



Herbicide Resistant Sugar Beet Plantings

Editor's Note: Commercial planting of a genetically modified herbicide-tolerant sugar beet began in the USA in 2008. Roundup Ready® sugar beets are the first biotech product commercialized for sugar beets. This is expected to make weed management simpler and more effective. This sugar beet is approved for import into the EU, as well as for food and feed processing; however, it is not yet authorized for cultivation.

Without massive weed control, young sugar beet plants hardly are able to establish themselves. Compared with other crops, they require the most intensive and frequent use of weed control products. Herbicides, machine use and equipment are big cost factors for farmers. Without weed management, sugar beet yield can be reduced by 75%.

The cultivation of sugar beets in some European countries is undergoing increasing economic pressure. Following the end of EU sugar sector regulations, the produce of beet farmers now must compete with cheap sugar cane on the world market. An alternative weed management program with fewer sprayings would be economically viable and also be more beneficial to the environment.

The German seed company KWS developed the genetically modified H7-1 sugar beet. The company used a concept from Monsanto in the USA that had already been used with soybeans, among other crops. Controlled by a specific gene, the sugar beet is resistant to the active ingredient glyphosate, marketed under the name Roundup as a universal herbicide. It works by blocking the production of certain amino acids in all green plants. The plants stop growing and die. The effect of glyphosate is neutralized in GM plants that are resistant.

Glyphosate has been used as an herbicide for a long time and in some European regions since 1975. Compared with other herbicides it has a favorable ecotoxicological profile. After just 30 to 40 days, it is completely broken down in the soil and there are little side effects to birds, fish and other organisms in soil or water. Conventional herbicides must contain many herbicidal ingredients, in order to manage all the different types of weeds. With glyphosate (Roundup) only one ingredient is necessary.

USA Successful Field Trials-

The combination of an herbicide-tolerant sugar beet with a compatible herbicide does not mean that just one spraying now will be necessary for weed control. However, experiences in the USA have shown that when this herbicide-tolerant system is employed in sugar beet cultivation, fewer sprayings are necessary – and also that less fuel is needed.

After cultivation of the H7-1 sugar beet was authorized in the USA in 2005, the state of Idaho began a field trial on a 1,000-hectare plot. An accompanying study showed that the

cost savings per hectare was 100 dollars. It was also shown that more mulch seeding and less tillage could be applied. Up to now such non-plowing, soil-preserving production practices were hardly possible in the cultivation of sugar beet because weed control was particularly difficult. Commercial cultivation of the GM sugar beet began in the USA in 2008. According to KWS, 250,000 hectares of H7-1 sugar beets were cultivated in the first year, half the total sugar beet area in the USA. In 2009, it is expected that cultivation of GM sugar beets will rise to cover 90% of the total area.

EU: Field Tests Planned in Germany and Spain-

In the EU, applications for the cultivation of H7-1 sugar beets were submitted years ago, but a decision is still far off. However, imports of sugar derived entirely or partially from these GM sugar beets are allowed in the EU, as is sugar beet pulp intended for use as feed.

Commercial cultivation in the EU is not expected before 2015. First, field tests will be carried out to determine if the concept of GM sugar beet with a compatible herbicide can actually contribute to a more environmentally-friendly, resource-saving sugar beet production. It must also be seen if farmers can sink their costs and thereby improve their ability to compete on the world sugar market.

Systematic field trials will be carried out at several locations in Germany and Spain.

Field Safety Concerns Still Prevail Especially in the EU-

Sugar beet is a biannual plant. The large, succulent roots of sugar beet used for food and feed production are harvested at the end of the first year of growth. If left to grow, sugar beets will flower and produce seeds during the second year. Sugar beets are only allowed to flower for seed production, which mainly takes place in France and northern Italy and the USA in the Willamette Valley of Oregon.

Out-crossing and hybridization are limited because sugar beets are harvested before flowering. Only bolters - sugar beets that flower during the first growing season - can hybridize with each other or with wild relatives when present.

Sugar beets are cross-compatible with other species in the genus *Beta* such as *B. vulgaris* ssp. *maritima*, *B. maritima*, and *B. atriplicifolia*. There is no evidence that *B. vulgaris* can intercross with other genera in the *Chenopodiaceae* family.

Problems with volunteer beets sometimes occur when planted on the same field for several consecutive years. Emerging annual weed beet from the seed bank can only be controlled by mechanical means, and only to a certain degree. Remaining volunteers can reproduce and could potentially cross with bolting, transgenic sugar beets.

Sugar beet is sensitive to frost and is poorly competitive in natural or agricultural habitats.

