Reliable enzyme activity translates into more starch

Friday, December 20, 2002
By Christof Fellman, Checkbiotech

BASEL – Recently a team of British scientists patented their invention to increase starch content in plants for commercial use.

Under the patent number 6,486,383 a British team, comprising of members from Cambridge and Cottenham universities, registered a method of genetically modifying a plant with a gene that encodes one subunit for adenosine diphosphoglucose pyrophosphorylase (ADPG PPase), a key enzyme responsible for starch synthesis.

In their study, the British team focused on two genes, shrunke-2 and brittle-2, which are subunits of the enzyme ADPG Ppase. Upon examining several wild samples of wheat, the researchers noted that species that have mutations in the genes coding for either shrunken-2, or the brittle-2 gene, will produce less starch than non-mutated wild varieties.

The scientists patented a method to produce a unique plant, in which only one subunit is needed for full activity of the enzyme. This fact facilitates the construction of the transgenic plant, because only one recombinant gene has to be inserted. With this patent, the non-mutated brittle-2 or shrunken-2 gene was chosen and inserted into the plant's genome. This new invention would help ensure more reliable starch production in targeted plants.

Why is starch important?

To start, starch is the most important form in which carbohydrates are stored in tissues of most higher plants. It consists of long chains of sugars (a polymer of glucosyl residues), that are synthesised from linking glucose-1-phosphate molecules together in starch granules called amyloblasts. Starch accumulates in leaves, tubers, fruit or seeds during photosynthesis, which is later used as energy reserves for plant growth and protection. Thus, starch level is a major vital factor for plants.

Furthermore, starch is one of the most important components of the human diet, as well as for many animals. Starch is even used in the industry to produce paper, textiles, plastics and adhesives. Thus, starch production, and its quality, is of great importance to the yield and commercial value of a plant.