EFFICACY OF DIFFERENT GLYPHOSATE FORMULATIONS AND ALTERNATIVE RIPENERS IN ENHANCING SUGAR YIELD IN LOUISIANA SUGARCANE DURING THE 2003 CROP

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SUMMARY

In the first of two field experiments, there was no apparent residual effect of Polado® (Monsanto) at 0.1875 lb ae/A (6 oz/A), Arsenal® (BASF) at 0.143 and 0.214 lb ai/A and Fusilade® (Syngenta) at 0.0625 and 0.875 lb ai/A on millable stalks per acre or TRS/TC. These results suggest that all treatments, with the possible exception of Arsenal at 0.214 lb-rate, can be applied repeatedly over years to the stubble crops of LCP 85-384 without a detrimental residual effect on the subsequent stubble crop.

In the second experiment, 18 ripener treatments were applied on August 26, 2003, in water at a broadcast rate of 8 gallong per acre with a CO_2 sprayer and hand-held boom: a nonionic surfactant, Induce® (Helena) (0.25% v/v), was added to all spray solutions for those treatments not loaded with their own surfactant to the fourth-stubble crop of the variety LCP 85-384. The 18 treatments included: Arsenal at 0.143 lb ai/A (8 oz/A), MON 78270 (Monsanto) at 0.125, 0.1875, 0.25 and 0.3125 lb ae/A (equivalent to 3.56, 5.34, 7.12 and 8.90 oz/A, respectively), MON 78754 (Monsanto) at 0.125, 0.1875 and 0.25 lb ae/A (equivalent to 4.325, 6.487 and 8.650 oz/A, respectively), Polado at 0.125, 0.1875, 0.25 and 0.3125 lb ae/A (equivalent to 4, 6, 8 and 10 oz/A, respectively), Polado at 0.1875 lb ae/A (6 oz/A) mixed with Takeup® at 1 pt/A, Touchdown HiTECH® (Syngenta) at 0.125, 0.1875, 0.25 and 0.3125 lb ae/A (equivalent to 3.2, 4.8, 6.4 and 8.0 oz/A, respectively) and an untreated check serving as control.

This study showed that glyphosate and Arsenal are effective in increasing the yield of theoretical recoverable sugar per ton of cane (TRS/TC) and sugar per acre (TRS/A) at the rates tested for the variety LCP 85-384 at 35 and 49 days after treatment (DAT), although it appears that little or no benefit is obtained by exceeding the glyphosate rate of 0.1875 lb ae/A (equivalent to 6 oz/A-rate of Polado). Because of the apparent impact of glyphosate and Arsenal on mean stalk weight (MSW) and yield of cane per acre (TC/A), it appears that a greater response in TRS/A occurs at 35 DAT although the efficacy of Arsenal in improving TRS/TC is greater at 49 DAT when compared to 35 DAT. However, the rates for both glyphosate and Arsenal will, undoubtedly, change depending upon variety (Millhollen & Legendre 1996). The data showed that the 0.125 lb ae/A rate of glyphosate (equivalent to 4 oz/A-rate of Polado) will significantly improve TRS/TC for LCP 85-384; however, the 0.1875 lb ae/A-rate is significantly more efficient in increasing TRS/TC when compared to control. These data support the previous recommendations that glyphosate, regardless of formulation tested, be applied at 0.1875 lb ae/A for optimal results in improving both TRS/TC and TRS/A. Arsenal, although not as effective as glyphosate in increasing TRS/TC and TRS/A, is still an effective ripener and currently the only

compound that offers new chemistry to compete with glyphosate as a proven chemical ripener under the prevailing conditions found in Louisiana. Although the use of a surfactant is optional with some products, it appears that response can be improved with the addition of a surfactant. No improvement in efficacy of glyphosate was noted for a second year with the addition of Takeup. To improve the probability of success in increasing TRS/A, sugarcane treated with a chemical ripener should be harvested within 35 to 49 DAT.

The only labeled and recommended glyphosate product included in the 2003 studies was Polado. Although Touchdown iQ ® (Syngenta) is also currently labeled and recommended for commercial use in Louisiana, it was not included in these studies. Instead, the Touchdown HiTECH formulation of glyphosate was included to compare its efficacy to that of Polado. Both Polado and Touchdown HiTECH contain no surfactants or additives; therefore, these products allow the user the flexibility to customize the amount of high-quality non-ionic (NIS) surfactant added.

INTRODUCTION

In Louisiana, a sugarcane crop cycle usually consists of a fall-planted crop (plant-cane), which grows very little during winter and is harvested about one year after planting, and two or more stubble (ratoon) crops. The region has a 7- to 9-month growing season that extends from early spring to late November or until harvest during the period from late September to mid January. Consequently, sugarcane is relatively immature at the beginning of harvest, and sucrose levels are usually low, generally increasing as the harvest season advances, depending upon the variety. Sucrose levels in juice and yield of sugar per ton and per acre are affected greatly by variety and weather conditions during the growing season and harvest. A combination of high incident light, cool nights and drying soil prior to and during the harvest period retards vegetative growth and promotes sucrose accumulation (natural ripening) (Legendre 1975).

Artificial ripening of sugarcane has been made possible by the development of plant growth regulators such as chemical ripeners that hasten sugarcane maturation and increase sugar yield (Nickell 1984). Glyphosate [N-(phosphonomethyl)glycine], one of the most effective chemical ripeners used on a worldwide basis, apparently influences the way dry matter is partitioned, increasing the ratio of sucrose to fiber (Osgood et al. 1981). However, glyphosate treatment usually decreases cane yield in the crop by slowing cane growth after treatment, thus reducing stalk weight. In Louisiana, the effectiveness of glyphosate (Polado or Touchdown iQ) for ripening sugarcane is strongly dependent upon variety, treatment-harvest interval and growing season. The Polado label for sucrose enhancement in Louisiana, Florida and Texas stipulates use only in stubble crops, a rate range of 4 to 14 ounces per acre of the formulated product (contains 4 lb of glyphosate acid in each gallon in the isopropyl amine salt form) and a treatment-harvest interval of 35 to 49 days. The Touchdown label also stipulates use only in stubble crops at a rate of 8 to 10 ounces per acre of the formulated product (contains 3 lb of glyphosate acid in each gallon in the diammonium salt form) and a treatment harvest interval of 21 to 35 days. Neither product is labeled for plant-cane crops in these states because of possible phytotoxicity to crown buds which could affect regrowth (stubbling) adversely, thus having the potential to reduce plant stands and yields in the subsequent stubble crop. Slow stand development in spring is commonly observed in glyphosate-treated sugarcane in Louisiana.

Millhollon and Legendre (1996) found that annual glyphosate (Polado) ripener treatments will usually increase mean annual sugar yield, but the magnitude of the increase will depend on variety tolerance to the treatments. They found that CP 70-321 appeared to have adequate tolerance to annual treatments, whereas LCP 85-384 can show extreme sensitivity. This prompted a reduction in the rate of Polado from 8 oz/A to 6 oz/A for LCP 85-384.

Currently, glyphosate is used on approximately 305,000 acres in Louisiana, netting the state's sugarcane growers, processors and landlords an estimated $22.1 million in increased gross revenues each year. However, Polado and Touchdown are not labeled for plant-cane use and typically cause a loss of cane yield in the crop being treated. Further, there is potential for these products to cause yield reduction in the subsequent stubble crop. Therefore, additional research is needed to find alternative ripeners that can be used on the plant-cane crop and be harvested at a reduced treatment-harvest interval. Additionally, alternative ripeners should be developed that have little or no impact on cane yield and will not affect the subsequent stubble crop.

Polado is currently formulated without added surfactant. Although it is suggested that a quality non-ionic surfactant be added with Polado if conditions warrant, i.e., if rain is eminent, research has demonstrated that the use of a surfactant can improve the efficacy of the product. On the other hand, Touchdown iQ is formulated with a surfactant; however, the formulation of Touchdown (HiTECH) used in this experiment is formulated without a surfactant. This experiment was designed to test the efficacy of various loaded and unloaded formulations containing different salts of glyphosate from Monsanto and Syngenta along with potential ripeners with different chemistry in the same test.

A second objective of this experiment was to look at other potential ripeners. Because of the possibility of glyphosate-tolerant sugarcane varieties being developed in the future, the use of glyphosate as a ripener would be effectively eliminated. From 1983 to 1986, Legendre (unpublished data), while employed by the USDA-ARS, SRRC, Sugarcane Research Unit at Houma, showed that two products, Fusilade (fluazifop-P-butyl) and Arsenal (imazapyr), had the potential to ripen sugarcane under Louisiana conditions; however, the testing of both products was discontinued because the companies expressed no commercial interest. However, in recent years BASF has had renewed interest in the use of Arsenal as a ripener; consequently, it was included in this study.

PROCEDURES

In an attempt to measure the residual effect of repeated applications of chemical ripeners on the variety LCP 85-384, on plant populations and yield of cane the subsequent stubble crops, plots treated with Polado, Arsenal and Fusilade for two consecutive years, 2001 and 2002, were harvested in the third-stubble crop in 2003. Sugarcane was cultivated and fertilized according to recommended practices; insecticides were applied as required. The previous chemical treatments were applied on August 23, 2001, and again on August 21, 2002, in water at a broadcast rate of 8 gal/A with a CO_2 sprayer and hand-held boom. A nonionic surfactant, Induce® (0.25% v/v)(Helena), was added to all spray solutions. The experiment consisted of six treatments: Polado at 0.1875 ae/A (6 oz/A); Arsenal at 0.143 and 0.214 lb ai/A; Fusilade at 0.0625 and 0.0875 lb ai/A; and an untreated check serving as control. A 36-inch band was sprayed over

sugarcane foliage so that most of the leaves were wet by the spray. Plots were one-row by 100 feet long with a 5-foot alley and with buffer rows on each side of treated row, arranged in a randomized complete block design with five replications. All plots were ultimately harvested green by combine at 49 days after treatment in both 2001 and 2002. The mulch residue remained on the fields after each harvest.

In 2003, fifteen-stalk samples, taken at random along the row, were removed from each plot on November 7. Stalks were stripped of all leaves and topped approximately 4-6 inches below the apical meristem (bud). Following hand sampling, each plot was harvested by a cane combine (Cameco Model 2500) operating at approximately 3.5 mph and an extractor fan speed of 950 rpm. All cane from each plot was weighed in the wagon equipped with load cells and the weights recorded. Data collected and/or calculated from hand samples included millable stalks per acre, mean stalk weight (MSW), Brix by refractometer, sucrose by polarimetry, purity as the ratio of sucrose to Brix and the yield of theoretical recoverable sugar per ton of cane (TRS/TC). From weighed plots, the yield of tons cane per acre (TC/A) was calculated and, with the data for TRS/TC, the yield of theoretical recoverable sugar per acre (TRS/A) was calculated for each plot.

In the second experiment, 18 ripener treatments were applied on August 26, 2003, in water at a broadcast rate of 8 gal/A with a CO_2 sprayer and hand-held boom. Induce (0.25% v/v) was added again to all spray solutions for those treatments not having with their own surfactant (unloaded) to the fourth-stubble crop of the variety LCP 85-384. The 18 treatments included: Arsenal (BASF) at 0.143 lb ai/A (8 oz/A), MON 78270 (a loaded formulation of glyphosate from Monsanto in the isopropyl amine salt form) at 0.125, 0.1875, 0.25 and 0.3125 lb ae/A (equivalent to 3.56, 5.34, 7.12 and 8.90 oz/A, respectively), MON 78754 (a loaded formulation of glyphosate from Monsanto in the potassium salt form) at 0.125, 0.1875 and 0.25 lb ae/A (equivalent to 4.325, 6.487 and 8.650 oz/A, respectively), Polado (Monsanto) at 0.125, 0.1875, 0.25 and 0.3125 lb ae/A (equivalent to 4, 6, 8 and 10 oz/A, respectively), Polado at 0.1875 lb ae/A (6 oz/A) mixed with Takeup at 1 pt/A, Touchdown HiTech (an unloaded formulation of glyphosate from Syngenta containing 5 lb of glyphosate acid in each gallon in the potassium salt form) at 0.125, 0.1875, 0.25 and 0.3125 lb ae/A (equivalent to 3.2, 4.8, 6.4 and 8.0 oz/A, respectively) and an untreated check serving as control. A 36-inch band was sprayed over sugarcane foliage so that most of the leaves were wet by the spray. Plots were one-row by 40 ft long with a 5-foot alley and with buffer rows on each side of treated row, arranged in a randomized complete block design with four replications.

Fifteen-stalk samples, taken at random along the row, were removed from each plot on September 30 and October 14 (35 and 49 DAT, respectively). Stalks were stripped of all leaves and topped approximately 4-6 inches below the apical meristem (bud). On October 14 (49 DAT), each plot was harvested by a cane combine (Cameco Model 2500) operating at approximately 3.5 mph and an extractor fan speed of 950 rpm. All cane from each plot was weighed in the wagon equipped with load cells and the weights recorded. Data collected and/or calculated included mean stalk weight (MSW) and height, Brix by refractometer, sucrose by polarimetry, purity as the ratio of sucrose to Brix and the yield of theoretical recoverable sugar per ton of cane (TRS/TC). From weighed plots, the yield of tons cane per acre (TC/A) was calculated and with the data for TRS/TC, the yield of theoretical recoverable sugar per acre

(TRS/A) was calculated for each plot. However, because of the damage done to plots at harvest in 2002 following Tropical Storm Isidore, Hurricane Lili and the record rainfall amounts that occurred during the harvest season, there was considerable variation in plot weights that could not be attributed to ripener treatments. Therefore, the yield of tons of cane per acre (TC/A) was calculated by multiplying the MSW on each of the two dates of harvest by a constant (40,000) which represented the average number of stalks per plot. The yield of theoretical recoverable sugar per acre (TRS/A) was simply the product of TC/A by TRS/TC.

Data were analyzed using the Proc Mixed Procedure of the SAS (v 8.2) software package. When data were balanced, LSD values were calculated for mean separation. When data were unbalanced, least square means were calculated. Mean separation was done by the PDIFF option (P = 0.05).

RESULTS AND DISCUSSION

Where ripener treatments were applied to the same plots for two consecutive years in the first- and second-stubble crops, only Arsenal at the high rate (0.214 lb ai/A) resulted in a significant reduction in MSW in the subsequent third-stubble crop (Table 1). However, this reduction in MSW did not result in significant reductions of either TC/A or TRS/A, although the yields of both components were numerically lower. There was no apparent residual effect of any of the ripener treatments on millable stalks per acre or TRS/TC. These results suggest that all treatments, with the possible exception of Arsenal at 0.214 lb ai/A-rate, can be applied repeatedly over years to the stubble crops of LCP 85-384 without a detrimental residual effect on the subsequent stubble crop.

In the second experiment, there was a significant difference in MSW among the 18 treatments in the test at 35 DAT (Table 2) although the data were highly variable. The variability was, undoubtedly, caused by the residual effect of the poor harvesting conditions during the 2002 crop. There was no treatment with an MSW that was significantly heavier than control and only two treatments, MON 78270 at 5.34 oz/A (0.1875 lb ae/A) and MON 78754 at 4.325 oz/A (0.1875 lb ae/A), had an MSW that was lighter than the control. However, one would expect that MSW would be affected negatively at the higher glyphosate rates, not at the lower rates as seen in this study. This is somewhat of an anomaly, undoubtedly caused by the variability of results. The same trend was noted for TC/A since TC/A was the product of MSW times a constant of 40,000 (estimated number of stalks per acre); there were also no treatments with TC/A greater than control and the same two treatments mentioned above had TC/A significantly less than control. Again, one would expect that TC/A would be affected most by the higher rates of glyphosate, which was not the case in this study.

There were highly significant differences among treatments for TRS/TC at 35 DAT (Table 2). The TRS/TC for all ripener treatments was significantly higher than control. Further, it appeared that the higher the rate, the greater the efficacy of the product in increasing TRS/TC although it appeared that little or no improvement was noted when rates of glyphosate, regardless of formulation tested, exceeded the 0.25 lb ae/A-rate (equivalent to Polado at 8 oz/A). Although there was a significant increase in TRS/TC at the 0.125 lb ae/A-rate (Polado at 4 oz/A) for all glyphosate formulations tested when compared to control, there was also a significant improvement in TRS/TC at the 0.1875 lb ae/A rate (equivalent to Polado at 6 oz/A) for both

Polado and Touchdown. For LCP 85-385, it is recommended that glyphosate be applied at a rate equivalent to 6 oz of Polado (Legendre 2001), although the lower rate is sometimes used. Although Arsenal at the 0.143 lb ai/A rate significantly increased TRS/TC when compared to control, it does so at a lower level when compared to the higher rates of glyphosate. It has been claimed that tank mixing Takeup with Polado will improve TRS/TC when compared to Polado alone, especially early in the post-treatment period. However, in the current test there was no advantage to tank mixing Takeup with Polado (Table 2). These results are similar to those reported in 2002 (Legendre, et al. 2003).

There was a significant increase in TRS/A for all glyphosate treatments with the exception of the two lowest rates of MON 78270 (3.56 and 5.34 oz/A, which is equivalent to 0.125 and 0.1875 lb ae/A rates, respectively), the lowest rate of MON 78754 (4.325 oz, which is equivalent to 0.125 lb ae/A) and the 4 oz-rate of Polado (0.125 lb ae/A-rate) (Table 2). There was a numerical increase in TRS/A for all remaining ripener treatments although the differences when compared to control were not significant at the 5% level of probability.

At 49 DAT, there were no significant differences in MSW between control and any of the 17 ripener treatments although the MSW for all ripener treatments were numerically lower than control (Table 3). In general, the longer the treatment-to-harvest interval, the greater will be the measured reduction in MSW and possibly TC/A (Legendre and Finger 1987). Again, since TC/A was derived from MSW and a constant for stalk population, the same trends seen for MSW were likewise observed for TC/A.

There was a significant increase in TRS/TC for all ripener treatments when compared to control at 49 DAT (Table 3). As a rule, the higher the rate, the greater the efficacy of glyphosate in increasing TRS/TC although it appeared that little or no improvement was noted when rates of glyphosate, regardless of formulation tested, exceeded the 0.25 lb ae/A-rate (equivalent to Polado at 8 oz/A rate). For LCP 85-385, it is recommended that glyphosate be applied at a rate equivalent to 6 oz/A of Polado (Legendre 2001) although the lower rate is sometimes used. There was a significant increase in TRS/TC for Arsenal at the 0.143 lb ai/A-rate; however, its efficacy is slightly lower when compared to the higher rates of glyphosate. Again, there was no improvement in the efficacy of glyphosate at 6 oz/A when tank mixed with 1 pt/A of Takeup. Because of the apparent negative effect of most ripener treatments on MSW and TC/A at 49 DAT, there were only two treatments (Polado at 8 oz/A and Touchdown at 3.2 oz/A) where the TRS/A was improved significantly when compared to control (Table 3). For all other treatments, with the exception of Polado at 4 oz/A, there was a numerical increase in TRS/A; however, the differences were not significant at the 5% level of probability.

These data show that glyphosate and Arsenal are effective in increasing TRS/TC and TRS/A at the rates tested for the variety LCP 85-384 at 35 and 49 DAT, although it appears that little or no benefit is obtained by exceeding the glyphosate rate of 0.1875 lb ae/A (equivalent to 6 oz/A-rate of Polado). Because of the apparent impact of glyphosate and Arsenal on MSW and TC/A, it appears that a greater response in TRS/A occurs at 35 DAT although the efficacy of Arsenal in improving TRS/TC is greater at 49 DAT when compared to 35 DAT. However, the rates for both glyphosate and Arsenal will undoubtedly change, depending upon variety (Millhollen & Legendre 1996). It appears that the 0.125 lb ae/A rate of glyphosate (equivalent to

4 oz/A-rate of Polado) will significantly improve TRS/TC for LCP 85-384; however, the 0.1875 lb ae/A-rate is significantly more efficient in increasing TRS/TC when compared to control. These data support the previous recommendations that glyphosate, regardless of formulation tested, be applied at 0.1875 lb ae/A for optimal results in improving both TRS/TC and TRS/A. Arsenal, although not as effective as glyphosate in increasing TRS/TC and TRS/A, is still an effective ripener and currently the only compound that offers new chemistry to compete with glyphosate as a proven chemical ripener under Louisiana conditions. Although the use of a surfactant is optional with some products, it appears that response can be improved with the addition of a surfactant. No improvement in efficacy of glyphosate was noted for a second year with the addition of Takeup. To improve the probability of success in increasing TRS/A, sugarcane treated with a chemical ripener should be harvested within 35 to 49 DAT.

The only labeled and recommended glyphosate product included in the 2003 studies was Polado. Although Touchdown iQ (3-lb gallon) is also currently labeled and recommended for commercial use in Louisiana, it was not included in these studies. Instead, the Touchdown HiTECH (5-lb gallon) formulation of glyphosate was included in these studies to compare its efficacy to that of Polado and the other products. Both Polado and Touchdown HiTECH contain no surfactants or additives; therefore, these products allow the user the flexibility to customize the amount of high-quality non-ionic surfactant to be added.

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Table 1. Regrowth potential of LCP 85-384 in the third-stubble crop following the application of various chemical ripener treatments for two consecutive years in the first- and second-stubble crops and harvested by combine at the St. Gabriel Research Station, St. Gabriel, La., during the 2003 crop[1,2].

Treatment	Sugar/A (lbs)	Cane/A (tons)	Sugar/T (lbs)	Stalk weight (lbs)	Millable stalks (no./A)
Arsenal(0.143 lb ai/A)	6797 AB	28.4 A	239 A	1.57 AB	36406 A
Arsenal(0.214 lb ai/A)	6136 B	26.0 A	239 A	1.50 B	35409 A
Control	7006 AB	29.7 A	237 A	1.73 A	34764 A
Fusilade(0.0625 lb ai/A)	6886 AB	29.5 A	233 A	1.69 AB	35094 A
Fusilade(0.0875 lb ai/A)	7344 A	30.0 A	244 A	1.66 AB	36121 A
Polado(0.1875 lb ae/A)	6519 AB	28.1 A	232 A	1.64 AB	34548 A

[1]Harvested on November 7, 2003. Treatments were applied to the same plots for two consecutive years, on August 23, 2001, and on August 21, 2002. Plots were harvested at 49 days after treatment (DAT) in both 2001 and 2002.
[2]Means followed by the same letter are non-significant at the 0.05 P.

Table 2. Response of LCP 85-384 to various chemical ripener treatments harvested at 35 days after treatment (DAT) at the St. Gabriel Research Station, St. Gabriel, La., during 2003 crop year[1].

Treatment	Sugar/A (lbs)	Cane/A (tons)	Sugar/T (lbs)	Stalk weight (lbs)
Arsenal (8 oz/A)	5691	24.4	234 +	1.22
Control	4578	26.7	171	1.33
MON 78270 (3.56 oz/A)	6601 +	26.7	248 +	1.33
MON 78270 (5.34 oz/A)	5264	22.2 -	235 +	1.11 -
MON 78270 (7.12 oz/A)	6363 +	25.4	250 +	1.27
MON 78270 (8.90 oz/A)	6073 +	23.7	256 +	1.19
MON 78754 (4.325 oz/A)	5300	22.2 -	240 +	1.11 -
MON 78754 (6.487 oz/A)	6123 +	24.6	249 +	1.23
MON 78754 (8.650 oz/A)	6326 +	24.8	255 +	1.24
Polado (4 oz/A)	5382	24.7	218 +	1.23
Polado (6 oz/A)	5981 +	25.0	238 +	1.25
Polado (8 oz/A)	6894 +	27.4	252 +	1.37
Polado (10 oz/A)	5988 +	24.4	245 +	1.22
Polado (6 oz/A)+Takeup (1 pt/A)	6446 +	27.2	236 +	1.36
Touchdown (3.2 oz/A)	6238 +	26.6	234 +	1.33
Touchdown (4.8 oz/A)	6422 +	24.9	259 +	1.24
Touchdown (6.4 oz/A)	7374 +	28.3	260 +	1.42
Touchdown (8.0 oz/A)	6437 +	25.3	254 +	1.27
LSD (P=0.05)	1162	3.9	16	0.20

[1]Treatments applied on August 26, 2003; plots harvested on September 30 (35 DAT). Cane/A is based on estimated yield (mean stalk weight by a constant stalk population of 40,000/A). (+) or (-) denotes yield or stalk weight which is statistically higher or lower than control, respectively.

Table 3. Response of LCP 85-384 to various chemical ripener treatments harvested at 49 days after treatment (DAT) at the St. Gabriel Research Station, St. Gabriel, La, during 2003 crop year[1].

Treatment	Sugar/A (lbs)	Cane/A (tons)	Sugar/T (lbs)	Stalk weight (lbs)
Arsenal (8 oz/A)	6559	25.4	258 +	1.27
Control	6318	29.8	212	1.49
MON 78270 (3.56 oz/A)	6693	25.4	263 +	1.27
MON 78270 (5.34 oz/A)	6710	24.5	274 +	1.23
MON 78270 (7.12 oz/A)	7353	27.0	272 +	1.35
MON 78270 (8.90 oz/A)	6633	24.5	271 +	1.23
MON 78754 (4.325 oz/A)	7463	27.5	272 +	1.37
MON 78754 (6.487 oz/A)	7833	28.6	273 +	1.43
MON 78754 (8.650 oz/A)	6950	25.8	269 +	1.29
Polado (4 oz/A)	5865	24.4	241 +	1.22
Polado (6 oz/A)	6957	27.3	255 +	1.36
Polado (8 oz/A)	7905 +	29.7	267 +	1.48
Polado (10 oz/A)	7333	26.8	274 +	1.34
Polado (6 oz/A)+Takeup (1 pt/A)	7173	28.6	251 +	1.43
Touchdown (3.2 oz/A)	8015 +	31.1	257 +	1.56
Touchdown (4.8 oz/A)	7266	26.8	270 +	1.34
Touchdown (6.4 oz/A)	7295	26.6	274 +	1.33
Touchdown (8.0 oz/A)	6806	24.9	273 +	1.25
LSD (P=0.05)	1581	5.5	13	0.28

[1]Treatments applied on August 26, 2003; plots harvested on October 14 (49 DAT). Cane/A is based on estimated yield (mean stalk weight by a constant stalk population of 40,000/A). (+) or (-) denotes yield or stalk weight which is statistically higher or lower than control, respectively.