



CHEESE RIPENING PROCESS MONITORED BY DIELECTRIC PARAMETERS

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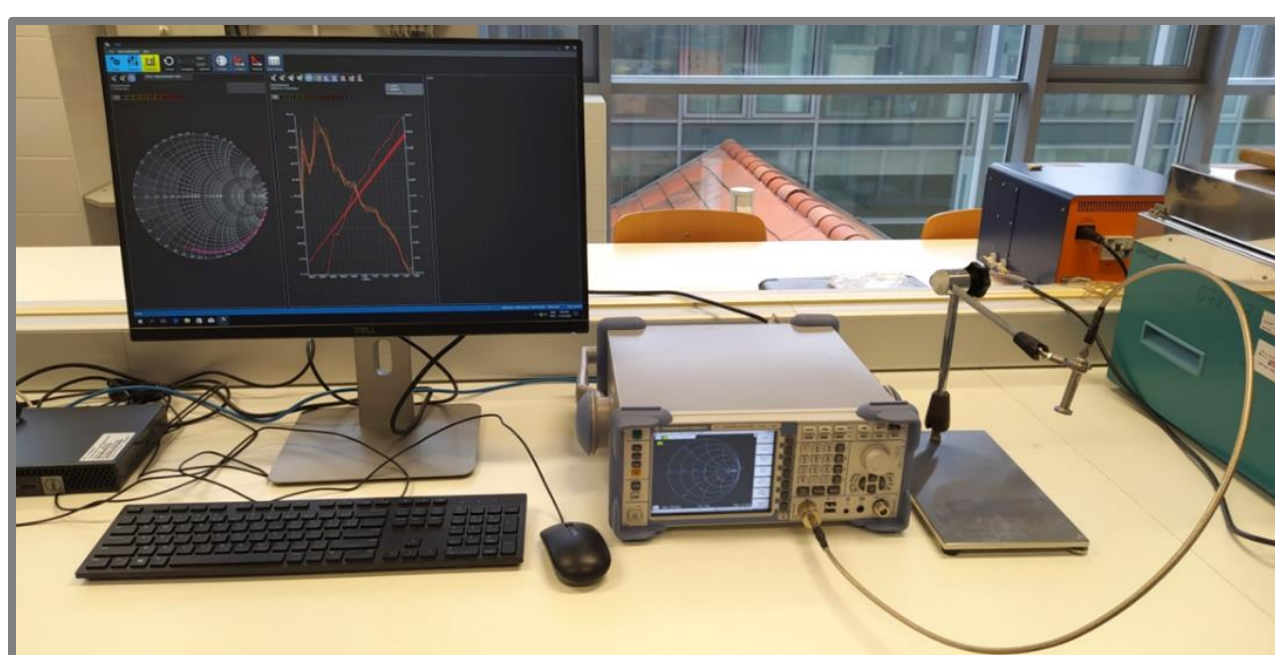
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ABSTRACT

Efficiency and economy of cheese manufacturing is determined by cheese ripening. Therefore, monitoring of cheese ripening and estimation of the end point of the process has high relevance and contributes to achieve high quality product. There are known several methods to characterize the physicochemical changes during ripening, such as texture profile analysis (TPA), colour measurements, soluble protein determination and sensory analysis. Dielectric measurements as fast and non-destructive method can be applied for monitoring of enzymatic processes, chemical reactions and textural modification of food, but there are very few experiences related to application in dairy technology. Therefore, the aim of our research was to investigate the applicability of dielectric measurements for monitoring cheese ripening process. For the experiments Trappist cheese and Bácskai kneaded cheese samples were used. During the ripening period CIE LAB colour coordinates (measured by Minolta CR300), hardness and the adhesive force (TPA parameters by Brookfield CT3 analyser), and soluble nitrogen fraction were determined. Dielectric constant (ϵ') was measured by Speag DAK 3.5 probe connected to vector network analyser (Rohde&Schwarz ZVL-3) in the frequency range of 200-2400 MHz. Our results show, that the dielectric constant has a good linear correlation with TPA parameters and colour coordinates (ϵ' show decreasing tendency for Trappist cheese and increasing tendency for Bácskai cheese versus time) in the first 14 days of the ripening period.

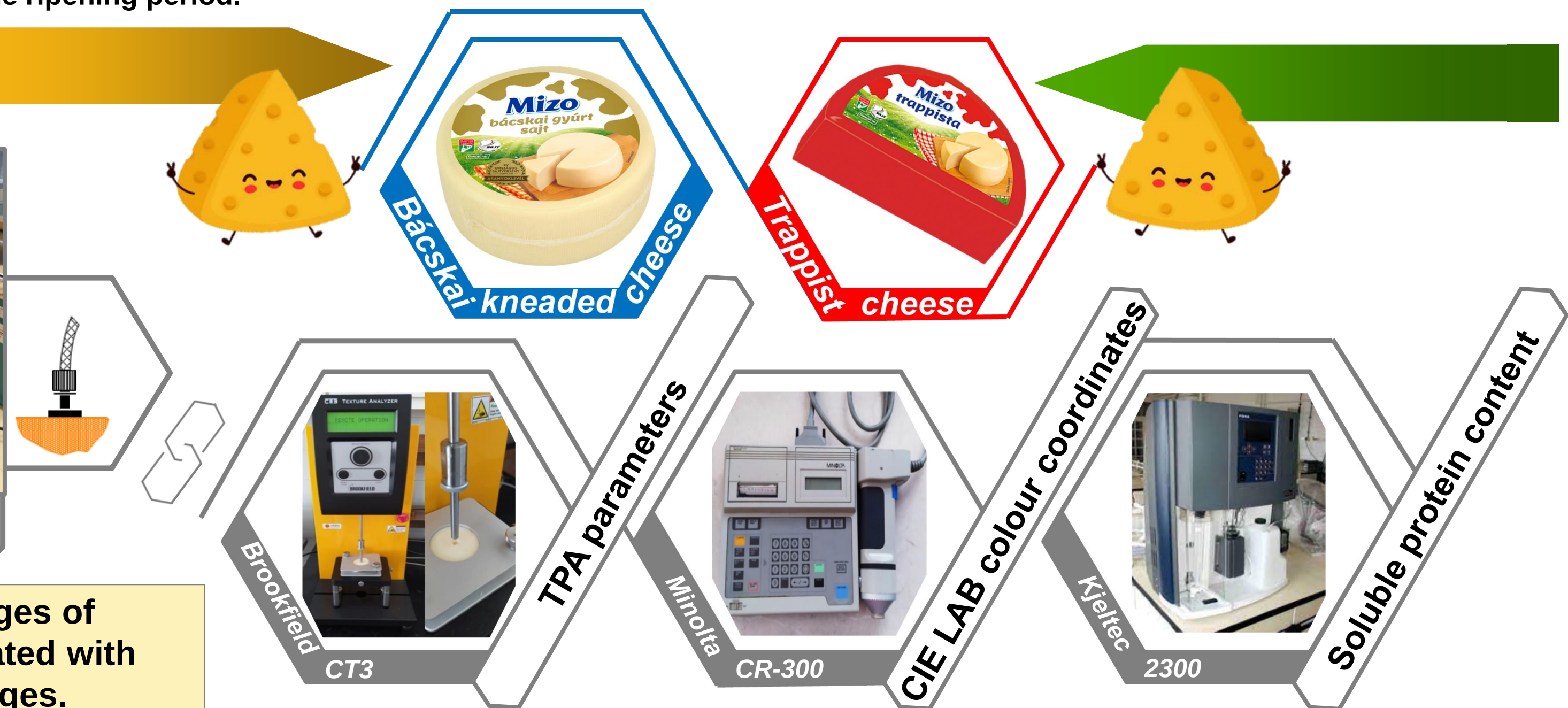
MATERIALS AND METHODS



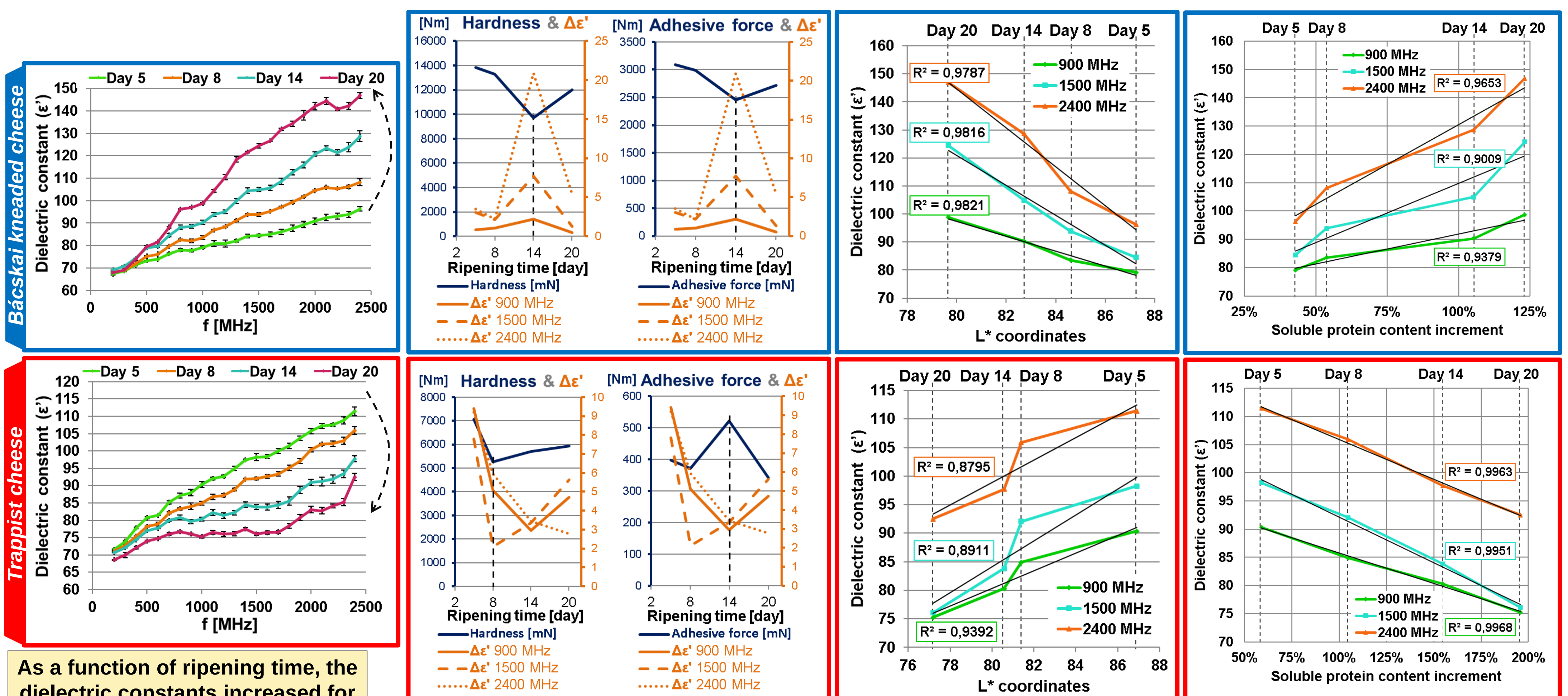
- DAK 3.5 open ended coaxial dielectric probe
- ZVL-3 (Rohde&Schwarz) vector network analyzer



Determine whether the changes of dielectric properties are correlated with the physico-chemical changes.



RESULTS AND DISCUSSION



As a function of ripening time, the dielectric constants increased for kneaded cheese, while decreased for Trappist cheese.

The difference of ϵ' between the rind and the center of the cheeses reached the maximum value or the minimum value when the hardness and the adhesive force had an extreme value.

Linear correlations of the dielectric constant values with the L* colour coordinates and the increase in soluble protein content.

Dielectric measurement method is suitable for monitoring cheese ripening.

ACKNOWLEDGEMENTS

The research is supported by the UNKP-21-5- SZTE-556 New National Excellence Program of the Ministry for Innovation and Technology from the source of the National Research Development and Innovation Fund. The authors thank the support of the János Bolyai Research Scholarship of the Hungarian Academy of Sciences (BO/00161/21/4.)



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ICOSTEE Conference Program

9 ⁰⁰ – 10 ⁰⁰	Registration and placement of posters			III. Lecture Hall
10 ⁰⁰ – 10 ¹⁵	Opening			
		Dr. István Biró Dean of Faculty	Welcome speech	
		Rector's greeting	Anniversary greetings	
	Plenary lectures			
10 ¹⁵ - 10 ⁵⁵		Prof. dr. József Popp Corr. Member of the HAS	Why circular bio-economy is key for sustainable development?	
10 ⁵⁵ - 11 ³⁵		dr. Branislav Šojić PhD Ass. Professor University of Novi Sad	Emerging antioxidants in meat processing	
11 ³⁵ - 12 ⁰⁰	Greetings of Prof. Emer. Sándor Balogh			
12 ⁰⁰ – 13 ³⁰	Lunch			Lecture room
	Poster Session			III. Seminar room
13 ³⁰ - 17 ⁰⁰	Sessions			
	Food technology	Chair: Prof.dr. Bánáti Diána Secret.: dr. Ernő Gyimes		VII. Seminar room
	Food Science I.	Chair: Prof. dr. Zita Seres Secret.: dr. Anita Vidács		II. Lecture Hall
	Food Science II.	Chair: Prof. dr. Éva Gelencsér Secret.: dr. Balázs P. Szabó		I. Computer room
	Biological and Environmental Technology	Chair: Prof. dr. Zsuzsanna László Secret.: dr. Katalin Sziládi Papp		I. Lecture Hall
	Technical I.	Chair: Prof. dr. Livia Cvetityánin Secret.: dr. János Simon		V. Seminar room
	Technical II.	Chair: Prof. dr. Gilbert-Rayner Gillich Secret.: dr. László Gogolák		VI. Seminar room
	Agro-Economy	Chair: Prof. dr. Zoltán Lakner Secret.: dr. Krisztián Kis		IV. Seminar room
	Food Policy	Chair: Prof. dr. József Popp Secret.: dr. József Csanádi		III. Lecture Hall
cc.17 ⁰⁰	Farewell Surprise Gift			reception

Duration of lectures: 10 min + 5 min discussion PowerPoint 2016 - ppt or pptx format is asked. No use private laptop please, pendrive would be useful.

The posters will be available on-line on the platform of the conference.

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(Printed Poster size: A1 (85×60cm))

	Sciences	Universal Motor Helical Gear Reducers	participation
Pál Patrik Dézsi	University of Szeged Faculty of Engineering	Structural and morphological studies of lactic acid based biodegradable modified polymer packaging materials	online

**Food Technology
POSTERS**

Corresponding Author	Affiliation	Title	
Balázs P. Szabó	University of Szeged Faculty of Engineering	Development of high-fiber, ready-to-bake flour mixtures	in.-person participation
Maja Milošević	University of Novi Sad - Faculty of Technology	Characteristics and properties of pectin fiber from butternut squash (<i>Cucurbita moschata</i>) obtained by green protocol	in.-person participation
Milica Perović	University of Novi Sad, Faculty of Technology	Functional and biological properties of isolated chickpea (<i>Cicer arietinum</i> L.) Seed protein fractions	in.-person participation
Milan Mudrinić	University of Novi Sad, Faculty of Technology	Effect of protease treatment on antioxidant activity of chickpea globulin and its potential usage in protein nanoparticles preparation	in.-person participation
Marija Lemić	University of Novi Sad Faculty of Technology	Rubisco from spinach: the influence of isolation protocol on protein recovery, purity and functional properties	in.-person participation
Marija Kostić	University of Novi Sad, Faculty of Technology	Microstructural, barrier and antimicrobial properties of citrus pectin-based edible films	in.-person participation
Biljana Lončar	University of Novi Sad Faculty of Technology	Mass transfer rate and osmotic treatment efficiency of peaches	in.-person participation
Zsuzsanna Horváth	University of Szeged, Faculty of Engineering	Comparative analysis of colour and sensory parameters of konzum biscuits made from high fiber flour using sweetener	in.-person participation
József Mihalkó	University of Szeged, Faculty of Engineering	Comparative analysis of beef, buffalo and bison meat	in.-person participation
Milica Nićetin	University of Novi Sad Faculty of Technology	Osmotic dehydration of wild garlic in sucrose-salt solution	in.-person participation
Réka Dobozi	University of Szeged Faculty of Engineering	Cheese ripening process monitored by dielectric parameters	in.-person participation
Ernö Gyimes	University of Szeged Faculty of Engineering	Development of method for measuring of particle size by chocolates and compound coatings	in.-person participation
Albana Tahiri	Agricultural University of Tirana	Education in pandemic times and the role of technology use.	online
Kincső Boróka Móricz	Faculty of Technology, University of Novi Sad; "Europa" Student Centre - Student Dormitory, Novi Sad	The stabilization of wine to tartars	in.-person participation
Dóra Szepesi-Bencsik	University of Szeged Faculty of Engineering	Possibilities of using natural dyes in the manufacture of breaded products	in.-person participation



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ABSTRACT

Efficiency and economy of cheese manufacturing is determined by cheese ripening. Therefore, monitoring of cheese ripening and estimation of the end point of the process has high relevance and contributes to achieve high quality product. There are known several methods to characterize the physicochemical changes during ripening, such as texture profile analysis (TPA), colour measurements, soluble protein determination and sensory analysis. Dielectric measurements as fast and non-destructive method can be applied for monitoring of enzymatic processes, chemical reactions and textural modification of food, but there are very few experiences related to application in dairy technology. Therefore, the aim of our research was to investigate the applicability of dielectric measurements for monitoring cheese ripening process. For the experiments Trappist cheese and Bácskai knéaded cheese samples were used. During the ripening period CIE LAB colour coordinates (measured by Minolta CR300), hardness and the adhesive force (TPA parameters by Brookfield CT3 analyser), and soluble nitrogen fraction were determined. Dielectric constant (ϵ') was measured by Speag DAK 3.5 probe connected to vector network analyser (Rohde&Schwarz, ZVL-3) in the frequency range of 200-2400 MHz. Our results show, that the dielectric constant has a good linear correlation with TPA parameters and colour coordinates (ϵ' show decreasing tendency for Trappist cheese and increasing tendency for Bácskai cheese versus time) in the first 14 days of the ripening period.

MATERIALS AND METHODS

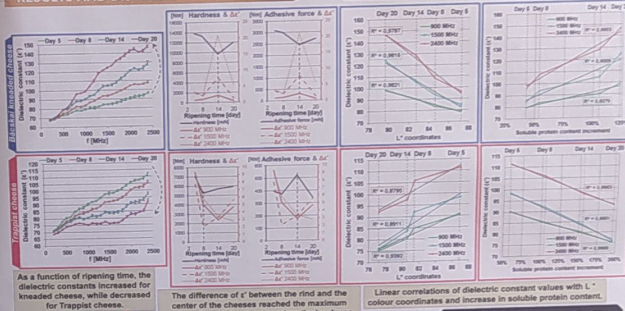


- DAK 3.5 open ended coaxial dielectric probe
- ZVL-3 (Rohde&Schwarz) vector network analyser

Determine whether the changes of dielectric properties are correlated with the physico-chemical changes.



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Linear correlations of dielectric constant values with L^* colour coordinates and increase in soluble protein content. Dielectric measurement method is suitable for monitoring cheese ripening.

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Keywords: cheese ripening, dielectric parameters, texture profile analysis, colour measurement