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Effect of Plant Geometry and Planting Methods on the Incidence of Shoot Borer *Chilo Infuscatellus* (Snellen) and Yield Parameters in Sugarcane

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Abstract **-** Field experiment was conducted at Sugarcane Research Station, Melalathur, Tamil Nadu Agricultural University during 2005-2008 in Randomized Block Design with three replications to study the effect of plant geometry and planting methods on the incidence of shoot borer *Chilo infuscatellus* and yield parameter in late planted sugarcane crop during summer months using COG 94077. The single bud seedlings were raised in bed and polybags on the same day of conventional two budded sett planted in the field. The seedlings were transplanted in the main field on 30 days after shoot borer observation taken. The intercrops were sown 3rd day after planting / transplanting and *in situ* incorporated on 90th day at the time of earthing up. The shoot borer incidences were recorded on 30th, 60th and 90th days on the basis of number of shoot affected with respect to total number of shoots and cumulative shoot borer incidence was worked out. Conventional two budded sett planted on one side of ridges + black gram on the other side, recorded the lowest cumulative shoot borer incidence of 21.32 per cent. The raised bed seedlings were more susceptible to shoot borer (31.5%) than polybag seedling (22.74%) and conventional two budded planting (22.44%). Sugarcane intercropped with blackgram reduced the shoot borer incidence in all the treatments due to changes in the micro climate developed by the intercrops and non host crops acted as physical barrier. The highest sugar yield of 14.81 t/ha was obtained from cane yield of 107.25 t/ha with CCS% of 13.81 in conventional two budded setts planted on one side of the ridges+ blackgram on the other side.

Index Terms - shoot borer, cane yield, sugar yield, plant geometry, planting methods

I. INTRODUCTION

Sugarcane is one of the most important commercial crops in India. Globally, India ranks second in area (20.4%) and production (18.6%) among sugarcane growing countries of world. In India, sugarcane is cultivated in an area of 4.2 million ha with total production of 281 million tones of cane with average productivity of 66.7 t/ha (Mahesh *et al*., 2010).

In Tamil Nadu, sugarcane is cultivated in 3.2 lakhs ha with an average productivity of 100 t/ ha. More than 200 species of insects causing damage to sugarcane crop during the course of its germination, growth and maturity. Among these, shoot borer *Chilo infuscatellus (*Snellen) assuming series pest status in subtropical situation where because of availability of a conducive environment for their population build up, the field and factory losses are substantially high because the industrially important sugarcane varieties have invariably been found to be more susceptible to shoot borer which is not even effectively controlled with pesticides, because of their concealed habitat (Jaipal and Singh, 2010).

The plant geometry plays major role to maintain the micro climate in the cropping area. Farmers mostly used the conventional method of planting with two budded setts in ridges and furrows. Due to recent advance research in sugarcane the interest of farmers and researches has changed their focus to various methods of planting with seedlings and varied plant geometry in the field. Because of this, the interest of cultivator have increase in planting of sugarcane with various method of planting using poly bag seedling, raised bed seedling, single bud, spaced transplanting method and direct planting of single bud in addition to conventional method of planting. Many worker studied the intercropping with legumes might have the effect of population built-up shoot borer because change the relative humidity at canopy level (Misra and Hora, 1982; Sandara, 2000; Thirumurugan *et al*., 2001 and Thirumurugan and Koodalingam, 2005).

However, no information is available on the impact of special arrangement of plant and varied planting techniques coupled with intercropping on the incidence of shoot borer and yield quality parameters. Hence, the present investigation was taken to study the effect of plant geometry and planting technique on the incidence of shoot borer, its yield and quality of cane.

II. MATERIALS AND METHODS

A field experiment was conducted in clay loam soil of Sugarcane Research Station, Melalathur during 2005-2008 with variety COG 94077 planted in plots measuring 20 m^2 each at 80 cm spacing in Randomized Block Design replicated thrice to study the effect of plant geometry and planting methods on the incidence of shoot borer and yield parameter.

The treatments include the following components:

- T_1 Single bud raised bed seedlings transplanted in furrow
- T_2 Single bud polybag seedlings transplanted in furrow
- T_3 Single bud raised bed seedlings transplanted on both sides of the ridges
- T_4 Single bud polybag seedlings transplanted on both sides of the ridges
- T_5 Single bud raised bed seedlings transplanted in furrow + black gram on ridges

T_6 Single bud polybag seedlings transplanted in furrow + black gram on ridges

T_7 Single bud raised bed seedlings transplanted on one side of ridges + black gram on other side of the ridges

T_8 Single bud poly bag seedlings transplanted on one side of the ridges + black gram on other side of the ridges

T_9 Conventional two budded setts planted in furrows

T_{10} Conventional two budded setts planted on one side of ridges + black gram on other side of the ridges

The seedlings were transplanted on 30 day after establishment at the distance of 30 cm in furrows and on ridges after shoot borer incidence observation taken. The shoot borer incidence was recorded on 30^{th}, 60^{th} and 90^{th} days after planting in T_9 and T_{10} whereas in T_1 to T_8 the shoot borer incidence was recorded 30^{th} days at nursery, 60th and 90^{th} days in main field and cumulative shoot borer incidence was worked out. The yield parameters were recorded at the time of harvest. The data was analyzed statistical tools described by Pande and Sukhatme, (1985).

III. RESULTS AND DISCUSSION

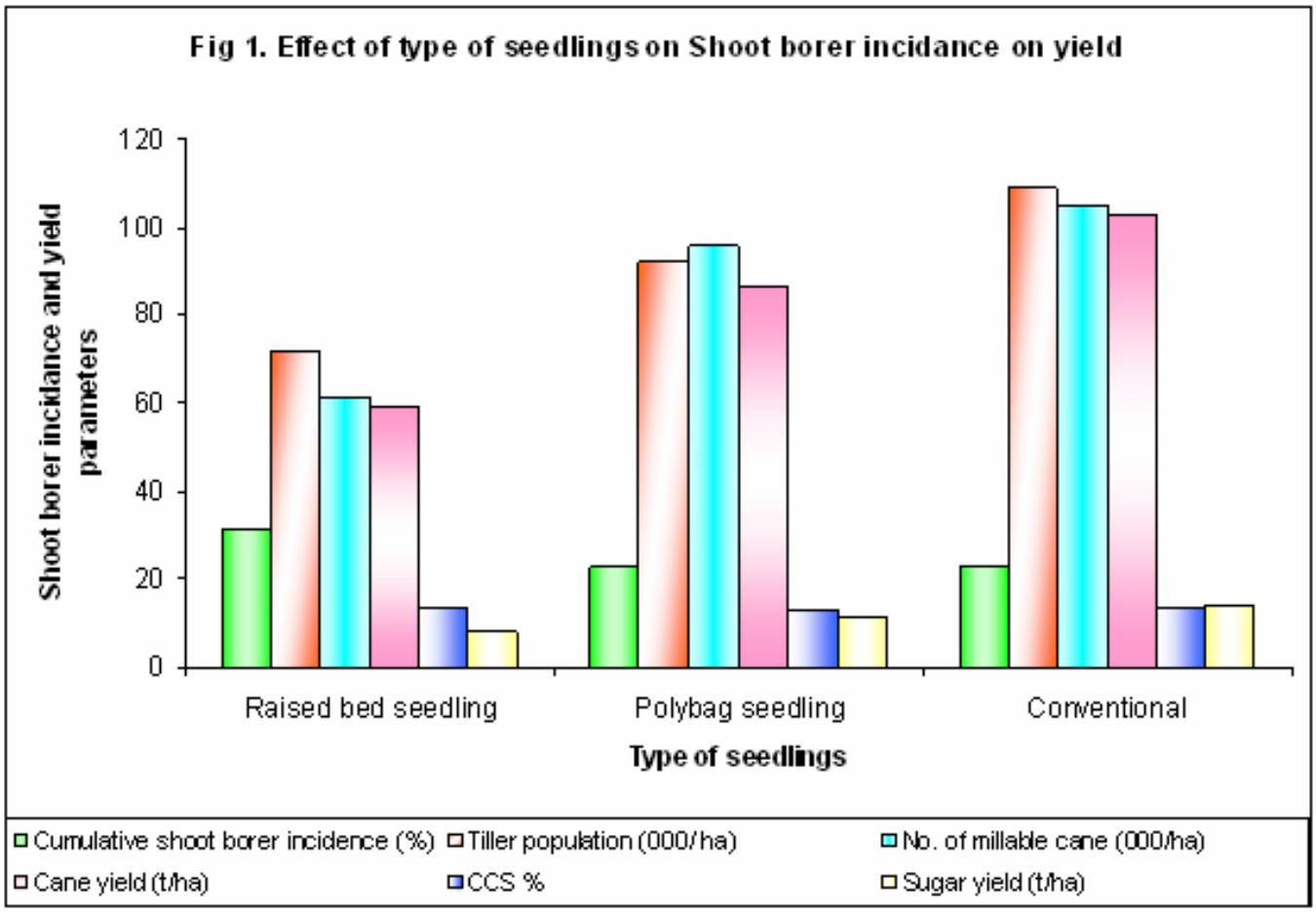
The shoot borer incidence was recorded on 30^{th}, 60^{th} and 90^{th} days. Cumulative incidence was worked out and presented in Table 1. From the data shown conventional two budded sett planting on one side of the ridges + black gram on other sides recorded lowest shoot borer cumulative incidence of 21.32 % as compared to highest of 31.71% incidence recorded in single bud raised bed seedlings transplanted in furrow. The raised bed seedlings were more susceptible to shoot borer which reflected in higher percent of cumulative shoot borer incidence (31.5%) as compared to poly bag seedlings (22.74%) and conventional planting (22.44%) (Fig 1). It might be due to transplanted seedlings are weaker and less vigor during the establishment stage and ultimately resulted in highly vulnerable for shoot borer attack. This was in conformity with the findings of Sikchi *et al.*(1989) who reported higher incidence of shoot borer incidence in 45-50 days old transplanted seedlings because after transplanting, seedlings were weaker and highly vulnerable for attack as compared to conventional method of plantings. Irrespective of type of seedling used for planting the intercrop reduced the incidence of shoot borer (Fig 2) due to changes in micro climate and faster growth, which were unfavorable to shoot borer multiplication. The non host crops might have also acted as physical barrier preventing initial build up of shoot borer population as reported by Sardara (2000) in sugarcane with green gram intercrop. Thirumurugan and Koodalingan (2005) sugarcane with green gram or sunhemp. Odor of non host plant inhibiting the fecundity, fertility of eggs and feeding potential of *Earias vitella* larvae in cotton (Krishna and Pathak, 1987; Varun *et al.,* 1994).

Data on yield parameters revealed highest number of millable cane (111690 /ha) in single bud polybags seedlings transplanted on both side of the ridges followed by conventional two budded sett planting on one side of the ridges + black gram on other sides (106040/ha) (Table 1). However, the later recorded the highest cane yield (107.25 t/ha) which was on par with conventional two budded setts planting in furrows (98.35 t/ha). The conventional two budded sett planting methods recorded higher cane yield (104.80 t/ha) than poly bags seedlings used (95.62 t/ha) and raised bud seedlings (61.71 t/ha).

Intercropping of blackgram in cane or cane seedlings had increased the sugarcane yield in all the treatment due to nodulation of legume crops and fixation of N in the soil which was available to the cane crop over and above the applied N as reported by Maragathamani (1993) in cotton and blackgram and Thirumurugan and Koodalingan (2005) sugarcane with green gram or sunhemp intercropping system. No change in Commercial cane Sugar (CCS %) content due to plant geometry and method of planting. The conventional two budded setts planting on one side of the ridges + black gram on other sides recorded the highest sugar yield of 14.81 t/ha.

Table 1: Effect of Plant Geometry and Planting Methods on the Incidence of Shoot Borer and yield parameters of sugarcane

Treatments	Cumulative shoot borer incidence (%)	% of Shoot borer increased over T_9	Tiller population (000/ha)	Millable cane population (000/ha)	Cane yield (t/ha)	CCS (%)	Sugar yield (t/ha)
T_1	31.71	(+) 34.65	64.26	55.59	56.73	13.39	7.59
T_2	22.40	(-) 4.88	89.87	95.40	85.97	13.35	11.92
T_3	33.02	(+) 40.21	74.33	62.12	60.25	13.36	8.05
T_4	22.76	(-) 3.35	117.82	111.69	96.17	13.35	12.83
T_5	31.07	(+)31.93	74.05	63.29	58.77	13.44	7.87
T_6	22.94	(-) 2.59	79.51	85.76	81.46	12.98	10.53
T_7	30.20	(+) 28.24	73.10	65.84	61.20	13.35	8.18
T_8	22.87	(-) 2.88	82.81	89.64	84.24	13.37	11.26
T_9	23.55	-	112.13	103.55	98.35	13.32	13.10
T_{10}	21.32	(-) 9.46	105.46	106.04	107.25	13.81	14.81
CD (=0.05)	9.11	-	26.52	9.21	10.55	NS	1.50



IV. CONCLUSIONS

It was concluded that conventional planting with two budded setts with or without intercropping and polybags seedlings could manage the sugarcane shoot borer attack than raised bed seedlings. It also concluded that intercropping with blackgram in sugarcane could be helpful in reducing shoot borer incidence in late planted summer crops and also increased the cane yield and sugar yield.

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