

PROSPECTS OF INTERCROPPING RABI CROPS IN AUTUMN PLANTED SUGARCANE

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ABSTRACT

Sugarcane is a long duration crop and is suitable for intercropping with other short duration crops to maximize the farmer income from the unit area. Thus, this study was designed to find out the possibility of wheat, lentil and gram intercropping with autumn planted sugarcane crop. The study was carried out at National Agricultural Research Centre, Islamabad during 2004–05 cropping season. Sugarcane variety RB–72–454 was used as test crop and planted at 1.2 meter row distance in the first week of September, 2004. Two rows of each wheat, lentil and gram crop were seeded in the month of November in between cane rows. Sugarcane crop was harvested in the month of December, 2005. Lentil and gram were harvested in the month of April while, wheat in May. The results of the study indicted that sugarcane planted alone produced highest cane yield of 130.5 t ha^{-1} , while sugarcane intercropped with wheat produced lowest cane yield of 105.5 t ha^{-1} . The yields of wheat, lentil and gram were 1.18, 0.57 and 0.43 t ha^{-1} , respectively. However, it was observed that intercropping of wheat, lentil and gram with sugarcane decreased cane yield by 19.2, 18.6 and 14.3%, respectively. The maximum economic return of Rs. 156641 ha^{-1} was noticed when sugarcane was planted without intercropping, whereas, intercropping of sugarcane with wheat resulted in minimum return of Rs. 138889 ha^{-1} . Findings of the study revealed that autumn planting of sugarcane without any intercropping is more profitable than intercropping with cereal and leguminous crops.

INTRODUCTION

Sugarcane (*Saccharum officinarum*) is an important cash crop of Pakistan and ranks fourth in acreage after wheat, cotton and rice. Intercropping is a tool to promote autumn planting giving 15-20 percent higher cane yield and 0.5 units more sugar recovery than spring planted cane. It is usually planted in spring i.e. in the months of February and March but now there is an increasing trend of its plantation in autumn season i.e. in the months of September/October which appears to be more profitable than spring crop. Autumn planted sugarcane occupies the land for more than a year and competes with Rabi crops and, therefore, area under autumn planted sugarcane can only be increased at the cost of other Rabi crops. This problem can only be overcome by intercropping some suitable Rabi crops in autumn planted sugarcane. Emergence of autumn planted sugarcane completes within 5-6 weeks of planting. Sugarcane after emergence remains dormant for the period of 3-4 months due to low temperature in winter and makes little use of both soil and water resources. In order to drive benefits from its slow growth and make better use of resources, intercropping of some short duration crops can be explored. Hussain *et al.* (2004) studied the feasibility of sugarcane intercropping with potato, gram, lentil, mustard and coriander. In terms of agronomic performance, sugarcane + potato and sugarcane + gram were feasible, although both crop combinations produced lower values for the different sugarcane yield parameters (number of tillers, number of millable canes, unit stalk weight, height of cane, brix and yield of cane) than the sole crop. Sugarcane + gram were the most profitable crop combination with the highest net benefit and benefit

cost ratio, followed by sugarcane + potato and sugarcane + coriander. The crop combinations sugarcane + mustard and sugarcane + lentil were not profitable because they produced less net benefit than sole sugarcane. Afzal *et al.* (2003) studied the intercropping of sunflower in sugarcane and results revealed that sugarcane alone produced more yield. Singh *et al.* (2002) found that Sugarcane + wheat, sugarcane + mustard in autumn and sugarcane + green gram in spring planted sugarcane are promising intercropping options for sustainability of sugarcane production and economic security of the sugarcane growers. Kuldeep *et al.* (2001) studied the possibility of growing chickpea as an intercrop in sugarcane. The results suggest that growing one row of chickpea as an intercrop in sugarcane can generate extra income without affecting the sugarcane yield, and that if recommended dose of fertilizer, is applied to sugarcane, there is no need to give any extra fertilizer to chickpea to get high productivity of both sugarcane and chickpea. Moreover, chickpea will also help in maintaining the soil fertility. Akhter *et al.* (2001) found that intercropping of lentil in sugarcane gave more net income than cane alone. Gill *et al.* (1994) found that lentil intercropped in autumn planted sugarcane did not decrease number of millable canes and stripped cane yield considerably. The present study was conducted to explore the possibility of intercropping of different Rabi crops (wheat, lentil and gram) in autumn planted sugarcane.

Materials and Methods

The experiment was carried out at National Agricultural Research Center, Islamabad during 2004-05. The experiment was conducted in randomized complete block design (RCBD) with three replications. The treatments included in the study were: T1= cane alone, T2= cane + wheat, T3= cane + lentil, T4= cane + gram. Variety RB-72-454 was planted in 1st week of September using a seed rate of 55, 000 double budded setts ha⁻¹... Fertilizer was applied @ 250-140-150 NPK kg ha⁻¹. The plot size of each experimental unit was 8 m x 4.8 m consisting of four rows. The wheat variety Wafaq-2001, lentil variety Markaz and gram variety Dasht were used in the study. Two rows of each of wheat, lentil and gram were seeded in between cane rows in the month of October. Wheat, lentil and gram were harvested during the months of April-May and data for crop yield was recorded. Observations on number of millable canes, stripped cane yield, cane length, cane diameter and brix (%) of sugarcane were recorded at harvest during 2nd week of December, 2005. All other agronomic practices were kept uniform throughout the study period. Data collected were analyzed statistically using analysis of variance at 5% level of probability (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Results presented in table-1 indicate the effect of different inter crops on yield and yield components of cane crop.

1.1 Number of millable canes

The number of canes was significantly affected by different intercrops. Cane alone produced significantly more number of canes (118, 000 ha⁻¹) than cane intercropped with wheat, lentil and gram. The intercrops adversely affected the cane formation. Similar results have been previously reported by Ahmed *et al.* (1991) and Hossain *et al.* (2004).

1.2 Cane yield

Planting of sugarcane alone resulted in significantly higher cane yield (130.5 ha⁻¹) followed by cane intercropped with gram (111.8 t ha⁻¹). Cane yields in case of cane intercropped with wheat, lentil and gram were statistically at par with each other. The decrease in cane yield by intercropping of

wheat, lentil and gram was 19.2%, 18.6% and 14.3%, respectively. This decrease in yield was due to competition of intercrops with cane for growth resources, which affected cane formation and growth. These results are in line with Ahmed *et al.* (1991), Santanu *et al.* (2003), Singh *et al.* (2003), Nazir *et al.* (2002) and Imran *et al.* (2000).

1.3 Cane length

The results indicated that intercropping of wheat, lentil, and gram did not affect cane length. However, longer canes were observed when cane was planted alone (248 cm) and shorter canes were found when intercropping was done with lentil (222 cm). Gill *et al.* (1994) and Hossain *et al.* (2004) also reported similar results.

1.4 Cane diameter

Cane diameter was not affected by intercropping with wheat, lentil and gram. The cane diameter ranged between 25 to 27 mm. These results are in conformity with those of Nazir *et al.* (2002) and Gill *et al.* (1994).

1.5 Cane Brix

Intercropping of wheat, lentil and gram did not significantly affect cane brix. Apparently cane alone resulted in lower brix content as compared to intercrops. Similarly Nazir *et al.* (2002) observed that sucrose content in cane juice was not affected significantly by different intercrops.

Economic benefits

The economics of different intercropping combinations was worked out, keeping in view the prevailing market prices of the produce (Table-2). The rates of sugarcane, wheat, lentil and gram were Rs. 1200/ton, Rs. 10375/ton, 40625/ton and 32000/ton, respectively. Results indicated that none of intercropping combination was economically superior to cane alone. Cane alone gave maximum gross income (Rs.156641), whereas, cane intercropped with wheat gave lowest gross income (Rs.138889). However, cane intercropped with lentil gave better return than other intercropping combinations. Similar results were obtained by Ahmed *et al.* (1994), Singh *et al.* (2003), and Santanu *et al.* (2003). However, these results do not agree with economic gains as reported by Nazir *et al.* (1991), Gill *et al.* (1994), Afzal *et al.* (2001) and Akhtar *et al.* (2001), Nazir *et al.* (2002), Shinde *et al.* (2009). Findings of the study showed that autumn planted cane as sole crop produced more yield and thus can generate more income for growers and intercropping of rabi crops in autumn planted sugarcane was found non profitable.

Table-1 **Yield and yield components of sugarcane with intercrops combination**

Treatments	Cane No. (000 ha ⁻¹)	Cane yield (t ha ⁻¹)	Cane length (cm)	Cane diameter (mm)	Brix (%)
T1= cane alone	118.00 a	130.5 a	248	25	18
T2= Cane + wheat	90.96 b	105.5 c	233	25	19
T3= Cane + lentil	93.04 b	106.2c	222	26	19
T4= Cane + gram	91.00 b	111.8 b	228	27	19
LSD (5%)	14.16	4.30	NS	NS	NS

Table-2 Economic analysis of various intercrops combination with autumn planted sugarcane

Treatments	Cane yield (t ha ⁻¹)	Yield of inter-crops (t ha ⁻¹)	Income of cane (Rs.)	Income of intercrops (Rs.)	Gross Income (Rs.)
T1= cane alone	130.5	—	156641	—	156641
T2= Cane + wheat	105.5	1.18	126646	12243	138889
T3= Cane + lentil	106.2	0.57	127480	23156	150636
T4= Cane + gram	111.8	0.43	134144	13760	147904

REFERENCES

1. Afzal, M., A. A. Chattha, M. Zafar, M. A. Iqbal and A. Jabbar (2003). Study on inter cropping sunflower in spring planted sugarcane. *Pak. Sugar Journal*. 18(4): 76-79.
2. Afzal, M., A. Ali, M. Najeeb Ullah and M. A. Iqbal (2001). Economics of inter cropping mungbean in spring sown sugarcane. *Pak. Sugar Journal*. 16(4): 108-110.
3. Ahmed, M. S., G. Muhammad and K. B. Malik (1993). Intercropping short duration legume crops in spring cane. *Pak. Sugar Journal*. 8(3): 3-6.
4. Ahmed, M. S., M.S. Cheema and G. Muhammad (1991). Feasibility of intercropping rabi crops in autumn crop of sugarcane. *Pak. Sugar Journal*. 6(2): 10-14.
5. Akhter, A., M. Afzal, M. Najeeb Ullah and A. A. Chattha (2001). Benefits of inter cropping lentil in autumn planted sugarcane at farmer's field. *Pak. Sugar Journal*. 16(4): 111-114.
6. Gill, M. B. M. S. Nazir, M. Saeed and S. Afghan (1994). Agronomic studies on lentil intercropping in autumn sugarcane planted on flat and in pits. *Pak. Sugar Journal*. 9(4): 11-16.
7. Hossain, G. M. A., M. A. Haque, K. Mahmud, M. I. Haque and M. R. Anam (2004). Feasibility study of different intercrops with sugarcane at Chuadanga Region. *J. Agric. and Rural Develop. Gazipur*, 2(1): 115-120.
8. Imran, M., A. Shaukat, M. Ilyas and A. Ishtiaq (2000). A glance at the agro economic study of sugar intercropping with three other crops. *Pak. Sugar Journal*. 15(1): 18-21.
9. Kuldeep, S., R. K. Gumber, S. Sarvjeet and G. S. Sidhu (2001). Exploiting chickpea as an intercrop in sugarcane. *Int. Chickpae and Pigeonpae Newsleter*, (8): 18-19.
10. Nazir, M. S., A. Jabbar, I. Ahmed, S. Nawaz and I. H. Bhatti (2002). Production potential and economics of intercropping in autumn-planted sugarcane. *Int. J. Agric. and Bio*. 4(1): 140-142.
11. Santanu, G. and B. R. Ray (2003). Studies on intercropping on productivity and profitability of autumn planted sugarcane in West Bengal. *Indian Sugar*. 53(3): 179-182.
12. Shinde, N., B. L. Patil, C. Murthy and N. R. Mamledesai. (2009). Profitability analysis of sugarcane based inters cropping systems in Belgaum district of Karnataka. *Karnataka J. Agric. Sci.*, 22(4):820-823.
13. Singh, J. P., S. Mahander, K. S. Gangwar, S. Prem and J. N. Pathak (2002). Economic security in sugarcane production through intercropping. *Ind. J. Sugarcane Tech.*, 17(1/2): 47-49.