

## THE LIBERTYLINK® SYSTEM AND FUTURE SOLUTIONS

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### Liberty Herbicide and Optimized Applications

Liberty® herbicide (glufosinate-ammonium) has a unique mode of action (Group 10) which inhibits glutamine synthetase. It provides non-selective control of a wide range of broadleaf and grass weed species in a matter of days as compared to weeks. The weed control strengths of this herbicide include morningglory species (*Ipomoea* spp.), cocklebur (*Xanthium* spp.), and glyphosate-resistant weed species.

Applications of Liberty can be optimized using the following recommendations:

- Use nozzles and pressures that generate medium-size spray droplets (250 microns to 350 microns);
- Apply Liberty at a minimum of 15 GPA of water and increase to 20 GPA in arid environments or with dense weed canopies;
- Apply at ground speed of less than 15 mph;
- Do not apply when wind speeds are greater than 10 mph;
- Apply to small weeds (<3-4 inches in height); and
- Add a tankmix partner, if needed.

Bayer CropScience recommends the following programs for cotton containing LibertyLink®:

- **Preplant/Preemergence/At Planting:** Apply a residual herbicide effective against target species.
- **First Liberty® Application:** Within 14 days after emergence, apply Liberty at 29 oz/A + residual herbicide. If environmental conditions prevented preplant/preemergence/at planting residual herbicide application or if it was not activated, apply Liberty at 43 oz/A + residual herbicide.
- **Second Liberty® Application:** Apply Liberty at 29 oz/A to address new emergence or within 10 days if preplant/preemergence/at planting residual herbicide was not activated or if weeds were >3-4 inches in height at the first application.

The Liberty label should be followed for additional restrictions. Liberty should be used in an integrated weed management (IWM) program which includes proper identification of weed species present, knowledge of herbicide history on areas to be sprayed, beginning the season with a clean field and maintenance of low weed pressure through the application of residual herbicides, ensuring that herbicide applications are made with adequate coverage and at correct timing, zero tolerance for weed escapes and seed set, cleaning equipment prior to leaving fields, and monitoring areas outside cultivated fields for weed movement.

### New LibertyLink Cotton Varieties

There will be two new cotton varieties introduced in 2013. The first of these is ST 4946GLB2. It contains GlyTol® (glyphosate tolerance), LibertyLink (glufosinate tolerance) and Bollgard II® technology (insect control). This variety is significantly higher yielding and provides higher value/A Beltwide compared to current GLB2 and LLB2s. Initial tests show positive results for root knot nematode tolerance. ST 4946GLB2 has a maturity similar to ST 4145LLB2, and is earlier than FM 1944GLB2 and ST 5445LLB2. It also has better storm tolerance than ST 5445LLB2 and ST 4145LLB2.

The second new cotton variety introduced in 2013 will be ST 6448GLB2. It also contains GlyTol, LibertyLink, and Bollgard II technology. It is significantly higher yielding and provides higher value/A than ST 5445LLB2 and ST 4145LLB2. This variety has equivalent yields and value/A to FM 1944GLB2 in the Southeast. The maturity of ST 6448GLB2 is significantly greater (later) than all checks across East, and it has significantly better fiber length than current Stoneville® varieties. It will be the first full season GLB2 offered across the Cotton Belt.

### **LibertyLink System and LinkUp Offer**

The LibertyLink system is a package combining the LibertyLink trait and Liberty herbicide. It offers full tolerance of cotton varieties, even at maximum label rates, and is the only non-selective alternative to the glyphosate-tolerant system. The system provides control of herbicide-resistant weed species. In an IWM program, the LibertyLink system preserves herbicide-tolerant technologies, land values, conservation tillage, and the farmer's legacy to future generations. Additionally, it is available in other rotational crops such as soybeans and corn.

The LinkUp Offer allows producers to earn a rebate on Liberty when they purchase LibertyLink cotton seed at a rate of \$30/unit. Some of the requirements to qualify include:

- Plant a minimum of 150 acres of LibertyLink seed
- Orders must be made between Sep 1, 2012 and Feb 1, 2013
- Must have valid Grower Trait License associated with orders
- Proof of seed purchase must be provided by Aug 31, 2013

### **Future Solutions**

The U.S. launch of TwinLink® cotton is anticipated in 2014, pending regulatory approvals. This trait package will include Bayer CropScience's proprietary stacked *Bt* product of Cry1Ab + Cry2Ae. It will provide a consistent, high level of efficacy against bollworms which is similar to the current commercial standard. Expression data indicates a slight decline of Cry 1Ab protein throughout the season which is typical of other Cry1 products. However, Cry 2Ae expression remains high throughout the flowering period. This insect control will be stacked with the GlyTol trait, and each *Bt* gene event contains the *bar* gene which confers tolerance to Liberty.

The pipeline for cotton includes tolerance to HPPD inhibitors, a group of bleaching herbicides such as isoxaflutole (Balance®), tembotrione (Laudis®), mesotrione (Callisto®), and future chemistries in this group. Additionally, there are continued efforts to look for additional modes of action for tolerance.

However, tolerance to HPPD chemistry is much closer in the rotational crop of soybeans. In collaboration with MS Technologies, Bayer CropScience identified event FG72 which provides tolerance to both glyphosate and isoxaflutole. The high-yielding elite germplasm with FG72 has demonstrated performance equal to or better than varieties growers are currently planting. It is planned for release in 2015, pending regulatory approvals. In conjunction with this release, Bayer CropScience will release Balance® Bean, the first HPPD herbicide available in soybean market. However, it has not been registered for sale or use in the United States or Canada at the present time. The release of FG72 soybean will be followed by FG72 LibertyLink soybean, providing Balance Bean/glyphosate/Liberty tolerance.

Syngenta & Bayer CropScience are also co-developing MGI herbicide tolerance for soybeans which would provide tolerance to Callisto, Liberty, and Balance Bean. MGI Soybeans are projected to launch after mid-decade, pending global regulatory approvals.

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