Annual Report of All India Coordinated Research Project on Sugarcane
(Agronomy & Soil Science) for the year 2012-13
Centre- Uchani (Karnal)

AS 42 : Agronomic evaluation of promising new sugarcane genotypes.

Objectives : To work out agronomy of sugarcane varieties from advanced varietal trial
Year of start : 2012-13 (Continued with new genotypes)
Treatments :

A. Genotypes – 8 (Four in early and four in mid-late groups in separate trials)
i) Early : Co 7023, Co 7025, CoLk 7201 and CoH 7261
ii) Mid-late : CoLk 7203, CoPb 7212, CoS 7234 and CoH 7263

B. Fertility levels - 3
i) 75% of recommended doses of N (112.5 kg/ha)
ii) 100% of recommended doses of N (150 kg/ha)
iii) 125% of recommended doses of N (187.5 kg/ha)

The trial was conducted on early and mid late sugarcane varieties as mentioned above in Factorial RBD with three replications. The crop was planted at 75 cm row spacing on March 6, 2012. The soil of the experimental field was clay loam in texture having pH 7.8, EC 0.4 dsm^{-1}, organic carbon 0.36%, available P 12.5 kg/ha and available K 180 kg/ha. Recommended doses of phosphorus (50 kg P_2O_5/ha) and potash (50 kg K_2O/ha) were applied at the time of planting whereas nitrogen as per treatments was applied in three equal splits. The crop was irrigated at 8-10 days intervals during pre-monsoon period and 20 days interval during post monsoon period. The harvesting of the experiment was done on February 16, 2013.

In early group varieties, significantly higher germination was recorded in variety CoLk7201 and CoH 7261 as compared to Co7023 and Co 7025. Variety CoLk 7201 and Co 7025 being at par produced significantly higher number of millable canes and cane yield as compared to variety Co 7023 and CoH 7261 (Table1). There was no significant difference in cane weight aming all the varieties. Variety Co 7025 produced highest sugar yield followed by CoLk 7201, CoH 7261 and lowest in Co 7023. Recommended and 25 % higher doses of N being at par recorded significantly higher number of tillers, millable canes and cane and sugar yield over 75% of recommended dose of N.

The data presented in Table 2 revealed that in mid-late group, significantly higher germination was recorded in variety CoPb 7212. Varieties CoLk 7203, CoPb 7212 and CoS7234 being at par produced significantly higher number of millable canes and cane yield as compared to variety CoH 7263(Table 2). Highest sugar yield was recorded in variety CoPb 7212 followed by CoLk 7203,CoS 7234and lowest in CoH 7263. Recommended and 25 % higher doses of N being at par recorded significantly higher number of tillers, millable canes and cane and sugar yield over 75% of recommended dose of N.

Summary: In early group Variety CoLk 7201 and Co 7025 being at par produced significantly higher cane yield as compared to variety Co 7023 and CoH 7261 Whereas in mid late group varieties CoLk 7203, CoPb 7212 and CoS7234 being at par produced significantly higher cane yield as compared to variety CoH 7263. Highest sugar yield was recorded in variety Co 7025 and CoPb 7212 in early and mid late group respectively. All the varieties in both the group responded upto recommended dose of fertilizers.

Table 1: Effect of different fertility levels on growth, yield and quality of early group varieties at Uchani (2012-13)

Treatments	Germination (%)	No. of tillers (000/ha)	No. of millable canes (000/ha)	Single cane weight (g)	Cane yield (t/ha)	CCS (%)	Sugar yield (t/ha)
Genotypes							
Co 7023	49.5	126.9	91.2	842	76.1	11.76	8.95
Co 7025	47.1	136.9	99.6	873	86.0	11.72	10.08
CoLk 7201	57.3	144.9	103.2	866	88.6	11.21	9.93
CoH 7261	57.5	123.2	91.0	879	79.2	11.28	8.96
CD at 5%	3.7	6.8	4.7	NS	4.0	0.42	0.63
Nitrogen dose							
75% of recom.	52.4	123.8	90.0	836	75.1	11.45	8.59
Recommended	52.9	134.9	97.9	877	84.9	11.57	9.84
125% of recom.	53.2	140.2	100.1	883	87.2	11.46	10.02
CD at 5%	NS	5.9	4.0	25	3.6	NS	0.54

* Recommended N - 150 kg /ha

Table 2: Effect of different fertility levels on growth, yield and quality of mid- late group varieties at Uchani (2012-13)

Treatments	Germination (%)	No. of tillers (000/ha)	No. of millable canes (000/ha)	Single cane weight (g)	Cane yield (t/ha)	CCS (%)	Sugar yield (t/ha)
Genotypes							
CoLk 7203	44.0	134.3	98.2	929	90.4	12.06	10.91
CoPb 7212	51.0	141.2	104.4	865	89.5	12.46	11.15
CoS 7234	46.5	146.0	105.7	838	87.9	12.22	10.74
CoH 7263	47.0	129.8	97.4	943	81.4	12.23	9.96
CD at 5%	3.8	6.9	5.0	29	4.7	0.17	0.62
Nitrogen dose							
75% of recom.	47.6	127.8	95.3	842	79.4	12.19	9.67
Recommended	47.3	140.4	103.5	882	90.32	12.31	11.13
125% of recom.	46.5	145.3	105.4	883	92.2	12.21	11.23
CD at 5%	NS	6.0	4.5	25	4.1	NS	0.54

* Recommended N - 150 kg /ha

AS-64: Response of sugarcane to different plant nutrients in varied agro ecological situations

Objective: To study differential response of sugarcane to different nutrients.

Year of start: 2011-12

Treatments:

1. Control(No fertilizer)
2. N
3. NP
4. NPK
5. NPK + S
6. NPK + Zn
7. NPK + Fe
8. NPK+ Mn
9. NPK+ S + Zn
10. NPK+ S + Zn + Fe
11. NPK+ S + Zn + Fe + Mn
12. Soil test based fertilizer application

Results achieved: Sugarcane variety CoH 119 (Mid group) was planted on March 13, 2012 at 75 cm spacing in randomized block design with three replications. The soil of the experimental field of plant crop was clay loam in texture having pH 8.7, EC 0.4 dsm^{-1}, organic carbon 0.30%, available P 9.0 kg/ha and available K 173 kg/ha, available S (10.4 kg/ha), available Zn (0.52 ppm) and available Fe (4.2 ppm) and available Mn (9.6 ppm). Recommended doses of phosphorus (50 kg P_2O_5/ha), potash (50 kg K_2O/ha) and Sulphur (60 kg/ha) were applied at the time of planting whereas recommended dose of nitrogen (150 kg N/ha) was applied in three equal splits as top dressing (April, May & June). Zinc, Fe and Mn were applied thrice (April, May & June) as foliar spray. The crop was irrigated at 8-10 days intervals during pre-monsoon period and 20 days interval during post monsoon period. The plant crop was harvested on February 19, 2013. Ratoon crop was initiated in mid January 2012 and raised with recommended packages and practices of the region. Nutrients were applied as per treatments. The ratoon crop was harvested on December, 15, 2012

Plant crop: The application of N over control, NP over N alone, NPK over NP, and NPKS over NPK significantly increased cane yield of plant crop (Table 3). The application of individual micronutrient (Fe, Mn and Zn) in combination NPK did not significantly increased cane yield over NPK alone. However, the combined application of these micro nutrients significantly increased the cane yield over NPK alone.

Ratoon crop: The application of individual micronutrient (Fe, Mn and Zn) in combination with NPK did not significantly increased cane yield over NPK alone in ratoon crop. The application of N over control, NP over N alone, NPK over NP, and NPKS over NPK significantly increased cane yield of plant crop (Table 4) in ratoon crop.

Summary: The application of N over control, NP over N alone, NPK over NP, and NPKS over NPK significantly increased cane yield. The application of individual micronutrient (Fe, Mn and Zn) in combination NPK did not significantly increase cane yield over NPK. However, the combined application of these micro nutrients significantly increased cane yield over NPK alone.

Table 3: Effect of different treatments on sugarcane growth and yield of plant crop at Uchani (2012-13).

Treatments	Cane yield (t/ha)	CCS (%)	Sugar Yield (t/ha)
Control(No fertilizer)	48.2	10.51	5.07
N	61.2	10.90	6.67
NP	72.5	11.28	8.18
NPK	82.8	11.56	9.57
NPK+S	88.8	11.58	10.28
NPK +Zn	82.3	11.55	9.51
NPK +Fe	83.2	11.59	9.64
NPK +Mn	81.2	11.53	9.36
NPK +S+Zn	90.5	11.68	10.57
NPK+S+Zn+Fe	95.0	11.70	11.12
NPK+S+Zn+Fe+Mn	95.6	11.72	11.20
Soil test based fertilizer application	81.4	11.57	9.42
CD at 5%	3.9	0.31	0.48

Table 4: Effect of different treatments on sugarcane growth and yield of ratoon crop at Uchani (2012-13).

Treatments	Cane yield (t/ha)	CCS (%)	Sugar Yield (t/ha)
Control(No fertilizer)	41.0	10.45	4.28
N	58.8	11.77	6.92
NP	69.9	12.01	8.39
NPK	80.6	12.40	9.99
NPK+S	87.8	12.54	11.01
NPK +Zn	82.2	12.51	10.28
NPK +Fe	83.2	12.50	10.40
NPK +Mn	82.7	12.48	10.32
NPK +S+Zn	88.4	12.56	11.10
NPK+S+Zn+Fe	92.0	12.60	11.59
NPK+S+Zn+Fe+Mn	93.3	12.64	11.79
Soil test based fertilizer application	82.0	12.38	10.15
CD at 5%	4.4	0.35	0.46

AS-65 : Enhancing sugarcane productivity and profitability under wheat sugarcane cropping system

Objective : To enhance the productivity of sugarcane under wheat- sugarcane cropping system

Year of start : 2011 (autumn)

Treatments:

T_1: Autumn planted sugarcane

T_2: T_1 + Wheat (1:2)

T_3: T_1 + Wheat (1:3)

T_4: Wheat sown on 15th Nov. followed by sugarcane planting after wheat harvest

T_5: Wheat sown on 15th Dec. followed by sugarcane planting after wheat harvest

T_6: FIRB sowing of wheat 15th Nov. + Sugarcane in furrows in 3rd week of February

T_7: FIRB sowing of wheat 15th Nov. + Sugarcane in furrows in 3rd week of March

T_8: FIRB sowing of wheat 15th Dec. + Sugarcane in furrows in 3rd week of February

T_9: FIRB sowing of wheat 15th Dec. + Sugarcane in furrows in 3rd week of March

Results achieved:

Sugarcane variety CoH 150 and wheat variety HD 2967 were planted as per treatment in different dates of planting in randomized block design with three replications. The soil of the experimental field was clay loam in texture having pH 8.2, EC 0.4 dsm^{-1}, organic carbon 0.36%, available P 11 kg/ha and available K 170 kg/ha. Recommended doses of phosphorus (50 kg P_2O_5/ha) and potash (50 kg K_2O/ha) were applied at the time of planting whereas nitrogen (150 kg N/ha) was applied in three equal splits in case of sugarcane crop Whereas in wheat crop full dose of phosphorus (60 kg/ha) and potash (60 kg/ha) were applied at the time of planting and nitrogen (150 kg/ha) was applied in two equal splits (21 and 42 days after sowing). Crops were irrigated as per the requirement of wheat crop upto harvesting of wheat and later on sugarcane was irrigated at 8-10 days intervals during pre-monsoon period and 20 days interval during post monsoon period. Wheat crop was harvested on April 15, 2012. Planting of sugarcane (after wheat harvest) in treatment T_4 and T_5 was done on April 22, 2012. Sugarcane crop was harvested on February 22, 2013.

Wheat sown with autumn cane (Oct. 30, 2011) and 15th November on bed or by conventional method produced higher grain yield as compared to wheat sown on 15th December. Autumn planted cane recorded significantly higher germination as compared to spring and late planting (Table 5). Lowest germination was recorded in late planting of sugarcane after wheat harvest. T1, T2 and T3 being at par

recorded significantly higher number of tillers, millable canes, cane weight ,cane yield and sugar yield as compare to rest of the treatments(Table 5& Table 6). FIRB sowing of wheat on 15th November + planting of sugarcane in standing crop of wheat in February or March (T_6, T_7) and FIRB sowing of wheat on 15th December + planting of sugarcane in standing crop of wheat in February or March (T_8, T_9) being at par produced significantly higher number of tillers, NMC, cane weight, cane yield and sugar yield as compared to late planting of sugarcane after wheat harvesting (T_4 and T_5). There was a yield reduction of 44.4% with late planting of sugarcane after wheat harvesting as compared to planting of sugarcane in February or March in standing crop of wheat (Table 6).

Summary: Wheat sown with autumn cane (Oct. 30, 2011) and 15th November on bed or by conventional method produced higher grain yield as compared to wheat sown on 15th December. Autumn planted cane recorded significantly higher germination as compared to spring and late planting. Lowest germination was recorded in late planting of sugarcane after wheat harvest. There was a yield reduction of 44.4% with late planting of sugarcane after wheat harvesting as compared to planting of sugarcane in February or March in standing crop of wheat.

Table 5: Effect of different treatments on wheat crop and growth parameters of sugarcane crop at Uchani (2012-13).

Sr. No.	Treatments	Wheat Grain yield (q/ha)	S. cane germi. (%)	Tillers (000/ha)	NMC (000/ha)	Cane wt.(g)
T_1	Autumn planted sugarcane	---	50.3	148.6	106.0	980
T_2	T_1 + Wheat (1:2)	60.5	48.3	145.4	104.1	971
T_3	T_1 + Wheat (1:3)	59.2	49.2	144.3	102.7	968
T_4	Wheat sown on 15th Nov. followed by sugarcane planting after wheat harvest	58.0	36.1	74.8	71.9	656
T_5	Wheat sown on 15th Dec. followed by sugarcane planting after wheat harvest	50.5	35.2	73.4	70.7	658
T_6	FIRB sowing of wheat 15th Nov. + Sugarcane in furrows in 3rd week of February	58.8	45.6	125.6	97.3	830
T_7	FIRB sowing of wheat 15th Nov. + Sugarcane in furrows in 3rd week of March	57.3	49.5	126.9	97.2	831
T_8	FIRB sowing of wheat 15th Dec. + Sugarcane in furrows in 3rd week of February	51.2	46.0	128.1	98.0	832
T_9	FIRB sowing of wheat 15th Dec. + Sugarcane in furrows in 3rd week of March	50.3	48.6	128.2	99.2	831
CD at 5%		1.8	2.7	10.8	7.5	50

Table 6: Effect of different treatments on cane yield, CCS (%) and sugar yield at Uchani (2012-13).

Sr. No.	Treatments	Cane yield (t/ha)	Equivalent yield (t/ha)	Total cane yield (t/ha)	CCS (%)	Sugar yield (t/ha)
T_1	Autumn planted sugarcane	102.8	--	102.8	12.57	12.92
T_2	T_1 + Wheat (1:2)	100	29.1	129.1	12.63	12.62
T_3	T_1 + Wheat (1:3)	98.3	28.5	126.8	12.68	12.47
T_4	Wheat sown on 15th Nov. followed by sugarcane planting after wheat harvest	46.4	27.9	74.3	12.35	5.72
T_5	Wheat sown on 15th Dec. followed by sugarcane planting after wheat harvest	45.6	24.3	69.9	12.31	5.61
T_6	FIRB sowing of wheat 15th Nov. + Sugarcane in furrows in 3rd week of February	79.5	28.3	107.8	12.62	10.05
T_7	FIRB sowing of wheat 15th Nov. + Sugarcane in furrows in 3rd week of March	79.6	27.5	107.1	12.53	9.97
T_8	FIRB sowing of wheat 15th Dec. + Sugarcane in furrows in 3rd week of February	80.4	24.6	105.0	12.65	10.17
T_9	FIRB sowing of wheat 15th Dec. + Sugarcane in furrows in 3rd week of March	81.2	24.2	105.4	12.56	10.19
CD at 5%		7.1	--	--	NS	0.92

AS-66: Priming of cane node for accelerating germination.

Objectives:

1. To find out suitable cane node priming technique.
2. To assess the effect of cane node priming technique on acceleration of germination.

Year of start: 2012-13

Treatments

1. Un primed cane node
2. Treating cane node in hot water at 50^{o}C for 2 hours.
3. Treating cane node in hot water (50^{o}C) + urea solution (3%) for 2 hours.
4. Priming cane node with cattle dung, cattle urine and water in 1:2:5 ratio.
5. Conventional three bud sett planting.
6. Primed and sprouted cane node (incubated for 4 days after priming).

The trial was conducted on early variety CoH 160 in randomized block design with three replications. The crop was planted at 75 cm row spacing on March15, 2012. The soil of the experimental field was clay loam in texture having pH 7.8, EC 0.4 dsm^{-1}, organic carbon 0.37%, available P 12.0 kg/ha and available K 172 kg/ha. Cane node having buds and root bands with 4-5 cm length were taken for planting. After planting cane nodes in furrows were covered with 2-3cm soil layer. Cane nodes were planted at 10 cm depth with plant to plant spacing of 30 cm. Recommended doses of phosphorus (50 kg P_2O_5/ha) and potash (50 kg K_2O/ha) were applied at the time of planting whereas nitrogen was applied in three equal splits. The crop was irrigated at 8-10 days intervals during pre-monsoon period and 20 days interval during post monsoon period. The harvesting of the experiment was done on Feb. 2, 2013.

No germination was noticed in any treatments at 10 days after planting. Highest germination was recorded in conventional three buds planting and planting of primed and sprouted cane node (Incubated for four days after priming) at 20,30 and 40 days after planting. Three bud planting recorded highest number of shoots, millable canes, cane weight, cane yield, CCS% and sugar yield (Table 7 &Table 8). Among priming treatments, planting of primed and sprouted cane node (T_6) recorded highest germination, number of shoots, millable canes, cane weight, cane yield and sugar yield. Planting of cane node after dipping in hot water (50^{o} C) +urea solution (3%) for 2 hours (T3) was found second best among priming treatments. Unprimed cane node recorded lowest number of number of shoots, millable canes, cane weight, cane yield and sugar yield (Table 7 & Table 8).

Table 7: Effect of different treatments on germination and no. of shoots of sugarcane at Uchani (2012-13)

	Treatments	Germination (%)			No. of shoots (000/ha)	
		20 DAP	30 DAP	40 DAP	90 DAP	120 DAP
T_1	Un-primed cane node	14.2	25.2	40.5	67.2	69.0
T_2	Treating cane node in hot water at 50°C for 2 hours.	19.5	29.4	42.6	69.9	72.8
T_3	Treating cane node in hot water (50° C) +urea solution (3%) for 2 hours	24.4	35.3	50.5	78.2	82.3
T_4	Priming cane node with cattle dung, cattle urine and water in1:2:5 ratio.	18.1	28.0	41.9	70.1	73.4
T_5	Conventional 3-bud sett planting.	30.3	42.6	51.2	159.0	161.5
T_6	Primed and sprouted cane node (Incubated for four days after priming)	28.1	41.0	52.7	82.4	89.5
CD at 5%		1.8	2.2	2.4	5.7	5.6

Table 8 : Effect of different treatments on growth and cane yield of sugarcane at Uchani (2012-13)

	Treatments	NMC (000/ha)	Cane height (cm)	Cane weight (g)	Cane yield (t/ha)	CCS (%)	Sugar yield (t/ha)
T_1	Un-primed cane node	67.7	14.1	646	43.2	12.09	5.23
T_2	Treating cane node in hot water at 50°C for 2 hours.	71.4	137.5	659	46.5	12.03	5.59
T_3	Treating cane node in hot water (50° C) + urea solution (3%) for 2 hours	80.9	178.4	679	54.2	12.07	6.54
T_4	Priming cane node with cattle dung, cattle urine and water in1:2:5 ratio.	71.9	177.5	654	46.4	12.07	5.61
T_5	Conventional 3-bud sett planting.	109.3	220.6	831	89.6	13.41	12.02
T_6	Primed and sprouted node (Incubated for four days after priming)	84.9	184.8	687	57.5	12.18	7.00
CD at 5%		4.5	14.4	28	2.8	0.35	0.40

Summary of Experiments Conducted by Crop production group (Agronomy& Soil Science) at CCSHAU, RRS, UCHANI, KARNAL
(2012-13)

Following experiments were allotted during 2012-13 and all the allotted experiments were conducted

AS 42: Agronomic evaluation of promising new sugarcane genotypes

In early group Variety CoLk 7201 and Co 7025 being at par produced significantly higher cane yield as compared to variety Co 7023 and CoH 7261 Whereas in mid late group varieties CoLk 7203, CoPb 7212 and CoS7234 being at par produced significantly cane yield as compared to variety CoH 7263. All the varieties in both the group responded upto recommended dose of fertilizers.

AS-64: Response of sugarcane to different plant nutrients in varied agro ecological situations

The application of N over control, NP over N alone, NPK over NP, and NPKS over NPK significantly increased cane yield. The application of individual micronutrient (Fe, Mn and Zn) in combination NPK did not significantly increase cane yield over NPK. However, the combined application of these micro nutrients significantly increased cane yield over NPK alone.

AS-65 : Enhancing sugarcane productivity and profitability under wheat sugarcane cropping system

Wheat sown with autumn cane (Oct. 30, 2011) and 15th November on bed or by conventional method produced higher grain yield as compared to wheat sown on 15th December. Autumn planted cane recorded significantly higher germination as compared to spring and late planting. Autumn planted cane recorded significantly higher germination as compared to spring and late planting. Lowest germination was recorded in late planting of sugarcane after wheat harvest. There was a yield reduction of 44.4% with late planting of sugarcane after wheat harvesting as compared to planting of sugarcane in February or March in standing crop of wheat.

AS-66: Priming of cane node for accelerating germination

Three bud planting recorded highest number of shoots, millable canes, cane weight, cane yield, CCS% and sugar yield. Among priming treatments planting of primed and sprouted cane node (T6) recorded highest germination number of shoots, millable canes, cane weight, cane yield and sugar yield.