Food Quality in Digital Age

Visegrad Fund

digitalfoodquality.com

Research methods

In this project we gather, explore, showcase and disseminate the innovative food quality assessment methods that are using smart technologies and enabling precision food production according to consumer preferences.

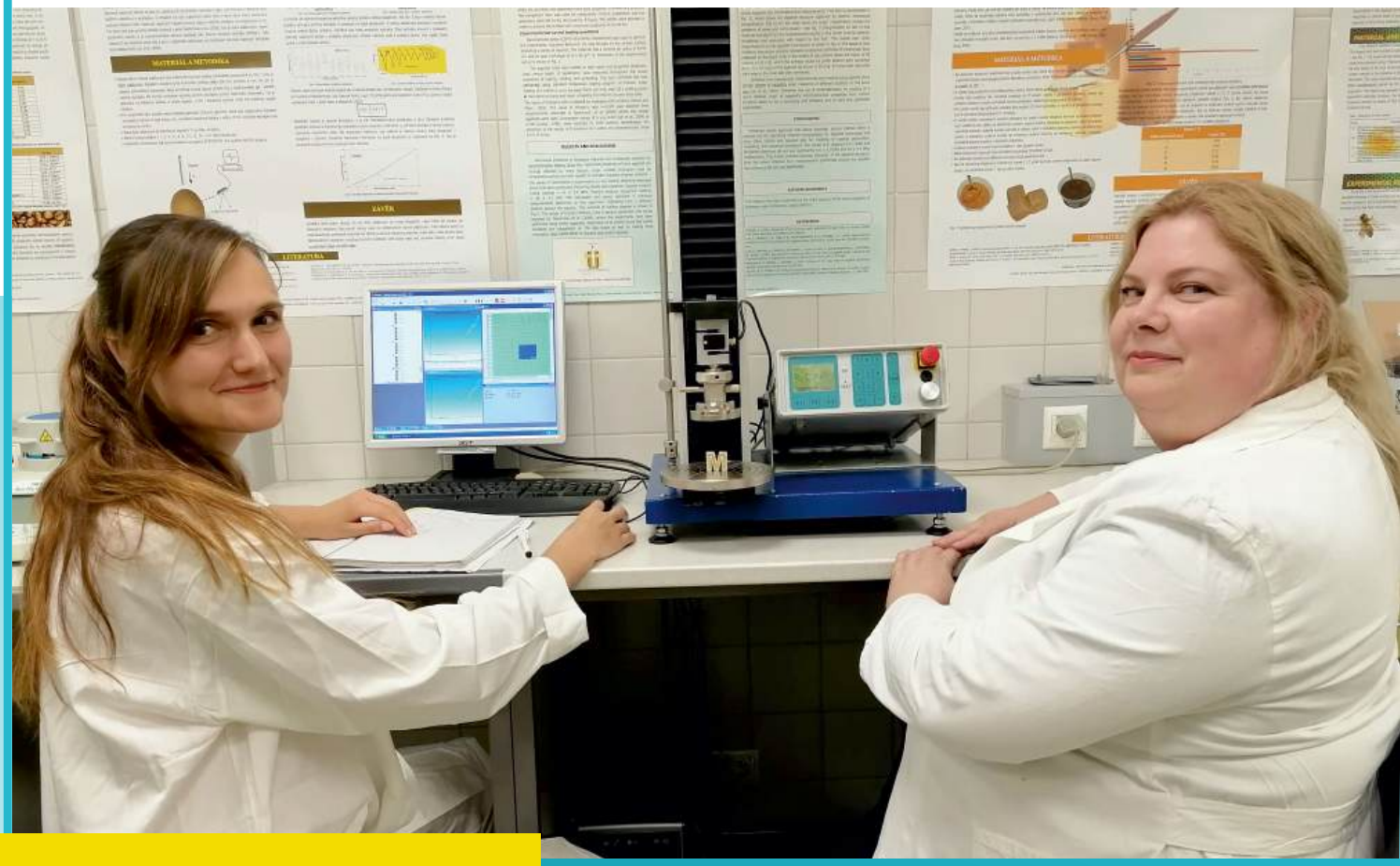
These novel strategies have a potential to generate technological advancements in food quality evaluation that allow both, small and large-scale food producers to implement precision food production. Integration of proposed methods (3D food printing, computer vision system, electronic eye, non-destructive methodology and surface analysis of food product) creates a comprehensive and unique arsenal of tools for transforming the V4+ agriculture into the food industry 4.0.

Food Quality in Digital Age

Visegrad Fund

3D Food Printing

An innovative technology such as 3-D printing of food products can be used by re-using food waste (e.g. whey) as starting ingredients/materials to make new food/edible coating products.



Advantages

3D-printing has gained phenomenal attention due to its scalable and rapid prototyping of 3D structures from various precursor materials.

Flexibility in structural design, waste minimization, mass customization and complex architectural manufacturing are some of the notable features of this printing technique.

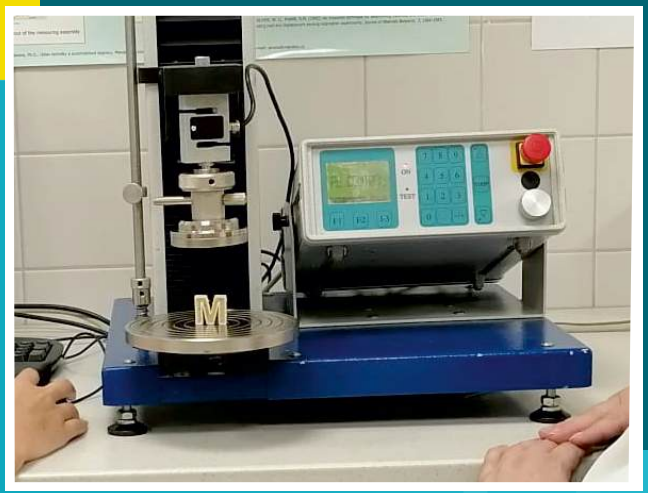
Food Quality in Digital Age

Visegrad Fund

3D Food Printing

Offer For Business

Cooperation in research and development of new or improved food products



Experts in the field

Šárka Nedomová, Associate Professor
Department of Food Technology
Faculty of AgriSciences
Mendel University in Brno
E-mail: sarka.nedomova@mendelu.cz

Soňa Hermanová, Associate Professor
Department of Food Technology
Faculty of AgriSciences
Mendel University in Brno
E-mail: sona.hermanova@mendelu.cz

Food Quality in Digital Age

Visegrad Fund

Non-Destructive Analytical Methods For Food Quality Evaluation

A novel, state of the art non-destructive analytical method has been developed (designed, calibrated, tested and validated) with the capability to provide rapid and objective results in digital form about food quality.

Developed methods

The developed method can provide “fingerprint” like characterisation of the tested foods, but using the developed calibration selected quality parameters can be also determined in a nondestructive manner. The developed new method can be later adapted for the rapid evaluation of further food products (e.g. high-protein (whey proteins) chocolate without sugar content, honey, fruits) which can support the precision food production (i.e. optimal use of raw materials in production, waste reduction etc.).

Analysis

Near-infrared spectrophotometers be applied using the Metrohm NIRSystems benchtop and the NIR-S-G1 handheld spectrophotometer applicable for the analysis of the various forms of foods and raw materials.

Food Quality in Digital Age

Visegrad Fund

Non-Destructive Analytical Methods For Food Quality Evaluation

The near-infrared spectra of the tested samples combined with the adequate chemometric models provides the rapid and objective characterisation of the tested food samples giving information from both physical and chemical/compositional properties of the sample.

Developed methods

The methods developed on the benchtop spectrophotometer provide highly accurate results in laboratory environment while the methods developed on the handheld spectrophotometer can be useful in field applications.

Offer For Business

- Rapid, chemical-free quality evaluation of agricultural food raw materials, intermediate and final products
- Optimization of process parameters based on the in-line measurements of the products
- Non-destructive origin identification of agricultural raw materials and food products
- Monitoring bioprocesses
- Model development for qualitative and quantitative characterization of agricultural raw materials and food products
- Fingerprint analysis for the on-the-spot quality evaluation of food with handheld device

Expert in the field

Zoltan Kovacs, Professor
Department of Food Measurements and Process Control
Institute of Food Science and Technology
Hungarian University of Agriculture and Life Sciences
E-mail: Kovacs.Zoltan.food@uni-mate.hu

Food Quality in Digital Age

Visegrad Fund

Computer Vision System (CVS)

A novel, state of the art Computer Vision System has been developed (designed, constructed, calibrated and validated) with the ability to achieve instant, online and digital food quality evaluation.

Developed methods

After its validation, CVS can be used to develop new methods for a quality evaluation of food products, e.g. highprotein (whey proteins) chocolate without sugar content.

CVS can be applied with the use of Sony Alpha DSLR-A200 digital camera (10.2 Megapixel CCD sensor, SONY, Tokio, Japan).

Data processing

The color will be expressed in terms of the International Commission on Illumination (CIELAB) color space with the coordinates being L* (0–100, estimation of lightness), a* (redgreen) and b* (yellowblue).

The noted differences between colors and shades could be described as visible color changes according to the NBS (National Bureau of Standard) reference scale, which implies that such changes are perceptible to the human eye.

Food Quality in Digital Age

Visegrad Fund

Computer Vision System (CVS)

Offer For Business

- Determination of food quality using Computer Vision System
- Consultig in food safety and quality management
- Cooperation in food research and development

INNOVATION MATTERS

Expert in the field

Igor Tomašević, Professor

Food Science and Technology

Faculty of Agriculture

University of Belgrade

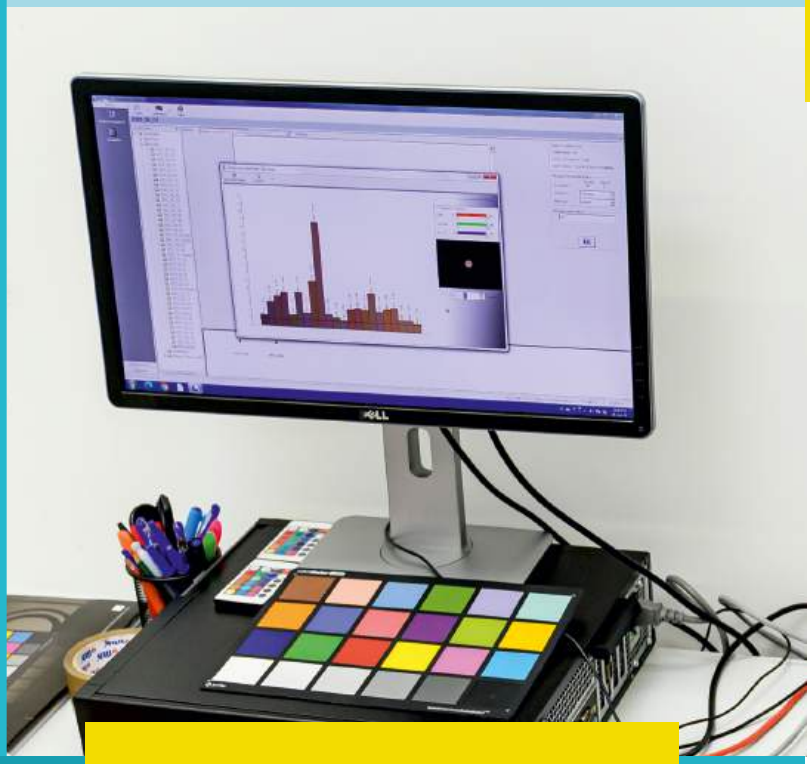
E-mail: tbigor@agrif.bg.ac.rs

Food Quality in Digital Age

Visegrad Fund

Methodology Of Electronic Eye

The color of innovative food products, e.g. high-protein (whey proteins) chocolate without sugar content, can be assessed by an electronic eye (IRIS VA400; Alpha M.O.S., France) and compared with results obtained with CVS. Alpha MOS IRIS visual analyzer is camera-based imaging system designed for visual assessment of products appearance.



IRIS VA 400 Visual Analyzer

IRIS VA 400 Visual Analyzer system is composed of two elements: the IRIS cabinet housing the lighting software-controlled CMOS camera (16 million colors) for picture acquisition under controlled conditions and a computer (provided by Alpha MOS) for system monitoring, data acquisition and multivariate statistics processing with AlphaSoft software.

Analysis

The analysis with IRIS instrument consists of taking a picture using the complementary metal-oxide semiconductor technology camera operating with RGB and L*, a* and b* parameters of the spectrum classification. The pictures are then processed as a color spectrum, with the surface of each significant color calculated in percentage.

The visual aspect of products, and especially food products, is strongly linked with quality in consumers' mind. Therefore, color and appearance are crucial sensory parameters for products success and need to be reliably and consistently monitored.

Food Quality in Digital Age

Visegrad Fund

Methodology Of Electronic Eye

By achieving instrumental analysis of the overall visual appearance, both color measurement and shape analysis, IRIS machine vision addresses the needs for visual quality control and inspection systems. This visual analyser provides wide range of applications:

- visual characterization of complex products, competition benchmarking and consumer palatability, shelf-life and freshness control, characterization of defects and foreign products, process monitoring, quality control and batch to batch consistency testing.

Experts in the field

Jana Lakatošová, PhD
AgroBioTech Research Centre
Slovak University of Agriculture in Nitra
E-mail: jana.lakatosova@uniag.sk

Miroslav Kročko, Professor
Department for Evaluation
and Processing of Animal Products
Faculty of Biotechnology and Food Sciences
Slovak University of Agriculture in Nitra,
E-mail: miroslav.krocko@uniag.sk

Offer For Business

- Determination of batch uniformity based on color
- Checking shelf-life and freshness based on color
- Color comparison with competing products

Food Quality in Digital Age

Visegrad Fund

Textural, rheological and surface properties of food products

Surface analysis and measurement of textural and rheological properties can be invaluable in developing new or improving existing food products.

The optical profilometer allows the character of the food surface (rough/smooth) to be measured quickly and without contact. Surface roughness is very important as it relates to controlling smoothness, improving appearance, palatability and reducing defects in the resulting food products. Like colour, this parameter influences the properties of the finished product and determines consumer behaviour regarding the purchase of the product.

Modern techniques

The study of the rheological properties of foods is one of the methods used to assess quality, which is essential in the development of various functional products and the modification of existing formulations.

Modern rheometric techniques allow the determination of physical characteristics that quantify the viscoelastic properties of foods under various dynamic conditions that are subjected to specific deformations. Thanks to these tests, it is possible to improve the final quality of food products, i.e. consistency, structure, viscosity or gelling power.

Food Quality in Digital Age

Visegrad Fund

Textural, rheological and surface properties of food products

The study

Texture testing, on the other hand, refers to the measurement of the mechanical properties of solids and liquids. By measuring texture parameters, it is possible to objectively assess and compare properties that are subjectively determined by the senses. These parameters are hardness, cohesiveness, fracturability, adhesiveness and gumminess. There is a very close correlation between these characteristics and sensory testing, which is carried out using the senses by a specially trained panellists.

Offer For Business

- Development and evaluation of texture (hardness, adhesiveness, cohesiveness, springiness etc.), rheological (viscosity, meltability), surficial properties: roughness (palatability, appearance), optical properties (microstructure) of various food products. Assessment of above-mentioned properties of commercial food products
- Functional properties of proteins and polysaccharides (viscosity, gelation, foaming)
- Food product formulas, especially functional foods for athletes, physically active people, and diabetics

Expert in the field

Bartosz Sołowiej, Professor
Faculty of Food Science and Biotechnology
University of Life Sciences in Lublin
E-mail: bartosz.solowiej@up.lublin.pl

Food Quality in Digital Age

Visegrad Fund

Project financing

The project is co-financed by the governments
of Czechia, Hungary, Poland and Slovakia
through Visegrad Grants
from the International Visegrad Fund.

The mission of the fund is to advance ideas
for sustainable regional cooperation in Central Europe.