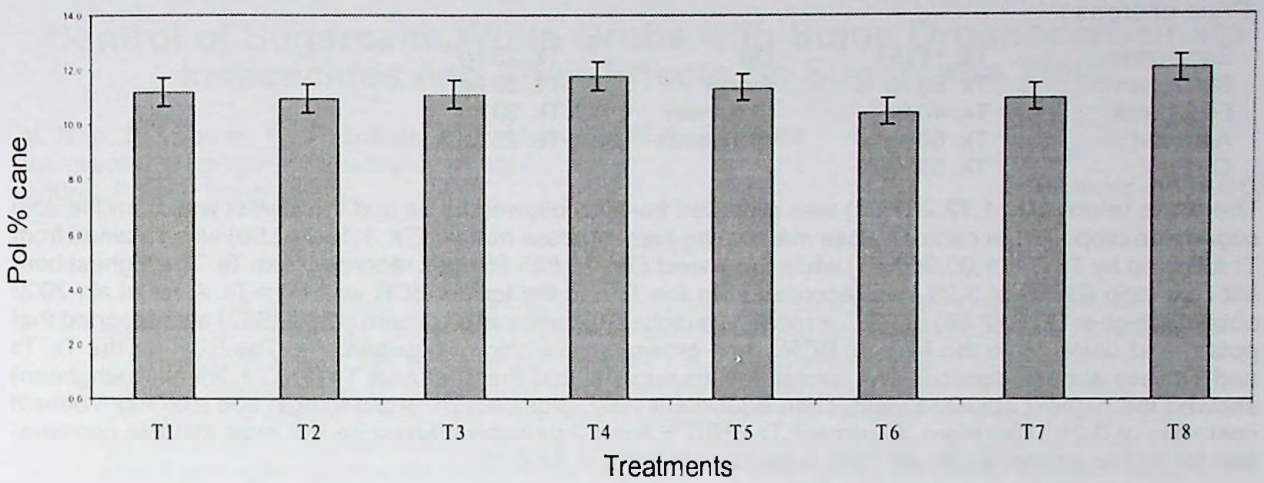

Figure 1. Pol % cane as affected by different intercrop combinations

Intercrop yield

The yield of first intercrops (spices) were found satisfactory in all intercropped plots with paired row cane (Table 1). The yields of black cumin, fenu greek, ani seed, carum, dill, firingi and coriander were 0.24, 0.28, 0.49, 0.28, 0.31, 0.62 and 0.77 t ha^{-1} respectively. All the spices as first intercrops were grown in 3 lines within two paired rows of cane. Yield of second intercrop mungbean varied with different treatment combinations for first intercrop. The highest mungbean yield of 0.28 t ha^{-1} was obtained from T_2 treatment followed by T_8 (0.26 t ha^{-1}) while the lowest yield of 0.13 t ha^{-1} was recorded from T_3 treatment. This result indicated that type of preceding spices intercrops to influenced the yield of second intercrop. Yields of mungbean were not found from T_4, T_5 and T_6 due to long vegetative period of first intercrops (ani seed, carum and dill). However, in all cases the yield of second intercrop was not satisfactory.

Adjusted cane yield

Adjusted cane yield is an important parameters for determining the total yield potential of the intercropped plot (cane + intercrop) over the sole crop cane (Table 1). The highest adjusted cane yield of 154.50 t ha^{-1} was recorded from T_7 plot (PRC + firingi- mungbean) followed by T_3 (138.31 t ha^{-1}) plot (PRC + fenu greek- mungbean), T_4 (137.57 t ha^{-1}) plot (PRC + ani seed- mungbean), T_2 (PRC + black cumin- mungbean) and T_8 (PRC + coriander- mungbean). The lowest adjusted cane yield of 116.53 t ha^{-1} was from the T_6 plot (PRC + dill- mungbean) and that was statistical identical to T_1, T_5 and T_8. This adjusted yield indicated that PRC + firingi- mungbean (T_7) was superior to others.

Economics

Table 2 shows the economic analysis of the experiment under different treatment combinations. The variable cost for seed cane and mungbean were equal for all treatments. Among the intercrop combination, the highest total production cost (Tk. 53,792) was for treatment T_8 (PRC + coriander - mungbean) while the lowest (Tk. 52,525) for treatment T_7 (PRC +firingi - mungbean).

Table 2. Economics and benefit cost ratio (BCR) of different cane intercrops combinations. BSRI, 2004.

Treatments	Total production cost (Tk. ha^{-1})	Gross return (Tk. ha^{-1})	Gross margin (Tk. ha^{-1})	BCR
T_1 = Paired row cane (PRC)	41,500	1,33,175.60	91,675.60	3.20
T_2 = PRC + black cumin–mungbean	52,575	1,45,596.70	93,021.70	2.76
T_3 = PRC + fenu greek – mungbean	53,255	1,54,215.65	1,00,960.65	2.90
T_4 = PRC + ani seed – mungbean	53,050	1,53,390.55	1,00,340.55	2.89
T_5 = PRC + carum – mungbean	53,305	1,35,717.80	82,412.80	2.55
T_6 = PRC + dill – mungbean	53,105	1,29,930.95	76,825.95	2.45
T_7 = PRC + firingi – mungbean	52,525	1,72,267.50	1,19,742.50	3.28
T_8 = PRC + coriander – mungbean	53,792	1,40,200.10	86,408.10	2.61

Price of crops :

Sugarcane	:	Tk. 1115 t^{-1}	Dill	:	Tk. 25 kg^{-1}
Black cumin	:	Tk. 50 kg^{-1}	Firingi	:	Tk. 50 kg^{-1}
Fenugreek	:	Tk. 40 kg^{-1}	Coriander	:	Tk. 20 kg^{-1}
Ani seed	:	Tk. 60 kg^{-1}	Mungbean	:	Tk. 25 kg^{-1}
Carum	:	Tk. 50 kg^{-1}			

The gross return (Tk. 1,72,267.50) was recorded from T_7 followed by T_3 and the lowest was from the sole sugarcane crop (T_1). In case of gross margin, the highest gross margin (Tk. 1,19,742.50) was obtained from T_7 followed by T_3 (Tk. 1,00,960.65) while the lowest (Tk. 76,825.95) was recorded from T_6. The highest benefit cost ratio (BCR) of 3.28 was recorded from the T_7 and the lowest BCR was from T_6. Alam et al., 2000 obtained higher BCR (2.68) in PRC + (potato-mungbean) combination. Imam et al. (1982) also reported that potato and onion gave the highest BCR when grown as intercrop with sugarcane. The BCR for the T_2, T_3 and T_4 were almost identical. The overall results suggest that the treatment T_7 (PRC + firingi - mungbean) showed the highest adjusted yield, cane equivalent yield, gross return, gross margin and maximum benefit cost ratio of 3.28. Therefore, treatment T_7 (PRC + firingi - mungbean) may be the most suitable combination for higher economic return from sugarcane farming in AEZ-11.

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Control of Sugarcane White Grubs with Some Organocarbamate Insecticides and Their Effects on Sugarcane Yield

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ABSTRACT

An experiment was conducted with some organocarbamate insecticides namely Kuridan 5G, Pardan 5G, Cemifuran 5G, Biesteren 5G, Alphafuran 5G, Hayfuran 5G, Sarafuran 5G, Furan 5G, Hextar 5G, Baifuran 5G, Newfuran 5G and Curaterr 5G to evaluate their effectiveness against white grubs and their effects on the yield of sugarcane. The experiment was carried out at Mohan farm under Thakurgaon Sugar Mills Ltd., Thakurgaon, Bangladesh during the cropping season 2004-2005. All those test insecticides applied @ 2.00 kg ai ha-1 in March and April significantly reduced the population of white grubs compared to check plots. Increased cane yield over control was recorded among the treatments ranging from 23.48 to 107.15%.

Key words: Sugarcane, white grubs, control, organocarbamate insecticides, yield

INTRODUCTION

The white grub is one of the major pests of sugarcane in Bangladesh. Different species of white grubs attack sugarcane and cause severe damage resulting in loss of yield. Its attack is mainly confined to the non- flooded sandy and sandy loam soils of northern cane growing areas of Bangladesh. Seventeen species of white grubs have so far been recorded in sugarcane fields in Bangladesh causing damage every year (SRTI, 1981; SRTI 1984). But all of them are not equally important in respect of damage. Among these, Brahmina sp., Holotrichia sp., Anomala sp. and Adoretus versutus are most damaging. Heavy infestation may cause 50-60% damages, even total loss of canes. The grubs feed on the roots and under ground portion of stalks rendering the plants looking pale and sickly, ultimately the affected shoot/cane dries up which can easily be pulled out. The canes from affected clumps become unfit for crushing and use as seed materials. The yield loss due to white grubs was found to be 23.07 to 38.17 t ha^{-1} (Miah *et al.*, 1986).

The attack by white grubs occur in the months of February to September but it is severe in March to April targeting sugarcane roots in the soil. Miah et al. (1986) reported that among different chemicals Furadan (Carbofuran) and Ekalux (Quinalfos) at 2.00 kg ai ha^{-1} effectively controlled white grubs. Mostafa *et al.* (1986) reported carbofuran (2,3-dihydro-2, 2-dimethyl benzofuran-7yl methylcarbamate) is a broad-spectrum systemic insecticide. The carbamate insecticides have both properties of killing insects by contact as well as systemic actions. The short life of carbofuran in soil is supported by Chowdhury *et al.* (2002) who reported that carbofuran after 30 days of application left no residues in soil indicating complete degradation of the pesticides. Therefore, the present study was taken to evaluate the control efficacy of some organocarbamate insecticides in reducing white grub population and their effects on the yield of sugarcane.

MATERIALS AND METHODS

The experiment was set up at Mohan farm under Thakurgaon Sugar Mills Ltd., Thakurgaon, Bangladesh during the cropping season 2004-2005. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. There were 13 treatments including one control. The treatment Curaterr 5G (March + April) was considered as standard. The plot size was 6m x 6m. Block to block distance was 2m and plot to plot distance was 1m.The variety Isd 31 was used and planting was done through conventional sett placement (end to end) in the trenches on November 26, 2004. All the test insecticides were granular in formulation and used @ 2.00-kg ai ha .The application of insecticides was done twice, once in March and then in April. Before irrigation, soi ridges surrounding individual plots were made to protect the flow of water from one plot to another. The fertilizer application, weeding, mulching and earthing up were done as normal cultural practices. For application of insecticides furrows were made on both sides of cane

rows and then insecticides (granular) were applied at the base of the plants and in the space between furrows and mixed with soil followed by irrigation. Data were recorded from 5 randomly selected clumps per plot. Soil was removed through digging pits 60 cm x 60 cm x 40 cm deep with spade. Larval population was counted in root zone and in soils of these pits. Data were taken twice, once in April and then in May 2005. The yield of canes per plot was recorded at harvest in December 2005.

RESULTS AND DISCUSSION

All the test insecticides significantly reduced white grub population over control (Table 1). Data collected in April showed that white grub population ranged from 0.33 to 4.67 among the treated plots whereas control plot had a population of 13.33 per 5 clumps. Control efficacy reached over 80% except Newfuran 5G, which showed 64.97% efficacy over control. After two application of insecticides (March and April), data collected in May showed that white grub population varied from 0.67 to 3.66 among the insecticide treated plots whereas in control plot that was 18.33 per 5 clumps.

Table 1. Effectiveness of different organocarbamate insecticides in controlling White grubs at Mohan Farm, Thakurgaon Sugar Mills Ltd, Thakurgaon, 2005.

Treatments	White grub population (5 clumps plot^{-1})			
	April data	% Efficacy over control	May data	% Efficacy over control
Kuridan 5G@ 2.0 kg ai. ha^{-1} (March + April)	2.00 bcd*	85.00	2.00b	89.09
Pardan 5G@ 2.0 kg ai. ha^{-1} (March + April)	1.67cd	87.47	2.67b	85.43
Cemifuran 5G @ 2.0 kg ai. ha^{-1} (March+April)	2.33bcd	82.52	0.67b	96.34
Biesteren 5G @ 2.0 kg ai. ha^{-1} (March + April)	1.67cd	87.47	3.66b	80.03
Alphafuran 5G @ 2.0 kg ai. ha^{-1} (March+April)	1.67cd	87.47	1.33	92.74
Hayfuran 5G @ 2.0 kg ai. ha^{-1} (March + April)	3.67bc	72.47	3.33b	81.83
Sarafuran 5G @ 2.0 kg ai. ha^{-1} (March+April)	0.33d	97.33	3.33b	81.83
Furan 5G @ 2.0 kg ai. ha^{-1} (March + April)	1.33cd	90.02	2.33b	87.29
Hextar 5G@ 2.0 kg ai. ha^{-1} (March + April)	2.00bcd	85.00	3..33b	81.83
Baifuran 5G@ 2.0 kg ai. ha^{-1} (March + April)	2.33bcd	82.52	2.00b	89.09
Newfuran 5G@ 2.0 kg ai. ha^{-1} (March + April)	4.67b	64.97	1.33b	92.74
Curaterr 5G @ 2.0 kg ai. ha^{-1} (March+April) (Standard)	2.00bcd	85.00	1.67b	90.74
Control	13.33 a		18.33a	
LSD (5%)	2.994		3.832	

*Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test.

No significant difference was observed among the test insecticides in respect of white grub population but all test insecticides significantly differed from control. All insecticides treated plots showed above 80% efficacy over control, which ranged from 80.03 to 96.34%. Miah *et al.* (1986) reported the effects of Furadan (Carbofuran) and Ekalux (Quinalfos) both at 2.0 kg ai ha^{-1} which significantly controlled the pests. But only Furadan was recommended for white grubs because it showed 190.89% yield increase over control while Ekalux showed 74.83%. Biswas *et al.* (1994) also suggested application of Furadan and Curaterr (commonly carbofuran) against white grub @ 2.0 kg ai ha^{-1}.

Table 2. Effectiveness of different organocarbamate insecticides on the yield of sugarcane at Mohan Farm, Thakurgaon Sugar Mills Ltd, Thakurgaon, 2005.

Treatments	Yield (t ha^{-1})	% Efficacy over control
Kuridan 5G@ 2.0 kg ai. ha^{-1} (March + April)	59.17 bc*	68.81
Pardan 5G@ 2.0 kg ai. ha^{-1} (March + April)	72.22a	105.81
Cemifuran 5G @ 2.0 kg ai. ha^{-1} (March + April)	58.24bc	65.97
Biesteren 5G @ 2.0 kg ai. ha^{-1} (March + April)	58.33bc	66.23
Alphafuran 5G @ 2.0 kg ai. ha^{-1} (March + April)	43.33e	23.48
Hayfuran 5G @ 2.0 kg ai. ha^{-1} (March + April)	72.69a	107.15
Sarafuran 5G @ 2.0 kg ai. ha^{-1} (March + April)	53.33cd	51.98
Furan 5G @ 2.0 kg ai. ha^{-1} (March + April)	57.22bc	63.07
Hextar 5G@ 2.0 kg ai. ha^{-1} (March + April)	52.96cd	50.93
Baifuran 5G@ 2.0 kg ai. ha^{-1} (March + April)	47.13de	34.34
Newfuran 5G@ 2.0 kg ai. ha^{-1} (March + April	63.80b	81.90
Curaterr 5G @ 2.0 kg ai. ha^{-1} (March + April) (Standard)	63.15b	79.97
Control	35.09f	
LSD (5%)	7.833	

*Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test.

It revealed that all test insecticides showed significantly higher cane yield over control (Table 2). The yield increase over control in different treatments varied. The yield of sugarcane ranged from 43.33 to 72.69 t ha^{-1} among insecticide treated plots whereas the control plots (untreated) had yield of 35.00 t ha^{-1} only which differed significantly over all other test insecticides. Insecticide treated plots received increased cane yield over control plots which ranged from 35.34 to 107.15%. Hayfuran 5G had the highest yield of 72.69 t ha^{-1} showing 107.15% increased yield followed by Pardan 5G which gave 72.22 t ha^{-1} showing 105.81% increased yield over control and both insecticides (Hayfuran 5G and Pardon 5G) were superior to all other insecticides in respect of cane yield. Alphafuran 5G had the lowest yield among insecticide treated plots which gave 43.33 t ha^{-1} and differ significantly over all other test insecticides. The result of the present findings has similarity with that of Miah *et al.* (1986) who reported 190.89% yield increase due to effective control of white grubs with Furadan 3G (carbofuran). Yield increase in Furadan (Carbofuran) treatments might be due to profuse root development through increased mitotic index that enhanced nutrient uptake resulting in increased cane yield (Miah and Akhter, 1985). Pesticide Technical Advisory Committee (PTAC, 1980), a government body requires 80% control to approve the use of an insecticide in agriculture. From the study it might be concluded that Kuridan 5G, Pardan 5G, Cemifuran 5G, Biesteren 5G, Alphafuran 5G, Hayfuran 5G, Sarafuran 5G, Furan 5G, Hextar 5G, Baifuran 5G and Newfuran 5G @ 2.0 kg ai ha^{-1} March and April application of might be recommended for the control of white grubs.

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