NO-TILL SUGARCANE – AGRONOMIC AND ECONOMIC IMPLICATIONS

W. E. Judice[1], J. L. Griffin[1], C. A. Jones[1], L. M. Etheredge, Jr.[1], and M. E. Salassi[2]
[1]Department of Agronomy and Environmental Management
[2]Department of Agricultural Economics and Agribusiness

In Louisiana sugarcane, tillage is used extensively to control weeds, eliminate ruts caused by harvest, destroy residue from the previous crop, and incorporate fertilizer. A common perception is that tillage also stimulates sugarcane regrowth in the spring by warming the seedbeds. The effect of tillage and weed control programs on LCP 85-384 sugarcane growth, yield and economics was evaluated over two growing seasons. In this study residue remaining from harvest of the previous crop was not a factor affecting sugarcane regrowth. When row shoulders and middles were not tilled in March, soil temperature in the sugarcane drill early in the growing season was equal to that where March tillage was performed. Weeds were effectively controlled with a March application of DuPont K-4 at 4 lb/A broadcast (2 lb/A banded). Sugarcane and sugar yield were each equivalent for the full season tillage (off-bar tillage in March plus layby tillage in May) and the no-till programs. Elimination of a single tillage operation reduced cost $6.59/A and herbicide applied on a band rather than broadcast reduced cost $12.34/A. For the no-till program with herbicide banded in March compared with full season tillage, net return was increased $13.18/A. In a subsequent study conducted at five locations sugar yield was increased 8.6% and net return was increased $61.79/A when sugarcane was not tilled in March. Sugar yield was increased 8.0% and net return was increased $58.23/A when layby tillage in May was eliminated.

Crop residue deposited on the soil surface as a consequence of using chopper harvesters can affect regrowth of sugarcane following the winter dormant period and efficiency of spring tillage. Mechanical removal of crop residue using a Sunco Trash Tiger three weeks after harvest of LCP 85-384 with a chopper harvester was compared with burning. Tillage efficiency in March was not reduced when the residue was mechanically removed from the row top and placed in the row middle. Sugar yield was reduced an average of 7.9% when sugarcane residue was not removed compared with mechanical removal or burning in December. Research was also conducted to compare mechanical removal of sugarcane residue with the Trash Tiger in January, February, or March. Allowing crop residue to remain on the soil surface until March reduced both early season sugarcane height and shoot population when compared with December residue removal. Sugar yield was equivalent when crop residue was removed in December by burning or mechanically and averaged 7,740 lb/A. Delaying mechanical removal of residue until February or March decreased sugar yields an average of around 13% compared with December burn or mechanical removal.

RED MORNINGGLORY (*Ipomoea coccinea* L.) RESPONSE TO SHADE AND SOIL-APPLIED HERBICIDES

C. A. Jones, J. L. Griffin, L. M. Etheredge, Jr., and W. E. Judice
Department of Agronomy and Environmental Management

Research was conducted over three years to evaluate red morningglory (tie-vine) emergence and growth in response to shade. Treatments included 0, 30, 50, 70, or 90% shade. Shade levels were established using 2 feet by 2 feet by 2 feet structures covered with shade cloth. Weed emergence, plant height, and leaf and stem dry weight data were collected 20 to 41 days after soil was tilled to a four-inch depth and shade enclosures were installed. At the time of data collection red morningglory in the no shade (full sun) treatment had three- to six-leaves. Data were expressed as percent of the full sun treatment. Emergence of red morningglory decreased 5 and 8% for the 30 and 50% shade treatments, respectively, compared with full sun. Increasing shade to 70 and 90% decreased weed emergence 37 and 43%, respectively. Shade did not affect height of red morningglory. Leaf weight per plant was reduced when compared with full sunlight only for the 90% shade treatment (48% reduction). Stem weight of red morningglory was reduced for both the 70 and 90% shade treatments (31 and 50% reduction, respectively).

A study also was conducted to determine seasonal changes in light penetration into the sugarcane canopy and to use these findings to help predict red morningglory emergence in the crop. An AccuPAR Linear Par Ceptometer was used to measure photosynthetically active radiation (PAR) at ground level in four sugarcane varieties: LCP 85-384, L 97-128, HoCP 96-540, and Ho 95-988. Sugarcane varieties did not differ in regard to PAR that penetrated the crop canopy at ground level for any of the sampling dates. On June 13, PAR reaching ground level for the varieties was 32 to 64% and decreased to 15 to 27% by July 6. On July 21, PAR reaching ground level was 7 to 12%. Using the red morningglory shade data it would be expected that plants would be able to emerge and grow into late July underneath a sugarcane canopy. Results also suggest that soil-applied herbicide with long residual activity would be needed to provide season long red morningglory control.

Residual control of red morningglory with soil-applied herbicides applied in late May and early June was evaluated over two years. Red morningglory control data were collected 5, 7, 9, and 11 weeks after treatment (WAT). To allow for evaluation of residual activity of the herbicides, Liberty (glufosinate) was applied after each rating to eliminate weed competition as a variable. Red morningglory control 5 WAT was at least 90% with Spartan DG (sulfentrazone) at 4, 5, 6, 7, and 8 oz/A; Atrazine at 3 and 4 qt/A; Dupont K4 (hexazinone plus diuron) at 3 and 4 lb/A; Sencor (metribuzin) at 3 lb/A; and Valor (flumioxazin) at 4, 6, and 8 oz/A. By 7 WAT, Spartan at all rates controlled red morningglory at least 93% and no other treatment provided more than 80% control. By 9 WAT, all rates of Spartan except 3 oz/A controlled red morningglory at least 83% and Spartan at 3 oz/A and the highest rates of DuPont K4 and Valor were the only other treatments controlling red morningglory at least 61%. Red morningglory control was still around 80% 11 WAT when Spartan was applied at 4 oz/A and higher.

Results clearly show that reported red morningglory control failures in sugarcane are related to the shade tolerance of red morningglory and the lack of long-term residual control with some soil applied herbicides. Findings show that red morningglory can emerge and grow under

the sugarcane canopy into late July. To maximize the effectiveness of soil-applied herbicides, the layby application should be delayed until late June or early July to assure that sufficient herbicide is present in soil when germination of red morningglory seed can be expected. Of the herbicides evaluated, Spartan was most effective and at 4 oz/A provided around 90% control 7 WAT and around 80% control 11 WAT.

INTERFERENCE OF PURPLE NUTSEDGE (*Cyperus rotundus* L.) IN LOUISIANA SUGARCANE

L. M. Etheredge, Jr., J. L. Griffin, and C. A. Jones
Department of Agronomy and Environmental Management

Over the past few years, nutsedge has become problematic in Louisiana sugarcane fields. This is likely due to the poor control of nutsedge from glyphosate products applied during the summer fallow period prior to planting of sugarcane in August and September and also to the limited herbicide options available for use in the crop. The possibility of cultivation as a control measure is not available since the sugarcane row top is not disturbed over the multi-year crop cycle. Research was conducted in August 2005 to evaluate purple nutsedge interference with sugarcane. One study evaluated growth response of sugarcane to varying purple nutsedge tuber densities and the other study compared the competitiveness of sugarcane varieties with purple nutsedge. For both studies in which experiments were repeated, 7-gallon pots with a surface area equivalent to 1 ft^2 were used and were placed outside under a drip irrigation watering system. In the density study, 0, 1, 2, 4, 8, and 16 purple nutsedge tubers were planted per pot along with one sugarcane seed piece of the variety LCP 85-384. In the other study, the sugarcane varieties, LCP 85-384, L 97-128, Ho 95-988, and HoCP 96-540, were subjected to purple nutsedge interference (0 and 4 tubers/pot). Both studies were terminated 62 days after planting and purple nutsedge tubers were counted and shoot and root biomass for both sugarcane and nutsedge were measured. Results from both studies showed that purple nutsedge is very competitive with sugarcane even at low initial tuber densities. An initial density of 4 tubers per pot ($4/ft^2$) changed to around 115 tubers per pot 62 days after planting. LCP 85-384 sugarcane was competitive with purple nutsedge when the initial density was 1 or 2 tubers per pot. With 4 purple nutsedge tubers per pot, however, sugarcane growth was severely limited and sugarcane shoot dry weight was reduced around 64%. Averaged across the four sugarcane varieties, an initial density of 4 tubers per pot decreased sugarcane height around 20%, shoot population around 50%, and shoot dry weight around 60%. In one of two experiments, L 97-128 was more competitive with purple nutsedge than LCP 85-384, Ho 95-988, or HoCP 96-540. Findings emphasize the importance of using viable sugarcane seed for planting and the need for soil moisture and warm temperatures that promote bud germination and rapid emergence and growth of sugarcane shoots. Use of efficacious soil-applied herbicide would enhance the competitiveness of sugarcane. Other ongoing research indicates that purple nutsedge is most detrimental to sugarcane at the time of planting in August and September. Once the sugarcane crop has become established its early emergence in the spring prior to that of purple nutsedge, and its ability to produce rapid growth and shading suggests that sugarcane will be much more competitive than other agronomic crops.

ALTERNATIVES TO TILLAGE/HERBICDE PROGRAMS IN FALLOWED SUGARCANE FIELDS

L. M. Etheredge[1], Jr., J. L. Griffin[1], C. A. Jones[1], and M. E. Salassi[2]
[1]Department of Agronomy and Environmental Management
[2]Department of Agricultural Economics and Agribusiness

Failure to effectively control bermudagrass and johnsongrass in fallowed sugarcane fields can have an economic impact on both the plantcane and stubble crops. A study was conducted at St. Gabriel, LA, in a fallowed sugarcane field to compare conventional tillage/herbicide programs with that of a no-till program where Roundup UltraMAX was used to kill sugarcane stubble and weeds. Another study conducted in Henderson, LA, evaluated only conventional programs. At both locations, standard herbicide programs at planting and throughout the first production year were used to allow for direct comparison of the effectiveness of the fallow treatments.

At St. Gabriel, weed control and sugarcane and sugar yields were each equivalent for the conventional and no-till fallow treatments. Therefore, effectiveness of the fallow weed control programs was based on economics where net returns (NR) were compared to the standard tillage-only program (NR=$0.00/A). Based on inputs and sugar yield, the most economical fallow program was the combination of four tillage operations and one glyphosate application (NR=$8.23/A). Since weed control and crop yield were not negatively affected when tillage was eliminated, the no-till fallow program was economically competitive (NR=$-1.71/A) when compared with a tillage only fallow program.

At Henderson, when a tillage alone program was used in fallow, bermudagrass ground cover was 73%, 247 days after sugarcane planting (DAP). In contrast, bermudagrass groundcover was no more than 5% when tillage and Roundup UltraMAX were used in fallow. Sugarcane shoot population 36 and 247 DAP was not negatively affected regardless of the conventional fallow program used, but by August of the first production year sugarcane height and stalk population were less when only tillage was used in fallow. When bermudagrass was not controlled in fallow, sugarcane and sugar yields were reduced around 40% compared with the other conventional programs. Even though the tillage alone fallow program was the lowest cost input program ($34.00/A), the significant sugar yield reduction resulted in net returns of $216 to $291/A less than when tillage and Roundup UltraMAX were used in fallow.

Other experiments addressed control of LCP 85-384 sugarcane in a fallowed field with various rates of glyphosate and with various glyphosate formulations. Maximum control 45 days after treatment (DAT) was achieved when Roundup UltraMAX was applied at 25.6 oz/A (1.0 lb ai/A) to 6 to 12 inch tall sugarcane (94% control). When application was delayed until sugarcane was 18 to 24 inches tall, 51 oz/A of Roundup UltraMAX was needed to obtain 95% control. Sugarcane was controlled 88 to 94% at 38 DAT with all glyphosate formulations applied at 2.0 lb ai/A to 8 to 10 inch sugarcane (Roundup WeatherMAX and Roundup OriginalMAX at 46.5 oz/A, Roundup UltraMAX at 51 oz/A, and Mirage and Honcho Plus at 64 oz/A). In a no-till system, less expensive glyphosate formulations and lower rates could be used to decrease input cost without sacrificing sugarcane destruction.

ALTERNATIVE CROPS FOR FALLOWED SUGARCANE FIELDS

J. M. Boudreaux[1], J. L. Griffin[1], C. A. Jones[1], L. M. Etheredge, Jr.[1]1, and M. E. Salassi[2]
[1]Department of Agronomy and Environmental Management
[2]Department of Agricultural Economics and Agribusiness

In sugarcane, three to five harvests are made from a single planting after which the stubble is destroyed and fields are fallowed and prepared for replanting. The fallow period usually starts in April and sugarcane is replanted in August or September. During the fallow period weed control programs are implemented to control perennial weeds which have become problematic over the multi-year crop cycle. Successful weed control in the fallow period is critical to reducing weed populations in the first crop production year. Costs associated with the fallow period include land preparation, herbicides, and seed and return on investment is not realized until the crop is harvested at the end of the following year. There is considerable interest in planting an alternative crop during the summer fallow period as a means to generate additional income, as long as the crop does not jeopardize either weed control or timely planting of sugarcane.

A field study was conducted in 2005 at the St. Gabriel Research Station in St. Gabriel, Louisiana, to evaluate the feasibility of growing corn or soybeans during the sugarcane fallow period compared with a conventional tillage non-crop system. For both the crop and non-crop treatments sugarcane stubble was destroyed in the fall and rows were formed to prepare for stale seedbed planting. Dekalb 69-71 RR BT corn was planted March 7 on sugarcane beds spaced 72 inches apart using a 36 inch row spacing (two rows per bed). Atrazine and Roundup Original Max were used during the growing season to control weeds. Recommended soil fertility practices based on a soil test were followed. Corn was harvested August 8 and yield was 138.4 bushels/A. Asgrow 4403 RR soybeans were planted April 14 on sugarcane beds using a 16 inch row spacing (three rows per bed). Roundup Original Max was applied at planting and as needed during the growing season. Insect and disease management programs followed the LSU AgCenter recommendations. Soybean was harvested on September 9 and yield was 24.4 bushels/A. For the non-crop fallow treatment weeds were controlled on an as needed basis using Roundup Original Max. On September 7, HoCP 96-540 sugarcane was planted and pre-emergence herbicide was applied.

Results showed that corn and soybeans can be grown during the sugarcane fallow period utilizing traditional sugarcane beds without delaying the planting of sugarcane or negatively affecting the planting operation. Weed control was not sacrificed when Roundup Ready corn or soybeans was grown in fallow compared with the conventional non-crop system. Based on economic analysis, production of corn during the fallow sugarcane period resulted in a net gain of $105.27/A compared with $28.66/A net gain for soybeans. The traditional non-crop fallow program resulted in a net loss of $49.57/A. Compared with the conventional non-crop fallow program, shoot population 37 d after planting was reduced when sugarcane followed corn, but not when sugarcane followed soybeans. Reduced shoot population when sugarcane followed corn may or may not affect sugarcane production the first year, and this will be determined in 2006. Alternative crops are slowly gaining popularity among sugarcane farmers as a means to generate additional revenue, but there are concerns as to the added risks, time requirements, and overall economic benefit.