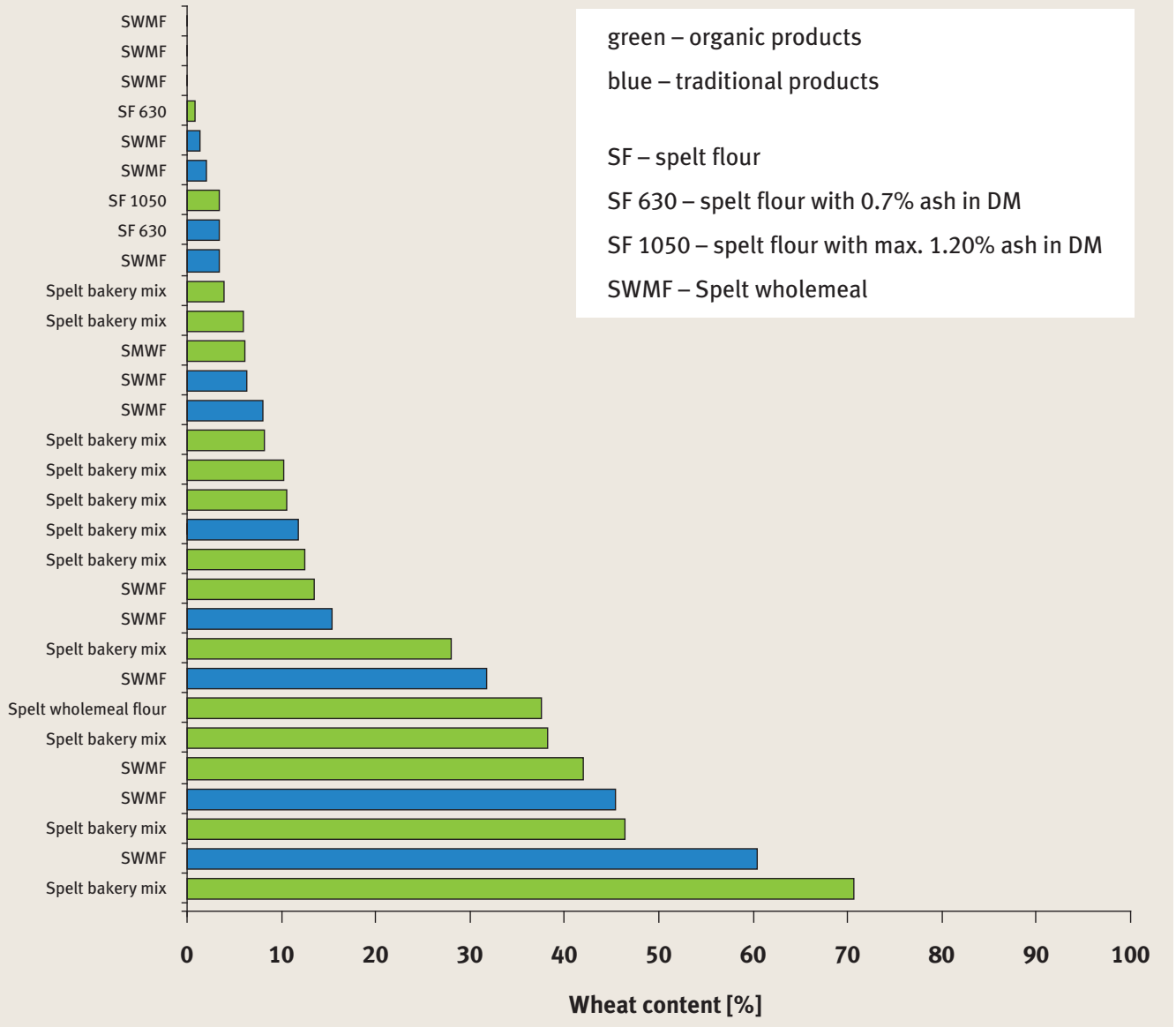
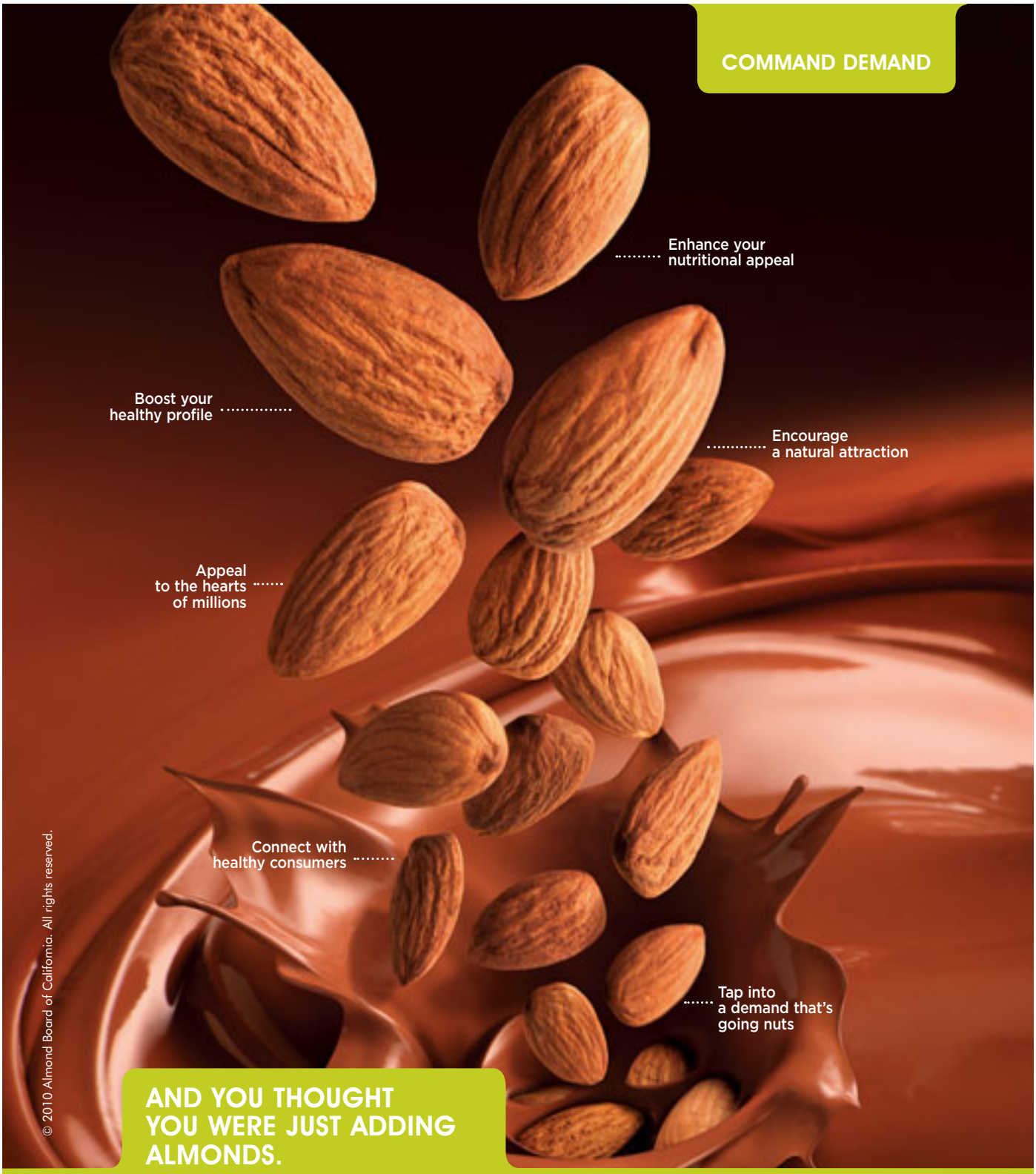
How much wheat is in spelt flour?

IT SEEMS THAT SPELT FLOUR IS PREFERABLY DILUTED WITH WHEAT FLOUR. A RESEARCH TEAM AT THE UNIVERSITY OF HAMBURG HAS NOW DEVELOPED RESPECTIVE TEST METHODS

The Institute of Food Chemistry at the University of Hamburg in cooperation with the Hans-Dieter-Belitz Institute for flour and protein research in Garching, both situated in Germany, has, for the last two years, been conducting a research project on the DNA and protein-based determination of the wheat content in spelt products. The project has already yielded test methods that are suitable for being applied in practice. The research project had been initiated, amongst others from bakery suppliers and was financially supported by the Research Association of the German Food Industry (FEI) and the German Federation of Industrial Research Associations (AiF). It is scheduled to be completed by the autumn of 2010.

The German Guidelines for Bread and Small Baked Goods issued by the German Food Code Commission, which are not necessarily legally binding, state the following for spelt – spelt bread/rolls are to be made from at least 90% spelt products; this allows for a maximum wheat content of 10% in such products. According to the German Federal Office for Plant Varieties, variety authenticity is provided with a tolerance of 1%. The intervention guidelines of the Federal Agency for Agriculture and Nutrition also demand that the grain impurities do not exceed 3%. The respective system of rules within the EU is the Commission Regulation No 1272/2009 of 11 December 2009 laying down common detailed rules as regards buying-in and selling of agricultural ▸





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products under public intervention and the analysis methods for determination of quality. They also define 3% as the maximum amount of impurities. This is the theory!

HHowever, when spelt has been ground into flour, the reality is often very different. Within the scope of the research project, the market situation was investigated. 16 of 25 spelt flours and spelt premixes offered by food retailers contained more than 10% wheat with one product having a wheat content of about 70% which really takes the biscuit.

The presence of wheat in spelt products can be accidental or intentional. It is possible that wheat can be present as a secondary growth on a spelt field. Accidental residues from transportation means and machines as well as unintentional contamination may happen in the processing companies. Alternatively, wheat is deliberately added to the spelt flour in order to improve the baking properties of the spelt which, compared to wheat, has a much weaker baking performance. Suppliers complying with the legal situation will label these additions accordingly.

If they do not, this is nothing less than consumer deception and is economically damaging the user. The reasons for the wheat addition are of an economical nature. Spelt has a much lower yield than wheat and its cultivation area is much smaller. Consequently the prices for spelt are higher than for wheat.

Up to now, it could not be proven easily how much wheat was present in the several spelt products because wheat is quasi the successor of spelt. Both spelt (*Triticum aestivum ssp. spelta*) and wheat (*Triticum aestivum ssp. aestivum*) belong to the Poaceae family; both originated from an ancient grain. Spelt has a tough hull or husk while wheat does not. For centuries both grain varieties have been cross-bred and selected so that the genetic material of spelt and wheat are very similar to each other.

Morphologically, there is a difference between both types but that is lost after the grain has been processed into flour. Therefore, there have been no reliable spelt detection tests for processed spelt products available until now.

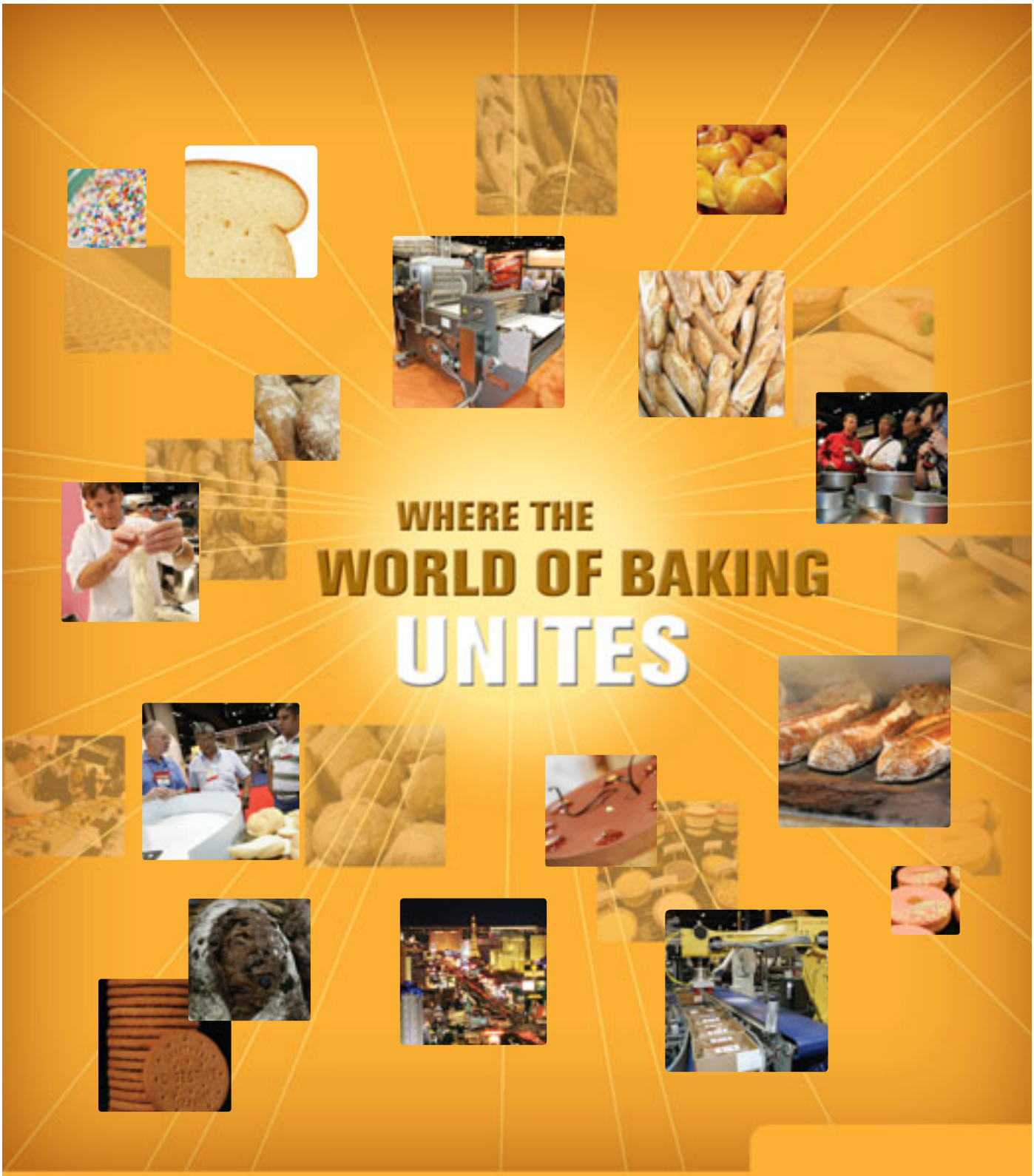
Dr. Ilka Haase and Franz Mayer from the Institute of Food Chemistry (headed by Prof. Markus Fischer) have now developed a method for the determination of the wheat content in spelt products based on DNA characteristics.

The following spelt varieties from the German Federal list of Varieties have been included in the analysis – Franckenkorn, Zollernspelz, Oberkulmer Rotkorn and Badengold – these are the four most important varieties with a market share of 95% in Germany – as well as Bauländer Spelz, Schwabenkorn, Ostro and Samir. Furthermore there are two other spelt varieties which are interesting because of their cross-breeding with wheat namely Hubbel, a Swiss spelt variety, and Balmegg. The scientists also took a closer look at the Swiss varieties Titan, Tauro, Sirino and Alkor. It would also have been possible to identify spelt varieties from other countries, but, for this project the selection has been limited to varieties from the German-speaking areas for obvious reasons. A continuous project-related expansion is underway and currently the Food Chemistry Institute is also examining the Belgium spelt varieties (Albin, Hercule, Redoute, Rouquin und Renval), Ökö 10 from Hungary as well as a very new German variety called Divimar which has only just been approved for use as seeds this spring.

The spelt varieties were compared to the four most important wheat varieties Akteur, Cubus, Dekan and Impression with their different baking qualities. Two DNA-based methods were employed – one wheat-specific PCR (polymerase chain reaction) and a specific PCR-RFLP (restricted fragment length polymorphism). First of all, the DNA had to be isolated from the grain matrix within half a day. DNA is a nucleic acid that contains the genetic instructions. It is unique for each individual. Due to their close relationship, wheat and spelt have many DNA components that are alike, but, there are certain DNS sequences that are specific to the respective grain. In this case a wheat-specific section on the gamma-gliadin gene has been used. Prior to the detection of this sequence, the DNA must be amplified because otherwise the amount of DNA is too small for the analysis. For this process, a two to three hour PCR is started where the double helix of the DNA is split up and the single DNA strands are doubled. A so-called primer is needed for selective and repeated amplification. Within the scope of this project a wheat specific pair of primers has been developed for this specific DNA fragment. This means that the primer pair only acts on a wheat-specific fragment of the DNA and does not react with spelt's DNA. Based on this qualitative detection it could be stated whether wheat is present in the spelt product or not.

The respective quantitative determination of the wheat proportion requires another half day. Fluorescence measurements and standards (wheat spelt mixtures with defined wheat content) are used for the quantification. Here the measuring signal of the standards is plotted against the logarithm of the wheat concentration. The resulting curve can be used to develop a calibration line that in turn can be used to determine the unknown wheat content in a sample. This procedure fulfills all performance criteria for the validation of DNA-based analysis methods; its detection limit is 1%. This method produces precise information on the wheat content in the spelt product.

With this DNA method, 95% of the German market for spelt products can be covered as all products made from the most important spelt varieties can be examined for the possible presence of wheat. However, the limits of this detection method are younger spelt varieties which have been cross-bred with wheat. They have the external properties of spelt such as the hulls or brittle rachis but also contain the DNA sequence of the gamma gliadin gene typical for wheat. One of these newer varieties is the biodynamic variety Alkor from Switzerland which according to this analysis would be classified as wheat and not as spelt. Time will show whether this DNA-based detection method will be useful for German producers, processors and consumers despite this shortcoming. The Institute of Food Chemistry itself does not offer contract analyses. However, because the project has been publicly funded, the methods will be openly published upon the completion of the project. **+++**



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