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AUTUMN RATOONING AS INFLUENCED BY GEOMETRY OF PLANTING AND RESIDUAL EFFECT OF BERSEEM INTERCROPPED IN AUTUMN PLANTED SUGARCANE

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Abstract

Studies conducted on first ratoon of autumn crop planted in different geometrical patterns and intercropped with berseem revealed that planting sugarcane in 60 x 60 cm hills with four setts per hill appeared to be the best planting system for obtaining the maximum yield of ratoon cane per hectare. However, a fairly high yield of about 103-106.5 tonnes per hectare could be obtained in case of first autumn ratoon crop of sugarcane by planting the fresh crop in 2, 3 and 4-row strips 90, 120 and 150 cm apart, respectively, as against 97.37 tonnes per hectare in the conventional method of planting double setts in 60 cm apart single rows. Intercropping berseem in between the strips of 2, 3 and 4-row planting systems although reduced the number of millable canes and yield of the plant crop but made the differences in the subsequent ratoon crop due to its favourable running residual effect on the soil fertility and ratooning potential of the crop. Sucrose contents in cane were also favourably affected by the new method of strip planting and intercropping over the conventional system of planting in 60 cm apart rows.

Introduction

Sugarcane (*Saccharum officinarum* L.) due to its perennial growth habit and wider adaptability is capable of growing continuously for several years in varied environment. A good ratoon crop of sugarcane can be raised successfully if the plant crop is planted properly and the following ratoon crop is managed wisely and given balanced nutrition well in time. Tang & Ho (1962) studied the ratooning behaviour of sugarcane for six consecutive years and found that the cane and sugar yields of the fourth ratoon were the highest and those of the fifth and sixth were the lowest, while Tandon *et al.* (1955) observed that the plant cane harvested in February or March produced the best ratoon crop compared to that harvested in December. Kanwar & Sharma (1974) tested five inter-row spacings (60, 90, 120, 150 and 180 cm) and observed higher tiller population in closer spacing but thicker cane and more sucrose content in wider spacing. On the other hand, Shanmugasundaram *et al.* (1981) found that both the plant and ratoon

crop yielded on an average 101.4 and 80 tonnes per hectare, respectively at a planting density of 90,000 buds per hectare, while a planting density of 3,60,000 buds per hectare increased the cane yield further to 123.6 and 87.3 tons per hectare, respectively.

Ratoon crop, besides saving the extra expenses on cultivation, seed and planting, matures earlier which is of great practical significance. Due to increasing demand for early availability of mature cane by sugar factories, the practice of ratooning is getting very common among the cane growers. The introduction of autumn planting although have solved the problem of early availability of mature cane to the sugar factories to some extent but it has created a problem of ratooning the cane harvested early in the month of October/November. Similarly, no reliable information is available regarding the residual effect of berseem grown in association with the autumn planted cane on the subsequent ratooned cane crop. Narwal & Behl (1978), however, observed that sugarcane planted in 60-cm apart rows and intercropped with mungbean gave the highest cane yield of 627.6 quintals per hectare while the lowest cane yield of 448.2 quintals per hectare was obtained from the cane planted in 90 cm apart rows and intercropped with okra, whereas Bose & Thakur (1980) reported that wheat-sugarcane combination depressed the yield of sugarcane. Highly variable results which differ with variety and the conditions under which these studies were conducted have been reported. For the best values, it would therefore, be more appropriate to develop such information in a given ecological zone. The yield potential and feasibility of ratooning the early harvested autumn cane planted in different geometrical patterns and intercropped with berseem under the irrigated conditions of Faisalabad is presented.

Material and Methods

Experiments were carried out at Agronomic Research Area, University of Agriculture, Faisalabad, on sandy clay loam soil during 1980-81. The net plot size measured 7.20 m x 4.20 m in quadruplicated randomized complete block design. The ratoon crop was raised from the autumn planted cane grown in the following geometrical patterns with berseem as an intercrop.

1. Planting in 60 cm apart single rows.
2. Hill planting in 60 x 60 cm with 4 setts/hill.
3. Planting in 2-row strips 90 cm apart.
4. Planting in 3-row strips 120 cm apart.
5. Planting in 4-row strips 150 cm apart.
6. Planting in 2-row strips 90 cm apart and intercropped with berseem.
7. Planting in 3-row strips 120 cm apart and intercropped with berseem.
8. Planting in 4-row strips 150 cm apart and intercropped with berseem.

Sugarcane variety BL-19 was planted in the first week of October, 1980 with a uniform seed rate of 108900 two budded setts per hectare. Berseem was intercropped in the blank spaces between the strips of treatments 6, 7 and 8 on October 7 using a usual seed rate of 20 kg/ha. Before sowing berseem, the plots were irrigated, water was made muddy and then berseem seed was broadcast uniformly. The plant crop was harvested during the second week of November 1980 and then kept as ratoon. The ratoon crop was hoed twice and fertilized at the rate of 112 kg N per hectare as urea in two splits, one in May and second in June 1981. All other agronomic practices were kept normal and uniform in all planting systems. The ratoon crop was harvested on December 12, 1981 by manual labour. Observations on cane length, cane girth and weight per cane were based on 20 random canes in each plot of which 10 canes were used for determination of sucrose content. The canes were crushed in power cane crusher for juice extraction. Brix readings were taken by brix hydrometer standardized at 19°C. Sucrose percentage was determined by Hornes dry lead acetate method of sugar analysis. The data were analysed statistically using analysis of variance and Duncan's New Multiple Range Test at 5% level of probability to compare the mean differences (Steel & Torrie, 1960).

The post harvest soil analysis for N, P and K indicated that there was 0.045 and 0.043% N, 8.5 and 5 ppm available P and 173 and 210 ppm available K in berseem intercropped and non-intercropped treatments, respectively.

Results and Discussion

Data revealed that hill planting in 60 x 60 cm with four setts/hill produced significantly higher number of millable canes per unit area than that planted in 2, 3 and 4-row strips but was at par with the single row planting system which in turn did not differ significantly from 2, 3 and 4-row strip planting system (Table 1). Amongst the berseem intercropped treatments, 4-row strip planting produced the maximum number of 697.25 millable canes per unit area as against 620.50 and 598.50 in case of 3 and 2-row strip plantings, respectively but the differences among them were statistically non-significant. Almost similar results were reported by Kanwar & Sharma (1974). The number of millable canes per unit area of the plant crop was greatly reduced by the intercropped berseem crop. This deficiency however, was made upto the level of non-intercropped plant cane in the subsequent ratoon crop as a result of the running residual effect of intercropped berseem which improved the fertility and physical condition of the soil as indicated by the post-harvest analysis of the soil. The results further indicated that although there were visible differences regarding the cane length (1.65–1.90m) girth (2.04–2.25cm) and weight (0.49–0.59 kg) among the various treatments but statistically these differences were non-significant. Non-significant effect of intercropping on cane girth and weight per cane was also reported by Venktaraman *et al.* (1978).

Table 1: Ratooned cane yield and its components as influenced by planting geometry and residual effect of berseem intercropped in autumn plant cane.

Planting System	No. of millable canes per unit area (7.20 x 4.20 m)		Cane length (m)	Cane girth (cm)	Weight/ cane (kg)	Yield of stripped cane (tonnes/ha)		Sucrose content in cane at harvest (%)
	Plant Crop	Ratoon Crop				Plant crop	Ratoon crop	
1. Planting in 60 cm apart rows.	545.50ab	660.50abc	1.68^{NS}	2.04^{NS}	0.50^{NS}	85.80c	97.37b	14.67b
2. Planting in 60x60 cm hills with four setts/hill	535.00bc	724.25a	1.77	2.22	0.57	96.06b	125.80a	14.79b
3. Planting in 2-row strips 90 cm apart	583.00a	609.25bc	1.66	2.22	0.56	107.33a	103.79b	14.87b
4. Planting in 3-row strips 120 cm apart	548.25ab	571.25c	1.87	2.25	0.58	95.75b	103.23b	15.06b
5. Planting in 4-row strips 150 cm apart	463.50de	562.50c	1.65	2.12	0.59	83.80c	103.31b	14.82b
6. Planting in 2-row strips 90 cm apart and intercropped with berseem.	492.75bc	598.50bc	1.83	2.24	0.56	89.51bc	102.80b	14.99b
7. Planting in 3-row strips 120 cm apart and intercropped with berseem.	509.50bc	620.50abc	1.74	2.25	0.56	86.88c	106.55b	16.46a
8. Planting in 4-row strips 150 cm apart and intercropped with berseem.	430.00e	697.25ab	1.90	2.19	0.49	59.88d	104.06b	15.27b

N.S..- Non-significant.

Any two means not sharing a letter differ significantly at 5% probability level.

The level of cane yield per hectare of ratoon crop was higher than that of the plant crop because of more number of millable cane per unit area rather than their individual length and girth. Hill planting in 60 x 60 cm produced significantly higher cane yield per hectare than rest of the planting systems irrespective of the intercropping, which were at par with one another. The higher cane yield per hectare in case of hill planting was attributed to comparatively higher number of millable canes per unit area rather than weight per cane. Although berseem interplanted in plant cane reduced the cane yield of the plant crop substantially over the non-intercropped cane but this deficiency was overcome in the subsequent ratoon crop because of the favourable running residual effect of the berseem crop on soil fertility and its physical condition and ultimately on the ratooning potential of the crop. Higher cane yield in hill planting system of 60 x 60 cm was also obtained by Nazir *et al.* (1980).

Sugarcane planted in hills of 60 x 60 cm with 4 setts per hill ratoons better because of healthy and compact stubble formation and two way circulation of air and light compared to single row and strip planting systems. Sugarcane planted in 2, 3 and 4-row strips and intercropped with berseem in between the strips also ratooned well to the level of non-intercropped strip plantings, although the stubbles handed down by the plant crop to these treatments were comparatively less. Berseem intercropped in the plant cane had thus encouraging effect on the subsequent ratooning capacity of the crop partly by producing more number of millable canes per unit area and partly by improving the soil fertility and its physical condition.

Cane growing in 120 cm apart 3-row strips with berseem as a residual crop gave significantly higher sucrose contents over the rest of the treatments under study. The higher sucrose content in 3-row strip planting with berseem as a residual crop may be attributed to better circulation of air and light both between the strips and within the strips which favoured the synthesis of sugar in cane. These results are similar to those of Kanwar & Sharma (1974). Intercropping of berseem in autumn cane planted in 2, 3 and 4-row strips 90, 120 and 150 cm apart, respectively, does not only increase the productivity per unit area and time but also leads to good ratooning and reduces expenses by leaving the soil relatively rich in nitrogen and phosphorus.

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