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## Introduction

Industrial scale bakeries do rarely provide products for people with protein allergies, protein incompatibilities or with the need to be nourished in a protein-limited diet. Some specialized bakeries provide pastries for celiacs, phenylketonurics or people suffering from multiple sclerosis or renal/kidney insufficiency but only in small scale and on the basis of non-wheat cereals. Wheat-based low protein pastries are not yet produced in industrial scale. In collaboration with a German crisp bread producer, gluten free bakery products are developed.

## Objective

The aim was to enable industrial production of extremely protein-limited and gluten-free pastries and other baked goods from wheat starch-based dough and batters. Protein-free wheat starch was used to adapt to protein-free or protein limited formulations that were developed in a previous project on the basis of maize and rice starches (Westphal et al. 2001).



Figure 1. Cookies and petit fours, glutenfree.

## Results

Table 1. Recipe formulation for short pastries.

| Ingredient   | Amount (g) |
|--------------|------------|
| Wheat starch | 480        |
| Fat/Butter   | 302        |
| Honey        | 60         |
| Sugar        | 100        |
| Xanthan      | 5          |
| Water to     | 1000       |

A formulation for short pastry is described in Table 1. Basic ingredient is special gluten-free wheat starch, which is now available (Sanostar, Kröner GmbH, Ibbenbüren, Germany). Honey and sugar are added for sweet varieties, spices may be added for savory flavors. Texture can be influenced by baking soda or other chemical leavenings. Bakers yeast may be used when strict protein limitation is not required.

Examples for short pastry and cookies are presented in Figures 1 and 2. Extremely protein-limited pastries are 100% gluten-free, contain maximum 0.4% protein (in comparison to 6-10% in conventional pastries), are extremely limited to phenylalanine, and non-allergenic. The sensory properties are good and correspond to their protein-rich counterparts. An example of the essential nutritional components, gluten and phenylalanine content in a formulation for cookies is presented in Table 2.

Table 2. Contents of food components in cookies.

| Component                 | Contents in 100g           |
|---------------------------|----------------------------|
| Carbohydrates             | 55.7                       |
| Fats                      | 25.2                       |
| Proteins                  | 0.4                        |
| Gluten                    | Not detected               |
| Phenylalanine             | 18 mg                      |
| <b>Total Energy value</b> | <b>1914 kJ or 458 kcal</b> |

## Conclusions



Figure 2. Short pastries, glutenfree.

The pastries can be consumed even to satiety by persons that have to live on a strictly protein-limited or gluten-free diet. They may be eaten without any affect and, hence, give back some quality of life and well-being. Especially for children it becomes possible to enlarge their diet with these tasty pieces. The pastries can be also consumed as functional food by family members of the mentioned patients or by people that have to cut in proteins for several other reasons.

The developments are expanded to other baked goods, such as wafers, biscuits, crackers, crisp bars, and many more.

## Literature

G. Westphal, K. Röhrich, T. Wolter, Entwicklung von Technologien zur Herstellung eiweißlimitierter Feinbackwaren, IASP Report, Berlin, December 2001