2003/04 U.S. SUGAR CORPORATION PROJECT

AN EVALUATION OF MOLASSES FOR IMPROVING TURFGRASS PERFORMANCE

FINAL REPORT
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OBJECTIVE: To define and quantify the agronomic performance benefits of molasses when applied to greens height bermudagrass.

TREATMENTS:

1. Molasses applied at 210 ml/m^2
2. Molasses applied at 21 ml/m^2
3. Untreated Control

MATERIALS AND METHODS:

Molasses treatments were initiated at the above rates to Tifdwarf bermudagrass mowed at greens height on May 7, 2003. Treatments were applied using a CO_2 boom type sprayer set at 30 psi. A randomized complete block design of 4 replications was used and plot size was 1m x 2m. Treatments were applied weekly and watered in with approximately 0.10 inches irrigation—just enough to remove treatments from the leaf blade. Turfgrass quality ratings (scale of 1-10 with 10=dark green turf, 1=dead/brown turf and 6=minimally acceptable turf) were taken weekly and beginning in July, monthly clipping samples were taken. All data was subject to statistical analysis and significant means were identified.

RESULTS AND DISCUSSION:

The experimental period encompassed 13 months and initially treatment differences were not observed until approximately one month following the beginning of the trial for turf quality (Table 1a). Generally, over the first several months, when significant differences were observed, it was most obvious with the highest rate of molasses (210 ml rate) (Tables 1a-e). For example, on 12/19/03, the 210 ml rate had a rating nearly 2 quality points higher than the untreated check (Table 5). It was interesting to note that degree of difference in the treatments. Those differences were not sustained thereafter as the trial entered into a period of cooler dry weather in winter (Tables 1e-1f). By February, there was an inverse in turf quality ratings in which the 210 ml rate had significantly lower turf quality scores through the 4/19 rating date (Tables 1f-1g). Beginning with the 4/26 rating date and thereafter, the 210 ml rate once again had the highest turf quality rates, with on some dates nearly having a 2 point increase in turf quality than that of the control (Tables 1g-1h).

The decrease in turf quality in the 210 ml rate may have been associated with soil water repellency. Soil water repellency in sand-grown turf is observed during Florida's dry weather periods. In an attempt to explain the turf quality ratings observed during winter and early spring of 2004, the impact of molasses on some factors of soil water repellency was determined on selected dates (Tables 3and 5). There was no strong effect of molasses on increasing water drop penetration time (a measure of potential soil water repellency (Tables 5a and b) or on soil moisture retention (Table 3)

Turfgrass clipping were significantly greater on two rating dates (Tables 2a-b). The greatest difference was observed on the last harvest date on 5/26/04 with the 210 ml rate having over 3X clippings compared to the control (Table 2b).

Cores were removed from the study area in December 2003 and again at the completion of the experiment to determine the effect of molasses on shoot density (shoot counts) and at the end of the study to quantify rooting. Shoot counts were not significantly increased by molasses treatment, although there was a non-statistically significant trend for increased shoots with increasing rate (Table 4). Root length was increased by the 210 ml rate and root dry weigh while not statistically-different was nearly 50% more for the 210 ml rate than the control (Table 4). Thatch depth was not different although there was non-statistically significant trend for more thatch depth with increasing molasses treatment (Table 4). There was not verticutting or core aerification done during the trial.

The observations reported here are mixed. While increasing molasses had a positive affect on turfgrass quality in warm weather months, decreases in turf quality in cool dry months suggests that careful application of the material is warranted. More work is needed to better understand the impacts of molasses on improving and decreasing turf quality. The impact of molasses on certain agronomic aspects of turf such as growth, rooting and potentially shoot density are promising. There is some concern over potential thatch accumulation. Turf managers generally increase cultivation via verticutting and/or core aeration to remove excess organic matter as needed during routine maintenance. It is anticipated that routine cultivation will reduce any potential adverse impacts on organic matter accumulation.

Table 1a. Turfgrass quality ratings for Molasses study initiated on May 7, 2003 at the Fort Lauderdale Research and Education Center.

Rate ml/m^2	5/7	5/14	5/20	5/27	6/4	6/11	6/18	6/25
0	8.0	8.1	8.1	7.8	7.9	5.4b	7.0	6.8b
21	8.0	7.9	8.4	7.9	8.0	5.9a	7.1	7.4a
210	7.6	8.1	8.4	8.0	8.3	5.8ab	7.0	7.4a
SIGNIF.	ns	ns	ns	ns	ns	+	ns	*

ns, +, and * = P>0.10, P<0.10, and P<0.05 respectively.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Turfgrass quality ratings based on a 1-10 scale with 10=dark green turf, 1=dead/brown turf, and 6=minimally acceptable turf.

Table 1b. Turfgrass quality ratings for Molasses study initiated on May 7, 2003 at the Fort Lauderdale Research and Education Center.

Rate ml/m^2	7/2	7/9	7/16	7/23	8/7	8/14
0	6.9	7.3b	6.9b	7.1	8.0	7.4
21	7.5	7.4ab	6.9b	7.3	7.8	7.4
210	6.6	7.6a	7.6a	7.5	7.8	7.8
SIGNIF.	ns	+	+	ns	ns	ns

ns and + = P>0.10 and P<0.10 respectively.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Turfgrass quality ratings based on a 1-10 scale with 10=dark green turf, 1=dead/brown turf, and 6=minimally acceptable turf.

Table 1c. Turfgrass quality ratings for Molasses study initiated on May 7, 2003 at the Fort Lauderdale Research and Education Center.

Rate ml/m^2	8/21	8/27	9/3	9/10	9/17	10/2
0	7.8	7.6	7.9	7.6	6.8	7.1
21	7.8	7.6	7.9	7.9	6.9	7.3
210	8.3	8.0	7.9	7.9	6.4	7.6
SIGNIF.	ns	ns	ns	ns	*	**

ns, *, and ** = P>0.10, P<0.05, and P<0.01 respectively.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Turfgrass quality ratings based on a 1-10 scale with 10=dark green turf, 1=dead/brown turf, and 6=minimally acceptable turf.

Table 1d. Turfgrass quality ratings for Molasses study initiated on May 7, 2003 at the Fort Lauderdale Research and Education Center.

Rate ml/m^2	10/8	10/15	10/23	10/29	11/20	12/16
0	6.9	6.9	7.9	7.9	8.1	7.4
21	7.1	7.3	8.0	7.8	8.3	7.4
210	7.9	7.8	8.1	8.1	8.3	7.8
SIGNIF.	*	ns	ns	ns	ns	ns

* and ns = P<0.01 and P>0.10 respectively.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Turfgrass quality ratings based on a 1-10 scale with 10=dark green turf, 1=dead/brown turf, and 6=minimally acceptable turf.

Table 1e. Turfgrass quality ratings for Molasses study initiated on May 7, 2003 at the Fort Lauderdale Research and Education Center.

Rate ml/m^2	12/19	12/30	1/8/04	1/13	1/21	1/26
0	7.4a	7.8	6.9	7.4	7.1	7.1
21	7.9b	7.8	7.3	7.3	7.0	7.1
210	9.1b	7.3	7.4	7.1	7.0	6.9
SIGNIF.	**	ns	ns	ns	ns	ns

** and ns = P<0.01 and P>0.10 respectively.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Turfgrass quality ratings based on a 1-10 scale with 10=dark green turf, 1=dead/brown turf, and 6=minimally acceptable turf.

Table 1f. Turfgrass quality ratings for Molasses study initiated on May 7, 2003 at the Fort Lauderdale Research and Education Center.

Rate ml/m^2	2/2	2/9	2/16	2/23	3/8	3/15
0	6.8	6.8b	6.8	6.3a	7.5ab	7.1a
21	7.1	7.4a	6.6	6.4a	7.9a	7.3a
210	6.6	6.4b	5.9	4.5b	6.9b	6.3b
SIGNIF.	ns	**	ns	**	**	*

ns, **, and * = P>0.10, P<0.01, and P<0.05 respectively.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Turfgrass quality ratings based on a 1-10 scale with 10=dark green turf, 1=dead/brown turf, and 6=minimally acceptable turf

Table 1g. Turfgrass quality ratings for Molasses study initiated on May 7, 2003 at the Fort Lauderdale Research and Education Center.

Rate ml/m^2	3/22	3/30	4/5	4/12	4/19	4/26
0	7.4a	6.8	6.0	6.3	6.6b	5.8b
21	7.4a	6.8	6.5	6.5	7.1a	6.1ab
210	6.8b	7.1	6.4	6.4	6.8b	6.8a
SIGNIF.	*	ns	ns	ns	**	*

*, ns, and ** = P<0.05, P>0.10, and P<0.01 respectively.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Turfgrass quality ratings based on a 1-10 scale with 10=dark green turf, 1=dead/brown turf, and 6=minimally acceptable turf

Table 1h. Turfgrass quality ratings for Molasses study initiated on May 7, 2003 at the Fort Lauderdale Research and Education Center.

Rate ml/m^2	5/3	5/17	5/26	6/9/04END
0	6.3b	5.5b	6.0b	6.8b
21	6.4b	6.0b	5.9b	7.0b
210	7.3a	8.3a	7.9a	7.8a
SIGNIF.	**	**	**	**

** = P<0.01

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Turfgrass quality ratings based on a 1-10 scale with 10=dark green turf, 1=dead/brown turf, and 6=minimally acceptable turf

Table 2a. Turfgrass clipping weights (grams) for Molasses study initiated on May 7, 2003 at the Fort Lauderdale Research and Education Center.

Rate ml/m^2	7/9	8/7	9/11	10/03	11/5	12/30
0	11.13	9.3	15.9	8.2	6.7	5.0
21	16.95	9.4	15.4	5.8	5.1	4.8
210	12.03	9.9	22.8	9.6	6.2	6.2
SIGNIF.	ns	ns	ns	+	ns	ns

ns, and + = P>0.10, and P<0.10 respectively.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Table 2b. Turfgrass clipping weights (grams) for Molasses study initiated on May 7, 2003 at the Fort Lauderdale Research and Education Center.

Rate ml/m^2	1/27	2/25	3/22	4/19	5/26
0	9.5	6.9	2.1	1.3	3.1b
21	6.6	14.9	3.6	1.6	5.1b
210	5.6	6.8	2.1	1.6	10.5a
SIGNIF.	ns	ns	ns	ns	**

ns = P>0.10.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Table 3. Soil moisture measurements (%) for Molasses study initiated on May 7, 2003 at the Fort Lauderdale Research and Education Center.

Rate ml/m^2	8/7/03	2/16/04	3/8/04
0	28	39	34
21	23	40	36
210	29	40	38
SIGNIF.	*	ns	ns

* and ns = P<0.05, and P>0.10 respectively.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Table 4. Data on soil cores taken December 30, 2003 and May 26, 2004 for Molasses study at the Fort Lauderdale Research and Education Center.

Rate ml/m^2	12/30/03 Shoot Count	5/26/04 Shoot Count	5/26 Root Length (cm)	5/26 Thatch Depth (cm)	Pelt / Root Dry Wt. (g)
0	201	289	4.75b	0.65	7.38 / 1.03
21	183	297	5.05b	0.88	6.43 / 1.01
210	185	375	6.75a	0.95	5.75 / 1.46
SIGNIF.	ns	ns	*	ns	ns / ns

Ns= P>0.10.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test.

Table 5a. WDPT (seconds) for Molasses study taken on 2/16/04

SOURCE	0	1cm	2cm	3cm	4cm	5cm	6cm
0	90.3	13.3	9.8	6.8a	3.5	2.8	1.0b
21	139.5	24.0	7.0	3.3b	3.3	1.5	0.5b
210	160.5	27.3	8.0	3.0b	2.5	2.0	2.0a
SIGNIF.	ns	ns	ns	+	ns	ns	**

ns, +, and **= P>0.10, P<0.10, and P<0.01.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test

Table 5b. WDPT (seconds) for Molasses study taken on 3/8/04

SOURCE	0	1cm	2cm	3cm	4cm	5cm	6cm
0	100.3	10	10.8	5	2	1.3	0.8
210	104.3	17	5	3.3	2	0.8	0.8
SIGNIF.	ns	ns	ns	ns	ns	ns	ns

ns, = P>0.10.

Means with the same letter within a column are not significantly different according to Duncan's Multiple Range Test