

SUGARCANE RESIDUE MANAGEMENT: INFLUENCE OF A MODIFIED SWEEPER ON YIELDS

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The focus of the study was to provide information on implementation of a modified sweeper which results in equally comparable yields to those of the traditional burn treatment for all stubble years. Equally important is to assess the influence of the sweeper on soil and nutrient losses as when compared to runoff from other traditional management strategies.

Materials and Methods

Two experiments were established near Paincourtville, one at Dugas Farm and one at Gravois Farm. The experiment at Gravois Farm consisted of three large plots of variety HoCP 96-540, 2.5 acres (burn), 2.1 acres (mulch), and 1.2 acres (sweep). The treatments were applied in January 2013 after the plant cane was harvested in December 2012. Stalk counts were collected in August 2013. The 1st stubble cane was harvested on December 13, 2013. The whole plots were loaded on to trucks and weighed at the mill. Ten stalk samples were collected from each plot at harvest and processed at the L. S. U. Sugar Station for sucrose analysis. The yield and yield components are reported in Table 1.

The experiment at Dugas Farm consisted of three treatments and two replications of variety L01-299. Each plot consisted of 6 rows 300 feet long. The treatments were applied in January of 2013 after the plant cane was harvested in December of 2012. Stalk counts were collected in August 2013. The 1st stubble cane was harvested on December 17, 2013. The plots were weighed in a weigh wagon. Ten stalk samples were collected at harvest and processed at the L. S. U. Sugar Station for sucrose analysis. The yield and yield components are reported in Table 1.

Two new experiments were initiated in 2015, one in Duson at Rosinski Farm and one in St. Gabriel at the L.S.U. Sugar Station. The experiment at Rosinski Farm consisted of three treatments (burn, mulch, and sweep) and two replications. The plots were 3 rows 480 feet long. Second stubble cane of variety L03-371 was harvested in December of 2014. The treatments were applied in January of 2015. Stalk counts were collected in August of 2015. The 3rd stubble cane was harvested on October 2, 2015. The plots were weighed with a weigh wagon. Ten stalk samples were collected at harvest and processed at the L. S. U. Sugar Station for sucrose analysis. The yield and yield components are reported in Table 3.

The experiment at the L. S. U. Sugar Station consisted of three treatments (burn, mulch, and sweep) and four replications. The plots were 3 rows 450 feet long. Plant cane of variety L 99-226 was harvested in December of 2014. The treatments were applied in January of 2015. Stalk counts were collected in August of 2015. The 1st stubble cane was harvested on November 16, 2015. The plots were weighed with a weigh wagon. Ten stalk samples were collected at harvest and processed at the L. S. U. Sugar Station for sucrose analysis. The yield and yield

components are reported in Table 4. This experiment was continued in 2016. The treatments were applied in January of 2016. The 2nd stubble cane was harvested on November 28, 2016. Stalk counts were collected in November, 2016. The plots were weighed with a weigh wagon. Ten stalk samples were collected at harvest and processed at the L. S. U. Sugar Station for sucrose analysis. The yield and yield components are reported in Table 5.

One new experiment was initiated at Dugas Farms in Paincourtville in 2016. The experiment consisted of three treatments (burn, mulch, and sweep) and two varieties (L01-283 and L01-299). The plots consisted of 6 rows 550 feet long. The plant cane was harvested in December of 2015. The treatments were applied in January 2016. The 1st stubble cane was harvested on November 21, 2016. The plots were loaded onto wagons and weighed at the mill. Ten stalk samples were collected at harvest and processed at the L. S. U. Sugar Station for sucrose analysis. The yield and yield components are reported in Table 6. Average yields over locations and varieties are reported in Table 7.

Results

In 2013, 2014, and 2016 the burn and sweep treatments were similar in cane and sugar yields. The mulch treatment was lower in cane and sugar yields than both the burn and sweep treatments. In 2015, the burn and sweep treatments were similar in cane and sugar yields. The mulch treatment was higher in cane and sugar yields than both the burn and sweep treatments. A strong draught occurred from June till October in both locations. The mulch helped hold moisture in the soil possibly causing the higher yields.

Results from effluent solution of edge field are given in the following figures below for sediment, nitrogen N and phosphorus P. These results are from Gravois site during the 2014 growing season. Several forms of N and P are presented including soluble and total P. Soil and nutrient losses were lowest for the mulch treatment followed by the sweep. These results are consistent with those collected during 2013.

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Table 1. Yield data for sugarcane under different residue management treatments. Harvest was conducted on December 12 and 17, 2013 for the Gravois and Dugas sites, respectively.

TREAT.	REP	POP 1000/A	STALK WT. LBS.	YIELD TONS/A	SUCROSE %	NORMAL BRIX %	JUICE SUCROSE %	PURITY %	SAMPLE CRS LBS/T	SAMPLE SUGAR LBS/ACRE
Gravois Farm HoCP 96-540										
BURN		32.4	1.78	35.1	17.9	16.8	14.3	85.1	204.6	7181
MULCH		30.2	2.06	28.9	18.0	17.0	14.4	84.7	206.3	5962
SWEEP		30.2	1.80	34.8	18.7	17.2	15.0	87.2	216.5	7534
Dugas Farm L 01-299										
BURN	I	36.8	2.52	33.5	18.3	17.2	14.6	84.9	209.7	7025
	II	37.2	1.92	34.0	17.6	16.9	14.0	82.8	199.5	6783
	Average	37.0	2.22	33.8	18.0	17.1	14.3	83.9	204.6	6904
MULCH	I	35.4	1.98	33.9	17.4	16.6	13.9	83.7	197.8	6705
	II	35.9	2.21	31.3	18.7	17.5	14.9	85.1	214.8	6723
	Average	35.7	2.10	32.6	18.1	17.1	14.4	84.4	206.3	6714
SWEEP	I	36.3	1.82	34.1	18.2	17.2	14.6	84.9	209.7	7151
	II	36.8	1.66	32.4	18.9	17.7	15.1	85.3	218.2	7070
	Average	36.6	1.74	33.3	18.6	17.5	14.9	85.1	214.0	7111

There were no significant differences with any yield component at the Dugas Farm experiment.

Table 2. Yield data for sugarcane variety HoCP 96-540 under different residue management treatments. Harvest was conducted on December 2, 2014 for the Gravois site.

TREAT.	POP	STALK WT.	YIELD	SUCROSE	CRS	SUGAR
	1000/A	LBS.	TONS/A	%	LBS/T	LBS/A
BURN	33.3	2.01	28.7	13.3	215.0	6172
MULCH	29.9	1.86	26.5	13.3	207.3	5492
SWEEP	33.1	2.01	28.0	13.6	219.9	6157

Table 3. Yield data for sugarcane variety L03-371 under different residue management treatments at Duson site. Harvest was conducted on October 2, 2015.

TREATMENT	REP	POP	STALK WT.	YIELD	BRIX	SUCROSE	CRS	PURITY	SUGAR
		1000/A	LBS.	TONS/A	%	%	LBS/TON	%	LBS/A
BURN	I	29.5	1.22	13.4	22.6	22.3	317.1	84.3	4249
	II	33.7	1.06	16.8	22.2	22.1	315.9	85.2	5307
	X	31.6	1.14	15.1	22.4	22.2	316.5	84.8	4778
MULCH	I	31.1	1.31	17.6	20.5	20.3	289.1	84.5	5088
	II	38.9	1.16	17.1	20.4	19.9	281.8	83.6	4819
	X	35.0	1.24	17.4	20.5	20.1	285.5	84.1	4954
SWEEP	I	31.8	0.96	15.3	22.5	22.5	322.7	85.7	4937
	II	37.8	0.90	14.8	21.5	21.3	303.7	84.7	4495
	X	34.8	0.93	15.1	22.0	21.9	313.2	85.2	4716
LSD .05		NS	NS	NS		NS	NS		NS

The plots consisted of 3 rows 480 feet long. The test was harvested October 2, 2015. The variety was L03-371.

A drought occurred from the middle of June until harvest. Only three measurable rainfall events with less than 2 inches occurred from early June to October 2.

Table 4. Yield data for sugarcane variety L99-226 under different residue management treatments at St. Gabriel site. Harvest was conducted on November 18, 2015.

TREATMENT	REP	POP	STALK WT.	YIELD	BRIX	SUCROSE	CRS	PURITY	SUGAR
		1000/A	LBS.	TONS/A	%	%	LBS/TON	%	LBS/A
BURN	I	42.1	1.70	27.2	17.3	17.3	247.7	85.4	6737
	II	42.7	1.75	27.9	17.0	17.3	250.2	87.2	6981
	III	38.5	1.39	40.2	16.6	16.5	235.5	84.9	9467
	IV	38.6	1.82	27.9	17.0	16.6	235.2	83.7	6562
	X	40.5	1.67	30.8	17.0	16.9	242.2	85.3	7437
MULCH	I	45.4	1.56	30.8	17.0	17.2	248.1	86.7	7641
	II	44.1	1.35	30.5	16.6	16.6	237.7	85.4	7250
	III	45.2	2.07	32.9	17.2	17.3	249.0	86.3	8192
	IV	46.6	2.13	33.6	17.0	17.0	243.8	85.7	8192
	X	45.3	1.78	32.0	17.0	17.0	244.7	86.0	7819
SWEEP	I	37.6	1.69	33.1	17.2	17.5	253.3	87.3	8384
	II	48.6	1.83	30.8	17.3	17.4	249.9	85.9	7697
	III	41.8	1.50	24.3	16.4	16.6	239.5	86.8	5820
	IV	47.0	1.67	35.5	16.7	17.2	249.9	88.0	8871
	X	43.8	1.67	30.9	16.9	17.2	248.2	87.0	7693
LSD .05		NS	NS	NS		NS	NS		NS

Table 5. Yield data for sugarcane variety L99-226 under different residue management treatments at St Gabriel site. Harvest was conducted on November 19, 2015.

TREATMENT	REP	POP	STALK WT.	YIELD	BRIX	SUCROSE	CRS	PURITY	SUGAR
		1000/A	LBS.	TONS/A	%	%	LBS/TON	%	LBS/A
BURN	I	40.5	1.93	23.3	17.2	17.1	245	85.3	5702
	II	37.3	1.89	24.1	17.2	17.2	247	85.8	5948
	X	38.9	1.91	23.7	17.2	17.2	246	85.6	5828
MULCH	I	40.2	1.92	25.3	17.2	17.2	246	85.4	6229
	II	42.8	1.99	21.9	17.4	17.4	249	85.5	5457
	X	41.5	1.96	23.6	17.3	17.3	248	85.5	5843
SWEEP	I	44.1	2.28	26.2	17.2	17.1	245	85.3	6411
	II	40.7	1.77	25.3	17.3	17.0	242	84.4	6120
	X	42.4	2.03	25.8	17.2	17.1	243	84.9	6266
LSD .05		NS	NS	NS		NS	NS		NS

Table 6. Yield data for sugarcane under different residue management treatments. Harvest was conducted on November 21, 2016.

TREATMENT	STALK			NORMAL BRIX %	JUICE SUCROSE %	PURITY %	SAMPLE CRS LBS/T	SAMPLE SUGAR LBS/ACRE
	POP 1000/A	WT. LBS.	YIELD TONS/A					
Dugas Farm L01-283								
BURN	43.3	1.65	35.7	18.9	18.5	83.8	262	9364
MULCH	43.3	1.40	30.3	19.4	18.3	80.6	254	7702
SWEEP	51.2	1.34	34.3	18.7	18.8	85.9	270	9261
Dugas Farm L01-299								
BURN	41.5	1.92	39.8	18.5	18.2	84.0	258	10280
MULCH	39.4	1.97	38.8	18.5	17.4	80.7	242	9378
SWEEP	54.2	1.44	39.0	18.7	18.3	83.7	259	10109

Table 7. Average yield data over years and varieties for the mulch treatments.

TREATMENT	POP 1000/A	STALK		SUCROSE %	CRS LBS/T	SUGAR LBS/A
		WT. LBS.	YIELD TONS/A			
BURN	37.3	1.79	30.3	16.9	243.6	7244
MULCH	34.2	1.80	28.8	16.5	236.8	6733
SWEEP	37.4	1.62	30.2	17.1	248.0	7356