QUALITY AND SENSORY ANALYSIS OF FOOD

In Brazil agricultural products such as coffee and cocoa have enormous potential for the development of innovative, high-quality foods. Post-harvest processes such as customized fermentation and roasting are the key for generating specific flavor components.

Services:
- Fermentation processes to improve flavour and eliminate or reduce off-flavour
- Reduction of salt
- Development of gluten-free bakery products
- Development of sugar-free products
- Identification and quantification of flavour substances
- Accelerated shelf life tests and evaluation of off-flavours
- Analyses of flavour substances in food and raw material
- Technology for chocolate products

Examples of projects:
- Development of beverages from plant raw materials by combining mashing and fermentation technologies
- Low Allergen – Effective measurement and lowering of the allergenic potential of foods using the example of soy protein
- TASTE – Edible seaweed-salt reduction in foods without taste loss
- Instant meals – new manufacturing process for ready-to-eat meals containing microwaved meat
- ProFerment – Fermentation of plant proteins for the development of new foods having high consumer acceptance
- Plant-based cheese-like products – Plant-based protein gels as alternatives to dairy products
- LikeMeat – High quality meat-like products based on plant raw materials
- GlutenFree – Healthy and tasty gluten-free bakery products and pasta
- Fat crystalization on chocolate technologies
- Enrichment of food with Omega 3 Fatty Acids

Fraunhofer Project Center for Innovations in Food and Bioresources at ITAL

Secretariat of Agriculture and Food Supply - SAA
Sao Paulo State Agency for Agribusiness Technology - APTA
Institute of Food Technology - ITAL

Fraunhofer IVV
Fraunhofer Institute for Process Engineering and Packaging

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The production of food and agricultural products is one of the most important sectors of the Brazilian economy, accounting for nearly 16% of the country's Gross Domestic Product. Innovations in these processes and the development of new technologies are crucial to maintain the competitiveness of the Brazilian agribusiness. The Fraunhofer Project Center for Innovations in Food and Biorefinery Resources at ITAL is working in Campinas (São Paulo) in 2013. The center targets a strong integration and networking between Brazil and German industries, highlighting new business opportunities in both countries.

**Models of Projects**
- Private sector contracts and joint industrial projects Brazil/Germany
- Public calls for proposals, e.g., Bioeconomy 2030; European Community (EU); FINEP/PIQ/YPB/PIB, etc.

**Product Development**
Both ITAL and Fraunhofer IVD have broad experience in executing projects for the industry. The products and processes developed in these projects follow the steps corresponding to the following criteria: Technical feasibility of the production (equipments and processes)
- Economic feasibility
- Screening of applications with focus on development of products

In the framework of the Project Center a strategic interaction with the market is offered to partners and clients, opening new business opportunities in Brazil and Europe.

**Networking**
The Project Center at ITAL allows the interaction with networks and alliances established with other Fraunhofer Institutes in Brazil and with institutes related to APRA – Paibra Agency for Agricultural Technology Research (Setor de Institutos de Campinas, Biological Institute, Institute of Animal Science, Institute of Fisheries and Institute of Agricultural Economy). This synergy complements the skills offered by each institute thereby facilitating the execution of complex multidisciplinary projects.

Examples of networks and alliances of the Fraunhofer Society:
- Food Chain Management Alliance (FCM); Polymer Surfaces Alliance (POLO); Nanotechnology Alliance (NAVO) and Group for Life Sciences (VLS).

**Facilities**
The infrastructure available at both, ITAL and Fraunhofer IVD, enables not only the testing of innovative processes and the production of selected samples but also fulfills the testing of several parameters, which contribute to the analysis of the economic feasibility of the process and the provision of data for industrial scale applications.

**Pilot Plants**
- Bioactive materials processing and modification of polymers
- Hydrolysis and deionization of UV-Systems and Plasma Reactor
- Fractionation of biogenic raw materials and manufacturing of food ingredients:
  - Milling technology and separators for city solid waste
  - Extraction technology using CO2
  - Mechanical separation of solids and liquids
- Heating Technology
- Evaporation Technology
- Drying Technology
- Extrusion equipment
- Meal and sausage products development
- Ice cream plant
- Pasteurization
- Bakery products and pastry development
- Processing of fruit and vegetable products
- Cheese plant (paste whey 5-10 kg)
- Packaging of products and samples
- Pilot plant for extraction, oil refining and biodiesel production
- Plant for food applications

**Bioenergy and Materials from Renewable Raw Materials**
Projects are being undertaken in the area of bioenergy and materials from renewable raw materials. These projects concentrate on the biological and material recycling of raw materials and residues from the agricultural and food industries, i.e., the extraction of secondary plant metabolites, or the fractionation of raw materials in order to obtain oil, fat, fibers, and proteins and carbohydrates.

**Services**
- Characterization of the composition and techno-functional properties of residual materials, raw materials and their fractions
- Fractionation of by-products, purification, modification, and optimization of fractions for technical applications
- Demonstration of functional properties, scale up, and manufacturing of samples on a pilot scale
- Development and testing of utilization strategies in close collaboration with potential users and industry
- Extraction of secondary plant metabolites
- Mass and energy balance

**Examples of Projects**
- Development of therapeutic materials based on residual whey for packaging applications
- Production of diacylglycerol (DAG) enriched plant oil with integrated, aromatic refining
- Mineral oil free lubricants based on polymers
- Novel biofuels via enzymatic processes and fractionation of plant cells
- High-quality active components from plant raw materials for the cosmetics industry

**Innovative Packaging Systems**
These foods and products require innovative packaging systems to guarantee their quality and shelf-life. The development and modified packaging systems, for example with effective barrier properties and active functions, is one of the main areas of research of the Fraunhofer Project Center.

This research area supports the CITEVA/IVV ME Group of Excellence on Serviceable and active packaging (GEA), composed of researchers from the Center for Packaging Technology at ITAL (CITEVA) and the Department of Material Development at Fraunhofer IVD (IVV ME). This group also meets the research demand for meat packaging technologies through innovative and sustainable solutions.

**Services**
- Development of multilayer systems to improve gas barrier properties
- Production of films with up to 7 layers
- Development of functional films by incorporating active agents with antimicrobial properties, control of headspace moisture, scavenging of oxygen and ethylene and binding condensed water
- Coating of paper and different substrate films such as P.P., PET, polyamide or PLA with metals (e.g. Al or Ag), semiconductors (e.g. Al, Bi), semiconductors (e.g. Al2O3, MO, SiO2)
- Plasma treatment (e.g., using O2, NH3, as reactive gases)
- Sustainable solutions for meat packaging

**Examples of Projects**
- Transparent and high barrier biodegradable film and sheet for customized modified atmosphere food packaging
- Sustainable paper-based packaging materials with nano-scale barrier layers
- Ethylene absorbers for corrugated board systems (i.e., fruit packaging)
- Development of films with antimicrobial activity
- Application of quality indicators in packaging systems

**Functionality, Nutritional Value and Health Aspects of Foods**
Certain conditions such as arteriosclerosis and diabetes are problematic in industrial nations and increasingly so in Brazil. Indeed, awareness of this and an interest in better foods is on the increase in Brazil. The Fraunhofer Project Center is developing new food ingredients and formulations to promote health, for example foods enriched with dietary fibers to reduce cholesterol levels and ingredients to promote gastrointestinal health.

**Services**
- Fractionation of plant raw materials, purification, modification and optimization of fractions for food and feed applications
- Chemical, physical and biochemical modification of fractions aiming to explore their functional properties for the development of products
- Production of food ingredients in pilot scale
- Development of prepared foods (i.e., healthy drinks and desserts) based on plant raw materials
- Development and optimization of formulations with focus on salt, sugar and fat reduction and substitution in food products
- Development of gluten-free and sugar-free food products
- Extraction technologies for optimization and development of innovative textures
- Color scale production examples for degustation and demonstration of process feasibility
- Mild heating technologies for the conservation of products: microwave and radio frequency heating

**Examples of Projects**
- Cultivated complex carbohydrates—Manufacturing of fat substitutes based on native plant proteins
- Development of an alternative process for manufacturing fat-rich, high-quality extrudates using the example of pea foods
- Use of plant-based residues from oil recovery to manufacture high-quality fish feed for farming rainbow trout
- Development of a fractionation process for manufacturing pea protein preparations with improved sensory properties
- Polysaccharide-enriched sunflower seeds as food ingredients
- SunPro: Sustainable cultivation and novel processing of sunflower seeds for simultaneous production of sunflower oil, solid fat and protein-rich food ingredients
- Lulin protein as a bioactive food ingredient – Mechanism of lipid reduction and cholesterol lowering
- BioProBio: Development of cholesterol-lowering foods through bioactive peptides and fibers
- Radio frequency heating for mild heating of foods
- PlantsProFood: Recovery of biofunctional food ingredients from lupin seeds for the food industry
- LUPRICH – New varieties of Blue Lupin as raw materials for the food industry (two project partners)
- LUPRING – Development of a plant for the processing and extraction of lupin seeds and for modification of protein isolates (six project partners)
- LUPRA1 – Development of lupin protein based snacks and plant-based sausage and meat surrogates (two project partners)
- LUPAS – Development of lupin protein based beverages (two project partners)
- LUPASTA – Development of lupin protein based pastries (two project partners)
- LUPBACK – Development of lupin protein based baked goods and confectionery (two project partners)
- LUPSEIN – Development of methods for the sensory evaluation of lupin based foods (one project partner)