From

The Director
PAU, Regional Research Station
Kapurthala 144 601

To

Dr. T.K. Srivastava,
Head,
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Lucknow 226 002

Memo No.: 3571-72
Dated : 04 /08/ 2015

Sub: **Annual report of AICRP on sugarcane (Crop Production) for the year 2014-15 Kapurthala Centre**

Please find enclosed herewith the annual report of trials conducted on sugarcane under AICRP at PAU, Regional Research Station, Kapurthala during crop season of 2014-15. This is for your kind information and necessary action please.

With regards,

Sd/-
Director

CC: Dr. O. K. Sinha ,Project Coordinator (Sugarcane)

ALL INDIA CO-ORDINATED RESEARCH PROJECT ON

SUGARCANE (ICAR)

ANNUAL REPORT (Crop Production)

2014-15

Agronomy Section

Punjab Agricultural University

Regional Research Station

Kapurthala (PUNJAB) – 144601

Project No.	**AS-42**	
Location	PAU, Regional Research Station, Kapurthala	
Title	Agronomic evaluation of promising new sugarcane genotypes	
Objective	To test the performance of early and mid –late maturing varieties under different nitrogen levels.	
Year of start	Long term experiment	
Treatments		
Early Varieties		
a) Varieties	**b) Fertilizer doses**	
V_1 – CoJ 64	F_1 – 75 % of recommended dose of N	
V_2 – CoJ 85	F_2 – 100 % of recommended dose of N	
V_3 – Co 0118	F_3 – 125 % of recommended dose of N	
V_4 – S 818		
Mid Varieties		
a) Varieties	**b) Fertilizer doses**	
V_1 – CoJ 88	F_1 – 75 % of recommended dose of N	
V_2 – CoPb 91	F_2 – 100 % of recommended dose of N	
V_3 – Co 0238	F_3 – 125 % of recommended dose of N	
V_4 – Co 08217		
Experimental Design	Factorial RBD	
Replication	3	
	Early set	**Mid set**
Date of planting	28-03-2014	01-04-2014
Date of harvesting	11-12-2014	14-02-2015

EARLY SET

The experiments on early and mid-genotypes were conducted on loamy sand soil, tested low in organic carbon (0.30 %), medium in available P (30.8 kg/ha) and low in available K (125 kg/ha). The genotypes Co 0818, Co 0118 were tested against check variety CoJ 64 and CoJ 85 (Table 42.1). The genotypes recorded significant differences in terms of growth and cane yield. The genotype Co 0118 recorded significantly highest cane yield (83.9 t ha^{-1}) which was 23.9% higher than standard check CoJ 64. The cane yield of varieties CoJ 85 and S 0818 were similar (73.8 t/ha & 74.3 t/ha respectively) but, recorded significantly higher than check (CoJ 64). All the genotypes differed statistically in terms of total tillers as the no. of tillers, milliable canes, intermodal length, POL % and single cane weight. Genotype S 0818 produced significantly higher tillers (214.2 th/ha) than CoJ 85, Co 0118 and CoJ 64 (92.3 , 115.1 and 166.5 th /ha respectively). It was observed that the cane length of genotype S 0818 (165.6cm) was significantly higher than CoJ 85 (145cm) and CoJ64 (148.7cm) and was at par with Co 0118 (157.7cm) . The no. of internodes per cane of the highest yielding variety Co 0118 (16.4) were significantly less than check CoJ64 (20.5) but were at par with other two genotypes. The no. of millable canes of genotypes CoJ 64 and S 0818 were significantly higher (101.0 & 113.8 th/ha respectively) than CoJ 85 and Co 0118 (60.8 & 72.5 th/ha respectively). Eventhough the no. of millable canes of Co 0118 were less than the S 0818 and the check CoJ 64 but due to significantly higher single cane wt. (995.7 g) the variety Co 0118 yielded significantly higher than than other genotypes. The quality aspect of early genotypes revealed that the genotypes differ significantly in terms of Pol %. The Pol % of the highest yielding variety Co 0118 (18.52%) was significantly higher than CoJ 85 and S 0818 (17.81 & 17.60% resp.) but was at par with the check CoJ 64 (18.56 %)

Application of either 100% or 125% of the recommended dose of nitrogen to the early maturing genotypes helped in significantly improving the number of tillers and cane length over the 75% of the recommended dose of applied nitrogen. The growth parameters like internodes per cane followed the similar trend as that of number of tillers but the level of significance could not be achieved. The highest cane yield of 78.6 t ha^{-1} was obtained at 125% of recommended nitrogen. Whereas, single cane weight and the quality aspects remains unchanged.

Table- 42.1 Effect of genotypes and fertilizer levels on performance of sugarcane (Early set)

Treatments	Germination %	Tiller Count (000/ha)	Cane length (cm)	Internodes/ cane	Millable canes (000/ha)	Cane yield (t/ha)	Single Cane wt. (g)	Pol % juice
CoJ 64	40.3	166.5	148.7	20.5	101.0	67.7	631.0	18.56
CoJ 85	38.4	92.3	145.0	19.9	60.8	73.8	1024.6	17.81
Co 0118	38.8	115.1	157.7	16.4	72.5	83.9	995.7	18.52
S 818	41.3	214.2	165.6	17.0	113.8	74.3	616.7	17.60
CD (0.05)	**NS**	**21.2**	**10.2**	**3.4**	**20.5**	**5.9**	**209.6**	**0.58**
Fertility level								
75 % of rec. N	40.4	138.1	148.3	18.1	87.1	68.4	767.6	18.07
100 % of rec. N	39.8	148.9	156.1	19.1	86.1	77.8	827.5	18.21
125 % of rec. N	38.9	154.1	158.5	18.2	87.9	78.6	855.8	18.09
CD (0.05)	**NS**	**9.1**	**6.7**	**NS**	**NS**	**6.8**	**NS**	**NS**
V x N	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Summary:

Genotype Co 0118 recorded the highest cane yield. Whereas as CoJ 64 was shown highest POL% but similar to Co 0118. The nitrogen application upto 100% of recommended increased cane yield significantly over 75% of recommended nitrogen.

MID SET: The experiment was laid out by selecting genotypes CoJ 88 (check), CoPb 91, Co 0238 and Co08217 under mid maturing group. The genotype Co 08217 recorded significantly higher cane yield (84.9 t ha^{-1}) than variety CoJ 88 (75.2 t ha^{-1})but at par with variety CoPb91 (83.8 t ha^{-1}) and Co 0238 (Table 42.2).. The per cent increase in cane yield of genotype Co 08217 over the check CoJ88 was found to be 12.9%. However, non-significant response was observed among the varieties in production millable canes. But variety CoJ 88 is better in milliable canes production. Variety Co 0238 was significantly better in tiller production over CoJ 88 (check), CoPb 91and Co08217 which were at par among each other .Cane length and internodes per cane were also found to be significant. The internodes per cane and cane length of genotype Co 08217 was significantly higher than all other genotypes which were at par among themselves. Similarly cane weight of genotype Co 08217 was highest (907.8g) closely followed by CoPb 91(889.4g), both were significantly higher than the check CoJ88 (621.1g) and Co 0238 (783.4g).

Table- 42.2 Effect of genotypes and fertilizer levels on performance of sugarcane (Mid set)

Treatments	**Germination %**	**Tiller Count (000/ha)**	**Cane length (cm)**	**Internodes /cane**	**Millable canes (000/ha)**	**Cane yield (t/ha)**	**Single Cane wt. (g)**	**Pol % juice**
CoJ 88	38.3	138.0	160.7	16.1	102.0	75.2	621.1	18.08
Co Pb 91	42.7	127.7	167.1	17.2	89.3	83.8	889.4	17.52
Co 0238	46.8	155.0	171.9	16.8	89.5	80.9	783.4	17.14
Co 08217	40.2	131.6	197.0	23.0	83.0	84.9	907.8	17.70
CD (0.05)	**4.8**	**13.5**	**20.1**	**4.5**	**NS**	**5.1**	**95.8**	**0.71**
Fertility level								
75 % of rec. N	41.6	137.5	170.3	17.7	84.4	74.1	757.5	17.45
100 % of rec. N	42.4	135.3	171.6	18.4	91.5	83.4	812.9	17.56
125 % of rec. N	41.9	141.5	180.7	18.8	96.9	86.1	830.9	17.53
CD (0.0 5)	**NS**	**NS**	**NS**	**NS**	**NS**	**6.5**	**40.2**	NS
V x N	NS	NS	NS	**NS**	NS	NS	NS	NS

The cane quality too get influenced as the POL% of standard check CoJ 88 was significantly higher than Co 0238 but at par with that of genotype Co 08217 and variety CoPb 91.

Restricting the application of nitrogen to 75% of the recommended significantly reduced the cane yield and cane weight as compared to the 100% or 125% of recommended nitrogen. However, non-significant response was observed with respect to all others parameters.

Summary

The genotype Co 08217 recorded the highest cane yield being significantly better than the check CoJ88 and comparable to Co 0238 and CoPb 91. The POL% of CoJ 88 was significantly higher than Co 0238 and was at par with Co 08217 and CoPb 91 . Fertilizing the crop with 100% recommended dose of nitrogen i.e. 150 kg N ha^{-1} significantly improved cane yield over 75% of the recommended dose of nitrogen but was at par to 125% of the recommended dose of nitrogen.

Project No.	**AS-64**
Location	PAU Regional Research Station, Kapurthala
Title	Response of sugarcane crop to different plant nutrients in varied agro-ecological situations
Objective	To study differential response of sugarcane crop to different nutrients.
Year of start	February- March 2011-2012
Experimental Design	RBD
Replication	3
Variety	CoJ 88
Date of Planting	15-02-2013
Date of harvesting	13-01-2014

Treatments	
T_1	Control (no fertilizer)
T_2	N applied from Urea as per recommendation
T_3	NP (P applied @ 12 kg P_2O_5/ ha from DAP)
T_4	NPK (P applied @ 12 kg P_2O_5/ ha from DAP)
T_5	NPK + S (S was added from elemental sulphur @ 40kg/ha in sub-tropical region)
T_6	NPK + Zn (Zn was added @ 25 kg Zn/ha from $ZnSO_4$ in sub-tropical region)
T_7	NPK + Fe (Fe was applied @ 5kg Fe from $FeSO_4$ as Foliar spray in sub-tropical.)
T_8	NPK + Mn (Mn was applied @ 5kg Mn from $MnSO_4$ as foliar spray in sub-tropical)
T_9	NPK + S + Zn
T_{10}	NPK + S + Zn + Fe
T_{11}	NPK + S + Zn + Fe + Mn
T_{12}	Soil test based fertilizer application
T_{13}	FYM @ 20t/ha

The experiment was conducted on loamy sand soil, tested low in organic carbon (0.30 %), medium in available P (30.8 kg/ha) and low in available K (125 kg/ha). The data presented in table 64.1 showed that the germination, internodes per cane and quality parameters were not significantly influenced by different treatments.

Table- 64.1 Effect of application of different plant nutrients on productivity of sugarcane.

Treatments		Germination %	Tiller Count (000/ha)	Cane length (cm)	Internodes / cane	Single Cane wt. (g)	Millable canes (000/ha)	Cane yield (t/ha)	Pol % juice
T_1	Control	38.0	109.0	146.0	28.3	563.7	85.2	42.6	19.33
T_2	N	39.3	140.5	161.0	29.3	748.7	105.7	64.1	19.99
T_3	NP	36.9	145.4	162.7	26.7	757.3	103.0	64.4	20.07
T_4	NPK	38.0	136.2	159.3	25.7	736.0	106.6	62.7	20.22
T_5	NPK + S	37.6	146.7	178.3	25.3	770.0	117.3	76.4	19.92
T_6	NPK + Zn	36.2	138.4	165.7	30.0	781.7	100.7	69.3	20.03
T_7	NPK + Fe	34.1	146.4	163.0	28.3	702.0	101.8	61.3	20.05
T_8	NPK + Mn	35.6	145.3	159.3	32.0	756.7	108.3	64.1	19.85
T_9	NPK + S + Zn	35.9	149.6	173.0	26.7	791.7	121.7	78.0	19.86
T_{10}	NPK + S + Zn + Fe	35.6	143.4	171.3	30.0	787.3	116.5	77.4	20.08
T_{11}	NPK + S + Zn + Fe + Mn	37.3	140.9	171.0	25.3	793.7	120.0	76.6	19.93
T_{12}	Soil Test Based fert. appln	38.3	143.0	166.3	28.0	771.3	117.6	75.2	19.90
T_{13}	FYM @ 20 t/ha	36.2	117.3	144.0	28.0	678.7	88.7	48.0	19.77
CD (0.05)		**NS**	**21.1**	**9.8**	**NS**	**66.4**	**10.2**	**9.6**	**NS**

It was observed that when sulphur & Zinc was applied along with recommended Nitrogen, Phosphorus & potassium highest cane yield of 78.0 t ha^{-1} was obtained which showed a significant increase of 83 % over the control plot where no nutrient was applied and was at par with the treatments where S was applied along with NP&K (76.4 t $ha^{-1)}$ or in combination with N, P, K, and Fe/ Zn/ Mn .The soil test based fertilizer application also recorded statistically similar cane yield (75.2 t ha^{-1}) . The highest number of tillers were recorded with application of NPK +S+ Zn which were significantly higher to control and FYM only treatment and was closely followed by other treatments where S was applied with combinations of Zn ,Fe &Mn. Similar trend was observed in single cane weight. Millable canes were also significantly high in the treatments where S was applied along with NPK and other micro nutrients.Application of nitrogen alone sustained similar level of productivity as that of other treatments. Even with application of all the nutrients in T_{11} i.e. NPK + S + Zn + Fe + Mn, no additional yield could be obtained. Hence, the results indicate that addition of P,K and other micronutrients except S did not show any increase in cane yield whereas significant increase in cane yield was observed with addition of 40 kg sulpher /ha. So if the soil test report shows S defficiency the Punjab farmers can go for the application of 40 kg/ha S along with recommended dose of nitrogenous fertilizer i.e. 150 kg N ha^{-1}. Applying additional nutrients like P, K, Zn, Mn, Fe failed to show any appreciable effect in the cane yield and seemed to increase only the cost of production. Applying different nutrients in variable combinations could not influence the quality aspects in terms of Pol% .

Summary:

Soil test based fertilizer application should be followed to obtain an optimum cane yield. In the absence of soil test report, one should only apply the nitrogenous fertilizer at recommended dose of 150 kg ha^{-1} to get the optimum yield.

Project No.	**AS-65**
Location	PAU,Regional Research Station kapurthala
Title	Enhancing sugarcane productivity and profitability under wheat –sugarcane cropping system
Objective	To allow farmers to plant sugarcane in time and harvest potential yields in wheat + sugarcane relay copping system.
Year of start	Sept. 2011
Experimental Design	RBD
Replication	3
Variety	CoJ 64
Date of Planting Sugarcane	**20.10.2013**
Date of harvesting	
Autumn Sugarcane	10.12.2014
Spring Sugarcane	01.03.2015
After Wheat harvest	01.03.2015

Treatments	
T_1	Autumn Sugarcane rows sown 90 cm apart
T_2	Autumn Sugarcane + Wheat (1:2)
T_3	Autumn Sugarcane + Wheat (1:3)
T_4	Wheat (15 Nov.) followed by sugarcane after harvest
T_5	Wheat (15 Dec.) followed by sugarcane after harvest
T_6	FIRB Wheat on 15 Nov. + Feb. sugarcane in furrows
T_7	FIRB Wheat on 15 Nov. + Mar. sugarcane in furrows
T_8	FIRB Wheat on 15 Dec. + Feb. sugarcane in furrows
T_9	FIRB Wheat on 15 Dec. + Mar. sugarcane in furrows

The soil of the experimental field was loamy in nature, tested medium in organic carbon (0.66 %), very high in available P (59.5 kg/ha) and very high in available K (925 kg/ha). The experiment was laid out with an objective to provide an option for all the wheat growers to harvest the potential yield of sugarcane through an agronomic intervention of timely planting of sugarcane crop in standing wheat. This will also help the farmers to diversify from the traditional paddy-wheat rotation to wheat– sugarcane relay cropping system. The data presented in table 65.1 showed non significant differences for germination, and cane girth of sugarcane under different methods of wheat- sugarcane intercropping and relay cropping. However, different ways of intercropping wheat in sugarcane and it's relay cropping recorded significant differences in terms of tiller count, cane length, no. of millable canes and cane yield. The tiller count and cane length was significantly reduced when sugarcane was planted late i.e. after harvesting of wheat crop (both Nov. and Dec. sown crop). Sole sugarcane planted in autumn recorded significantly highest cane length (209.4 cm) and millable canes (112.2 th/ha) when compared to sugarcane after harvest of 15 Nov. & 15 Dec. sown wheat and were at par with all other treatments where sugarcane was planted in standing wheat crop either in Feb. or in March.

Autumn planted sole sugarcane crop produced significantly higher cane yield than the crop planted after harvesting of 15 Nov., 15 Dec, sown wheat crop and autumn crop where three rows of wheat were planted.The cane yield of autumn sown sole crop was at par with autumn sown crop with wheat as intercrop and the treatments where sugarcane was planted in standing wheat crop indicating the possibility of timely planting of sugarcane in furrow irrigated raised bed wheat. The yield of wheat was maximum in the treatment T_4 where wheat was sown on 15 Nov. and sugarcane was planted after harvest of wheat crop. It was at par with all others treatments where wheat was sown on 15 Nov. but was significantly better than the treatments where wheat was sown on 15 Dec. The cane equivalent yield was also significantly less when sugarcane was planted after harvesting of 15 Nov. & 15 Dec. sown wheat crop.So highest cane equivalent yield was achieved when autumn crop was intercropped with two rows of wheat (90.7 t/ ha) and was at par with sugarcane relay cropped in Feb. and Mar. in 15 Nov. FIRB wheat but was significantly superior to the sole sugarcane planted in autumn. The cane quality of autumn sown and relay cropped sugarcane was significantly superior to the crop planted late after harvesting of wheat.

Table- 65.1 Effect of planting methods and irrigation levels on performance of sugarcane

Treatments		Germination %	Tiller Count (000/ha)	Cane length (cm)	Cane girth (cm)	Millable canes (000/ha)	Cane yield (t/ha)	Single cane wt.(g)	Wheat Yield (q/ha)	Cane equivalent yield	Pol % juice
T_1	Autumn Sugarcane	44.8	149.8	209.4	1.87	112.2	82.6	738.2	-	82.6	18.55
T_2	Autumn Sugarcane + Wheat (1:2)	43.2	148.5	200.2	1.81	106.9	73.9	702.0	33.6	90.7	18.89
T_3	Autumn Sugarcane + Wheat (1:3)	44.0	150.6	203.2	1.78	105.7	71.8	683.2	35.9	89.8	19.05
T_4	Sug. after harvest of 15 Nov.Wheat	33.9	112.0	169.9	1.74	92.2	59.9	611.6	38.0	78.9	17.41
T_5	Sug. after harvest of 15 Dec Wheat	35.8	109.8	170.2	1.56	88.9	57.9	610.2	28.9	72.4	17.48
T_6	Feb. cane in furrows of 15 Nov. FIRB Wheat	42.2	151.4	203.4	1.93	100.2	74.0	690.8	32.8	90.4	18.52
T_7	Mar. cane in furrows of 15 Nov.FIRB Wheat	42.9	150.0	202.8	1.84	98.5	73.6	685.8	32.9	90.0	18.79
T_8	Feb. cane in furrows of 15 Dec. FIRB Wheat	42.2	152.5	199.9	1.77	98.9	74.4	689.8	26.2	87.5	18.22
T_9	Mar. cane in furrows of 15 Dec. FIRB Wheat	42.0	150.6	198.6	1.76	97.0	73.2	699.6	26.8	87.6	18.46
CD (0.05)		**NS**	**25.4**	**14.9**	**NS**	**9.8**	**11.5**	**68.3**	**6.0**	**9.3**	**0.58**

Summary

The highest cane equivalent yield of 90.7 t/ha was obtained in the treatment T_2 having autumn sugarcane + wheat (1:2) and was at par with relay cropping in standing wheat crop and significantly better than sole sugarcane crop and where crop was planted after wheat harvest.

Project No.	**AS-66**
Location	PAU, Regional Research Station Kapurthala
Title	Priming of cane node for accelerating germination
Objective	To allow farmers to cut down the seed cost besides increasing germination percentage
Year of start	March 2012
Experimental Design	RBD
Replication	3
Variety	CoJ 88
Date of Planting Sugarcane	**03-03-2014**

Treatments	
T_1	Unprimed cane node
T_2	Treating cane node in hot water at 50^0C for 2 hours
T_3	Treating cane node in hot water with 3% urea solution at 50^0C for 2 hours
T_4	Priming cane node with cattle dung, cattle urine and water in 1:2:5 ratio
T_5	Conventional 3 bud sett planting
T_6	Primed and sprouted cane node (incubated for four days after priming)

The experiment was conducted on loamy sand soil, tested low in organic carbon (0.30 %), medium in available P (30.8 kg/ha) and low in available K (125 kg/ha). The objective was to cut down the seed cost and increase germination percentage of the single cane node.

In this experiment the optimum germination was achieved only T5 where conventional three budded sets were planted whereas all other treatments the did not germinate properly. Hence the data was not recorded.

Project No.	**AS-68**
Location	PAU Regional Research Station, Kapurthala
Title	Impact of integrated application of organics and in organics in improving soil health and sugarcane productivity.
Objective	To develop nutrient management strategy for sustaining soil health and sugarcane production.
Year of start	2014-15
Experimental Design	RBD
Replication	3
Variety	CoJ 88
Date of Planting/ harvesting	10-04-2014/ 13-02-2015

Treatments	
T_1	No organic + 50% RDF
T_2	No organic + 100% RDF
T_3	No organic + soil test based recommendation
T_4	Application of FYM/Compost @ 20 tonnes / ha + 50% RDF (inorganic source)
T_5	Application of FYM/Compost @ 20 tonnes / ha + 100% RDF (inorganic source)
T_6	Application of FYM/Compost @ 20 tonnes / ha + in-organic nutrient based on soil test
T_7	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/Acetobacter + PSB*) + 50% RDF
T_8	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/Acetobacter + PSB*) + 100% RDF
T_9	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/Acetobacter + PSB*) + in-organic nutrient based on soil test

Note:

The biofertilizer (*Azotobacter/ Acetobacter* + PSB) was applied @ 5 kg/acre .

The experiment was conducted on loamy sand soil, tested low in organic carbon (0.30 %), medium in available P (30.8 kg/ha) and low in available K (125 kg/ha).The data presented in table no. 68.1 reveals that the highest cane yield (84.0 t/ha) was obtained in treatment T6 when FYM 20t/ ha was applied along with 100% of recommended RDF, which was significantly higher than the treatments (T1,T4 & T7) where 50% RDF was applied alone and also with combination of FYM & biofertilizer. Similar trend was observed in case of millable canes where these were significantly high in T6 than T1,T4 &T7 and at par with other treatments. However the same trend was observed in case of tillers, cane length and single cane weight but the differences were not upto significant level.

Table: 68.1

Treatments	**Germination %**	**Tiller Count (000/ha)**	**Cane length (cm)**	**Cane girth (cm)**	**Single Cane wt. (g)**	**Millable canes (000/ha)**	**Cane yield (t/ha)**	**Pol % juice**
T_1	36.0	113.0	148	2.23	673	72.0	53.9	19.89
T_2	35.2	128.6	154	2.20	760	81.6	65.2	20.09
T_3	37.8	135.6	168	2.22	773	98.9	74.6	19.84
T_4	37.2	133.5	156	2.13	777	79.8	67.0	19.86
T_5	38.2	155.3	161	2.18	853	88.0	79.0	20.11
T_6	38.8	157.3	168	2.29	833	103.8	84.0	20.24
T_7	35.4	115.1	152	2.14	740	75.4	64.3	19.94
T_8	37.0	130.1	160	2.24	791	85.1	71.4	20.76
T_9	35.8	139.6	165	2.22	815	101.9	79.2	20.48
CD(5%)	NS	NS	NS	NS	NS	20.1	13.8	NS

Summary : Soil tested based fertilizers nutrients application along with organic source in an integrated way helps to attain the optimum sugarcane crop yield