Roundup Ready Sugarbeet Forum
ASSBT 2007 General Meeting
Salt Lake City, Utah
March 2, 2007

Forum Moderator: **Alan Dexter**, Professor, North Dakota State University and the University of Minnesota, Fargo, ND.
Recorder: **J. Lenny Luecke**, Research Specialist, North Dakota State University and the University of Minnesota, Fargo, ND.

Each speaker will present their comments and then the floor will be open for questions.

VIEWPOINT OF THE TECHNOLOGY PROVIDERS

Joe Dahmer, President, Betaseed, Inc., Shakopee, MN.

We are on the threshold of this long awaited technology in sugarbeet production.

Global adoption of biotechnology in crops is spreading rapidly.

In 2006, 22 countries planted biotech crops - 14 of these countries planted over 125,000 acres.

U.S. leading the way with 134.9 million acres, followed by Argentina (44.5 M acres) and Brazil (28.4 M acres).

Three European Union countries planting biotech crops – Spain, France and Germany

Global biotech planting has gone from 4.3 million acres in 1996 to 252.1 million acres in 2006.

Status overview of Roundup Ready Sugarbeet:

- 2006:
  - Successful Idaho demonstration planting
- 2007:
  - Limited commercial launch – Wyoming Sugar
  - Demonstration plantings
- 2008:
  - 4 processors in addition to Wyoming Sugar have announced acceptance (2 limited acres, 2 unlimited acres).
  - Others that have not made statements yet.
  - Variety availability?
  - Seed availability?
  - Roundup Ready sugarbeet adoption rate?

Variety Availability in 2008?

- Will varieties have to meet the normal variety approval guidelines?

Seed Availability in 2008?

- Enough seed will be available for a significant launch.

Roundup Ready sugarbeet adoption rate?

- Other crops, especially soybeans have been adopted rather quickly.
- Roundup Ready sugarbeet will likely be adopted faster than soybeans.

Summary:

- Exciting Advancement
- Not a "Silver Bullet"
- Will Require Good Stewardship
- Exciting Times Ahead!!

Paulette Pierson, Technology Development Manager, Roundup Ready Specialty Crops, Monsanto, St. Louis, MO.

Weed Management Recommendations with Roundup Ready Sugarbeet

- Use minimum of 22 oz/acre Roundup WeatherMax per application.
- Broadcast applications are recommended.
- First application between cotyledon and 4 leaf stage of sugarbeet and weeds are 2-3 inches tall.
- Additional applications when weeds are less than 4 inches tall.
- Add ammonium sulfate for hard water or dusty conditions.
- Include residual/other MOA herbicides in your Roundup Ready cropping systems.

Roundup WeatherMax Label Recommendations

- 5.3 qt/acre maximum combined total of all applications per year
- 3.3 qt/acre maximum preplant and preemergence applications per year
- Emergence to 8 leaf – up to 32 oz/A per application with maximum 56 oz/A
- Between 8 leaf stage and canopy closure – 22 oz per acre per application with maximum 44 oz/A

Discussion:

Tom Schwartz comments:

- 2006 commercial production of Roundup Ready sugarbeet by Amalgamated Sugar was an effort of the entire sugarbeet industry and not just Amalgamated Sugar.
- Training and education on the use of this technology is critical.
- Roundup Ready sugarbeet launch must succeed, not just for the sake of Roundup but for the sake of future biotechnology traits in sugarbeets.
- Must do this launch right and must do it together.

Q: Can Monsanto provide some type of stewardship guide to using Roundup in sugarbeet?
Paulette Pierson responded to question saying a Technology Use Guide for Roundup Ready Sugarbeet would be available from Monsanto in May or June of 2007. She would welcome any input for this publication.

Q: What has happened recently that all of a sudden Roundup Ready sugarbeets are accepted in the U.S.?
Nothing has happened all of a sudden. Many people have been moving ahead for many years anticipating the upcoming launch dates. There has been background work ongoing for many years. So no one thing has happened recently but rather a long term plan finally coming to fruition.

Q: What will happen with the sugar from the sugarbeet produced commercially in 2006?
Products containing sugar from H7-1 sugarbeet are not yet approved for sale in Europe. However, the sugar that will be produced from the 2006 sugarbeets is already sold. This sugar will be produced in late March, 2007.

THE SUGAR IS THE SAME

Charles Baker, Executive Vice President, The Sugar Association, Washington, DC.

Project One:
Test molecular makeup of the sugar produced from Roundup Ready sugarbeet, non-Roundup Ready sugarbeet and a sample of commercially available analytical grade sucrose.
Result: Sugar is sugar. Sugar from Roundup Ready sugarbeet is identical at the molecular level to sugar from non-Roundup Ready sugarbeet.

Project Two:
Objective: Provide direct proof that sugar is sugar at the molecular level.

Phase I:
- Establish a baseline for commercial scale demonstration.
- 44 commercial sugar samples collected from Africa, Australia, Canada, Caribbean, Europe, Mexico, South America and the United States.
- Tested only for DNA. Bio-tech protein would not be found in any of these samples.

Phase II: Commercial demonstration samples
- Testing sugar, molasses, pressed pulp and dried pulp
- Test for DNA and Biotech Protein

Discussion:

Brochure is available from Monsanto showing that all sugar is the same at the molecular level.

Q: What if Phase II testing does show DNA is present in sugarbeet pulp?
It doesn't really matter. Sugarbeet pulp is approved for feed use in Japan and European approval is expected within 12 months.

INSIGHTS FROM THE ROUNDUP READY DEMONSTRATION PROJECT

Stacey Camp, Agricultural Manager, Mini-Cassia District, Amalgamated Sugar Company, Paul, ID.

Project of the Beet Sugar Development Foundation.

Four locations under center-pivot irrigation were planted. Roundup Ready and conventional sugarbeet were planted side by side in these demonstrations.

1-2% of Roundup Ready sugarbeet plants will not be resistant to Roundup and will die after Roundup application.

What was learned from the project:

- Excellent weed control with two applications of Roundup.
- Wind is a concern for herbicide application due to risk of damage from spray drift.
- Timing of herbicide application is still important.
- Sugarbeet yield is not hampered with fewer cultivations.
- Broadcast application of Roundup recommended instead of banding.
- Roundup Ready varieties of sugarbeet appeared to respond differently in nitrogen uptake compared to conventional varieties.
- High tonnage and percent sugar was achieved with Roundup Ready varieties.
- Minimum tillage will become more common in the future for sugarbeet production.

Discussion:

Q: Why do sugarbeet growers want to cultivate so badly?
Because they have been taught to do it that way. Will need to reeducate growers to cultivate less frequently.

WEED RESISTANCE TO GLYPHOSATE

Robert Wilson, Professor, University of Nebraska, Scottsbluff, NE.

Assessing the Long-Term Viability of Roundup Ready Technology as a Foundation for Cropping Systems.

Overview:

- Roundup Ready crops are very popular.
- Has been intensive use of Roundup as a burn-down treatment.
- Weed shifts may take place.
- Interest is widespread in long-term impact of intensive glyphosate use.
- Study developed to survey growers in six key agricultural states.

Survey Goals:

- Cropping history
- Herbicide use pattern
- Grower insights
- Identify practices causing weed management challenges.
- 1,195 Growers surveyed by phone (roughly 200 growers per participating state).

Survey respondent requirements:

- Actively involved in farming.
- Responsible decision maker for the farm.
- Minimum of 250 acres of Roundup Ready crops.
- Minimum of 3 years use of Roundup on crops.

Survey Results:

- Weed pressure in the field was reduced after using Roundup Ready crops.
- The amount of tillage was reduced.
- Biggest weed challenges were morning glory in cotton, waterhemp and redroot pigweed in corn, and morning glory in soybean.
- The seriousness of glyphosate resistance problems – 45% of growers were aware of documented Roundup resistant weeds.
- "Using the correct label rate" was the most common grower response to the question of how to prevent the development of Roundup resistant weeds.
- "Farm publications" was the most common grower response to the question regarding sources of information about weed resistance.

Summary:

- Growers were satisfied with Roundup Ready system.
- Growers experienced few weed problems.
- Most common grower management of herbicide resistance was not the same as Extension Service – University ideas of best resistance management.

<u>Grower Glyphosate Resistance Project</u>

- Second year of project.
- Grower fields divided in half.
- One half of field managed as usual by the grower.
- One half of field managed by University resistance management practices.

Data collected:

- Soil seed bank data
- Weed densities
- Crop inputs and yields
- Project is ongoing

IMPACT OF ROUNDUP READY SUGARBEET ON AGRONOMIC PRACTICES

Allan Cattanach, General Agronomist, American Crystal Sugar Company, Moorhead, MN.

Seed spacing and plant population concerns:

- Seed cost of $250/unit makes seed even more valuable.
- Growers will be tempted to spread out seed spacing.
- Growers will be able to accept lower plant population fields rather than replant. Change in replanting guidelines will be needed since weed control will be easier in low sugarbeet populations with glyphosate as compared to control with conventional herbicides.
- Some sugar coops would like to see tech fee based on per acre charge rather than per unit.

Mechanical weed control:

- Elimination of harrowing
- Elimination of rotary hoe
- Reduce row crop cultivation 50 to 100%
- Savings of 5 to 10 dollars per acre on mechanical weed control

Herbicide application changes:

- Fewer postemergence applications
- Very little banding, mostly broadcast application
- Flexibility in application scheduling (wider window of opportunity and no crop phytotoxicity)
- Reduce or eliminate PPI or Pre herbicides (more cover crop use and better environmental stewardship)

Weed control issues:

- Elimination of hand labor.
- Easier control of kochia and other difficult weeds.
- Easier control of late season escapes.
- Roundup Ready volunteers in Roundup Ready crops (soybean, corn, canola, sugarbeet).
- Resistant weeds and weed shifts (especially common lambsquarters and amaranth species).
- Hand weed as necessary for resistance management.
- Compatibility and efficacy of tank mixing Roundup with other herbicides, fungicides or insecticides.

Other production practices:

- Easier adoption of narrow rows.
- Easier adoption of new tillage systems.
- Easier irrigation management.
- Larger growers (new land in rotation; easier to manage more acres).

Roundup Ready Seed Quality:

- Purity
- Vigor
- Disease resistance
- Priming treatments
- More precise planting

Discussion:

Bob Wilson's comments on weed shift studies in Nebraska:

- Weed shift away from kochia problems.
- Weed shift toward common lambsquarters problems.

Q: How do we deal with weed shifts?

- Growers must be observant in the field.
- Growers must adjust and adapt weed control programs accordingly.
- Growers will probably need to use glyphosate in combination with other herbicides.

Roundup Ready sugarbeet trait is not linked with disease resistance traits or seed vigor and emergence traits. These traits are completely separate. Growers may have some concerns about seed vigor and emergence and about disease resistance in Roundup Ready sugarbeet. Even if these concerns are unfounded, growers still need to be educated about these concerns.

Q: What will the Roundup Ready adoption rate be in sugarbeet?
Acceptance and adoption are expected to be rapid.

TECHNOLOGICAL IMPACT OF ROUNDUP READY SUGARBEET ON ALLIED INDUSTRY

Kevin Thorsness, Technical Service Representative, Bayer CropScience, Fargo, ND.

Herbicide changes in the sugarbeet market:

- Roundup Ready sugarbeet will be introduced.
- Rate of adoption will be driven by several factors.

Aspects driving the adoption rate of Roundup Ready sugarbeet:

- Seed availability.
- Seed cost.
- "Pent-up" demand for the convenience of a superior technology.
- Experience in other Roundup Ready crops has been a very rapid adoption rate.

Bayer CropScience prediction is 50% adoption of Roundup Ready sugarbeet by 2009 and 90% adoption by 2010.

The Problem: How do companies continue to produce herbicides for conventional sugarbeet if they are less than 10% of the market? There are no alternative uses for Betanex, Betamix and Progress.

Discussion:
We need the old chemistry for weed shifts or resistance problems. Would also need the old chemistry in the event Roundup Ready seed was planted and there was wind damage, a late frost or some other natural disaster causing a large amount of replanting. With Roundup Ready seed quantity limited initially, conventional seed would have to be planted for the second planting. The old chemistry would be a must for weed control in this situation.

Q: Will generic manufacturers stay in the sugarbeet herbicide market?
It all boils down to the cost of inputs and the amount of returns. It would likely be cost prohibitive to maintain registrations and to produce product for a very small acreage of conventional sugarbeet.

Q: Will there be conventional sugarbeet varieties available into the future?
"Breeding companies will not drop conventional variety testing and breeding." – Art Quinn (Betaseed)

Q: Can excess conventional herbicides go to Europe? No.

THOUGHTS ON USING GLYPHOSATE FOR WEED CONTROL IN SUGARBEET

Alan Dexter, Professor, North Dakota State University and the University of Minnesota, Fargo, ND.

- Use high glyphosate rates to slow weed resistance.
- 100% weed control should be the goal.
- Use cultivation and hand labor to remove the last weeds and slow resistance.
- Rotate herbicides to slow weed resistance.
- Liberty Link sugarbeet would slow weed resistance development.
- Eliminate cultivation if weed control is adequate (cultivation will help control weeds that have become tolerant to Roundup so they do not produce seed).
- Two or three glyphosate applications will be necessary.
- Apply glyphosate early to avoid yield loss from weed competition.
- Glyphosate may reduce the availability of other herbicides.
- Apply from 10:00 am to 4:00 pm for best weed control.
- High humidity improves weed control.
- Dew and dust reduce weed control.
- Always add AMS to glyphosate.
- Add NIS if glyphosate label allows use.
- Roundup Ready bolters will produce viable seed.
- Future availability of other herbicides?
- Research on the yield effect from 5 or 6 applications of glyphosate may be needed.
- Drift management needed with glyphosate application.

Discussion:
The Roundup label in sugarbeet only supports four applications.

Q: Will Roundup Ready sugarbeet be damaged by high temperatures at the time of Roundup applications?
Common to spray Roundup on sugarbeet when temperatures are from 80°F to 90°F but temperatures in the Imperial Valley of California can exceed 100°F at application. No effect from high temperatures was reported by anyone at the Forum.

Moisture stress may be a concern for good weed control with Roundup.

Encourage seed companies to standardize seed color for Roundup Ready sugarbeet seed. This would allow grower to dig up seed and know for sure if they planted Roundup Ready seed or not.