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- 1977 Ph.D., Society of Biotechnological Research, Dept. of Molecular Biology, Braunschweig-Stöckheim/Technical University, Braunschweig, Germany
- 1983 Postdoctoral thesis in the field of Genetics at the University, Köln
- 1986 Offer of chair of Molecular Biology at the University FU Berlin, at the same time Scientific Director of the Institute of Genetic and Biological Research Ltd.
- 1993 Appointment as Director of the Max-Planck-Institute of Molecular Plant Physiology and Scientific Member of the Max-Planck-Society

Engineering Carbohydrate Metabolism: Modified Starches and Other Polymers

Starch constitutes most of the dry matter accumulated in the harvested organs of crop plants. It represents the primary source of calories in the human diet. In addition, about 2×10^7 tons/year are extracted mostly from corn, wheat, and potato and processed further for numerous applications in the food, feed, and industrial area. With respect to polymeric starch, only a small proportion is used in the areas indicated above without being modified. The vast majority is modified by either chemical or physical treatments or a combination of both in order to adjust the properties of the polymer to the specific needs of the customer.

A couple of years ago, we set out to understand starch biosynthesis in higher plants. To this end, we cloned a large number of genes encoding enzymes involved in starch biosynthesis and modified their expression in transgenic plants to either increase or decrease the activity of the corresponding enzyme. Subsequently, the starch was extracted and analyzed with respect to its polymeric properties. Following this approach, we were able to produce a large number of starches with different properties in plants which hopefully will reduce the need for chemical or physical modifications.

As a second example, we set out to analyze the possibility of producing a different polymeric carbohydrate, inulin in non-fructan producing plants. Fructans present a health-beneficial diet due to their low caloric value and their effects on the microbial composition of the intestine. Data obtained for various starch modifications as well as fructan producing potato plants will be presented.