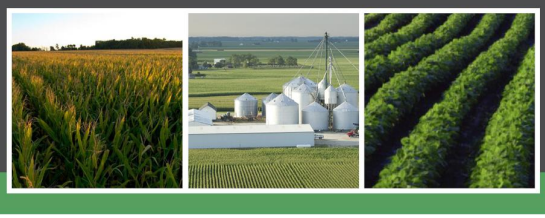

Agronomic Spotlight

The Benefits of Value-Added Traits in Silage Corn Products

- Corn product selection is one of the most important decisions a corn silage producer can make to obtain the highest yield and quality forage for silage.
- Silage producers have many selection considerations including conventional, herbicide-tolerant, or combined insect-protected plus herbicide-tolerant corn products.
- Genetically modified corn products have a number of benefits over conventional corn that help mitigate risk under variable yield conditions and protect yield potential.

Corn silage is an important source of forage in the United States. Silage provides over 40% of the forage value fed to dairy cows and is also an increasingly important feed in the beef finishing industry.

Benefits of Biotechnology Corn

Corn products with biotechnology traits and associated agronomic practices have contributed to the steady increase in corn production since their introduction in 1996 by reducing pest and environmental stresses in highly productive new corn genetics. While conventional corn products may offer lower seed costs and market premiums, they also may require more intensive weed, insect, and other management practices that can result in higher overall costs, lower stress tolerance, and lower yield potential. An analysis of 20 years of field research trials shows that genetically modified (GM) corn has a number of benefits over conventional corn.[1] The benefits for GM corn found in this research include:

- GM corn products provided higher yields when compared to conventional corn.
- GM corn products responded to higher plant densities better than conventional corn.
- GM corn products helped overcome the continuous corn yield penalty conventional corn experienced during the 2000 to 2005 comparison period.

For example, research at the University of Wisconsin showed that farmers planting GM corn products in a corn-on-corn rotation in 2000 had a lower potential risk of low yield (175 bu/acre) than farmers using a conventional corn-on-corn rotation. In 2005, the negative impact of the corn-on-corn rotation was not apparent for GM corn products, but was still a problem in conventional corn-on-corn rotation.[1]

Silage Corn Product Selection

Corn product selection is one of the most important decisions a corn silage producer can make to obtain the highest silage yield and quality forage.[2] To help maximize yield potential, silage corn products should be planted early, at higher plant populations, and in narrower rows than corn grown for grain. For high quality forage, select corn products that are 5 to 10 relative maturity units higher than a product grown for grain in the same field.[1] Increasing plant populations by 10 to 20% over those recommended for grain can help maximize silage yields. In University of Wisconsin research, maximum forage yield was measured at 44,000 plants/acre and 38,000 plants/acre for grain yield, while around 30,000 plants/acre was the minimum for maximizing grain and forage yield.[3] Although population recommendations are generally higher for silage products, populations should not exceed the “upper end” recommendation for any corn product.

Benefits of Herbicide Tolerance Traits

Weed competition reduces yield, digestibility, and protein content of silage.[2] Corn is very sensitive to early-season weed competition and loss of silage corn yield potential can begin soon after planting. The critical period of weed competition is variable. Roundup Ready® 2 Technology provides crop safety and flexible application timing to adjust glyphosate applications to the scope and intensity of the weed infestation in each field to reduce the risk of lost yield potential. Benefits include:

- Reduced plant stress due to weed infestations.
- Limited host plants for insects, diseases, and nematodes.
- Facilitates the use of reduced-tillage for soil and water conservation.
- Corn products with Roundup Ready 2 Technology contain in-plant tolerance to Roundup® brand glyphosate-only agricultural herbicides. This system provides proven crop safety, over-the-top application flexibility, and broad-spectrum weed control.
- A system with corn products with Roundup Ready® 2 Technology can reduce potential yield loss from crop injury resulting

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The Benefits of Value-Added Traits in Silage Corn Products

in an average of up to 5.6 more bushels/acre than conventional corn herbicide products (433 field-trial comparisons, same Roundup Ready 2 Technology product).
- The cornerstone of weed management in corn is the use of residual herbicides and multiple sites of herbicide action throughout the program. Roundup Ready PLUS® Crop Management Solutions provides weed management recommendations for broad-spectrum weed control, incorporating multiple application timings and herbicide sites of action.

Features of Roundup Ready PLUS® Crop Management Solutions

- A centralized resource for weed and insect management that combines the knowledge of weed scientists, academics, agronomists, and industry partners.
- Provides customized recommendations for a proactive, economical approach to controlling tough-to-manage and glyphosate-resistant weeds, plus best management practices for controlling weeds and insects.
- Offers cash-back incentives for corn, soybean, and cotton acres when you use Roundup® brand glyphosate-only agricultural herbicides with Roundup Ready PLUS platform endorsed products.
- See your local retailer or visit **www.roundupreadyPLUS.com** for additional information, recommendations, and details.

Benefits of Insect Resistance Traits

European corn borer, corn earworm, western bean cutworm, fall armyworm, and corn rootworm feeding can cause stress and injury to plant tissues. This damage can reduce yield potential or allow fungi to infect, proliferate, and produce mycotoxins which have the potential to cause health problems in animals and humans.[4,5,6] The insect protection in GM corn products protects the plant parts these insects feed on, which can help reduce the risks of lost yield potential and lower grain quality. Conversely, insecticide applications require precise application timing, rates, and coverage, and may affect non-target organisms such as pollinators and beneficial insects.

- European corn borer (ECB) populations still threaten non-Bacillus thuringiensis (B.t.) corn products. An analysis of historical ECB damage in Minnesota estimated that B.t. corn for ECB protection provided an average benefit of $17.24/acre.[14]
- Corn rootworm protection in GM corn can have agronomic benefits in addition to insect management. Improved root growth and activity can allow plants to utilize nitrogen more effectively after flowering to promote higher kernel weight and yield potential.[7]
- Higher plant densities can improve grain yield potential in corn. Genetic improvements, including GM traits such as insect protection from the B.t. gene, help support higher plant populations.[10]

Summary

Farmers planting corn products with herbicide tolerance and insect protection traits with multiple modes of action can realize higher yield potential through:

- Reduced plant stress from corn borers, ear-feeding insects, stalk boring insects, and root damage from rootworms.[11,12,13]
- Planting corn-intensive crop rotations with more successful outcomes.
- Maintaining higher plant densities to help maximize corn yield potential.
- Harvesting better quality grain by preventing insect damage that can lead to stalk and ear rot diseases, which in turn can reduce the occurrence of mycotoxins produced by fungal diseases in corn silage.
- Reap the economic benefits of higher yield potential in feedstuffs for cattle.[8]

GM products protect corn yield potential and provide other benefits. The PG Economics annual report on the impact of GM crops shows that GM crops are credited with decreasing pesticide and fuel use, facilitating conservation tillage practices that reduce soil erosion, improving carbon retention, and lowering greenhouse gas emissions.[9]

Sources

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For additional agronomic information, please contact your local seed representative. Developed in partnership with Technology Development & Agronomy by Monsanto.