4th International Congress on Food Safety and Quality
ONE HEALTH
November 9th-12th, 2022 | Dubrovnik, Croatia

Innovative technology in „Paški sir” cheese production

Assoc. prof. Nataša Mikulec, PhD

University of Zagreb, Faculty of Agriculture

Potential of microencapsulation in cheese production, K.K.01.1.1.04.0058 (2019 – 2022)

- **Project coordinator**:
  - Faculty of Agriculture, University of Zagreb
  - Department of Dairy Science, Department of Animal Science, Department of Chemistry
    - Reference Laboratory for Milk and Dairy products
      - Project manager: Assoc. prof. Nataša Mikulec, PhD
- **Project partners:**
  1. Faculty of Veterinary Medicine, University of Zagreb
     - Department of Hygiene, Technology and Food Safety
  2. Ruđer Bošković Institute
     - Department of Physical Chemistry

Europska unija Zajedno do fondova EU
REPUBLIKA HRVATSKA Ministarstvo regionalnoga razvoja i fondova Europske unije
EUROPSKI STRUKTURNI I INVESTICIJSKI FONDOVI
Operativni program KONKURENTNOST I KOHEZIJA

Project goals

- To sequence DNA genotype from Pag sheep (paška ovca)
- To extract coagulation enzymes from suckling lamb's abomasum
- To extract Starter lactic acid bacteria from suckling lamb's abomasum, cheese and milk
- Prepare microcapsules containing indigenous rennet and starter cultures

✓**Innovation in cheese production**

Project activities

I. DNA
II. Rennet
III. Indigenous Lactic Acid Bacteria isolation and determination
IV. Experimental microencapsulation
V. Field experiment → Case Study on „Paški sir" cheese
    a) Sampling, laboratory analysis, sensory analysis, statistical analysis
VI. Results publishing and dissemination

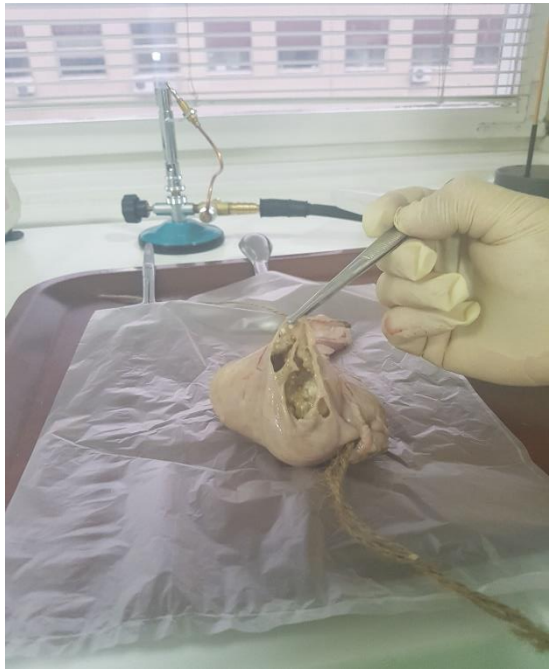
FIELD RESEARCH, SAMPLING AND ACTIVITIES

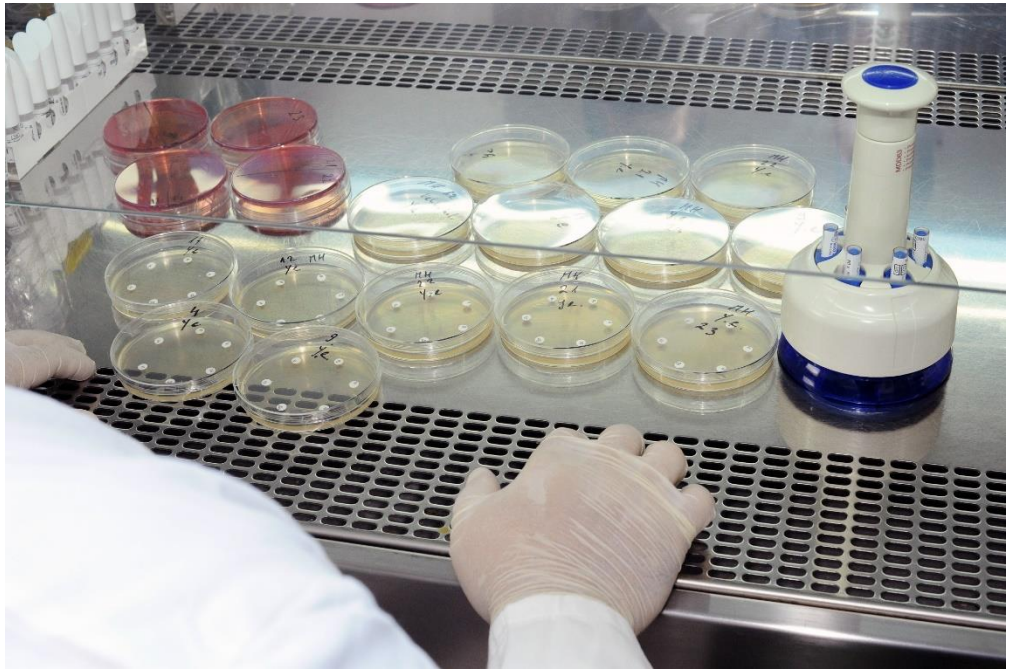
I. DNA sampling from sheep

FIELD RESEARCH, SAMPLING AND ACTIVITIES

II. Rennet extraction

III. Indigenous lactic acid bacteria determination

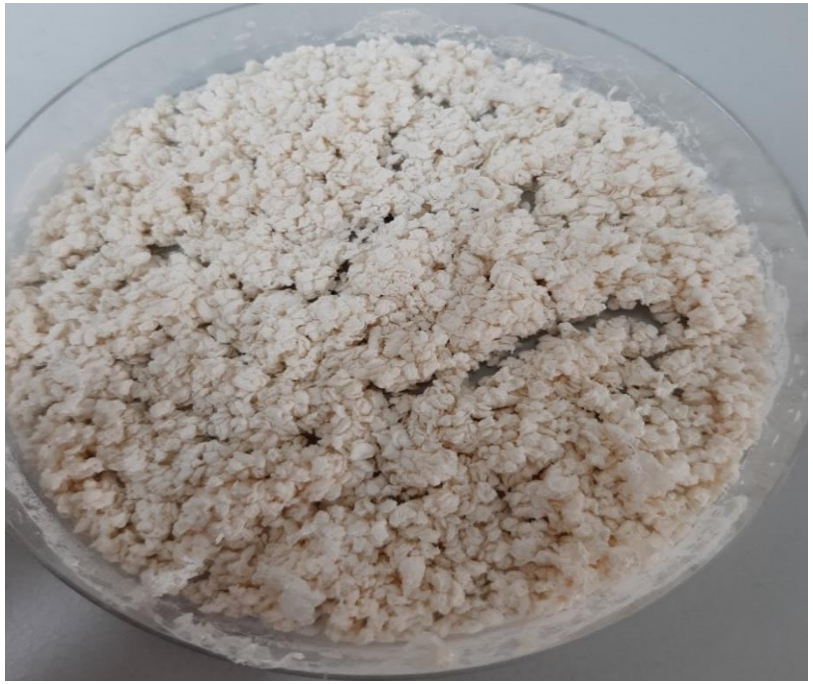




FIELD RESEARCH, SAMPLING AND ACTIVITIES

IV. Preliminary microencapsulation tests

- Needed to optimize rennet concentration, microcapsules size, efficiency etc.
- Completely new type of capsules containing 2 bioactive components



FIELD RESEARCH, SAMPLING AND ACTIVITIES

V. Coagulation properties testing

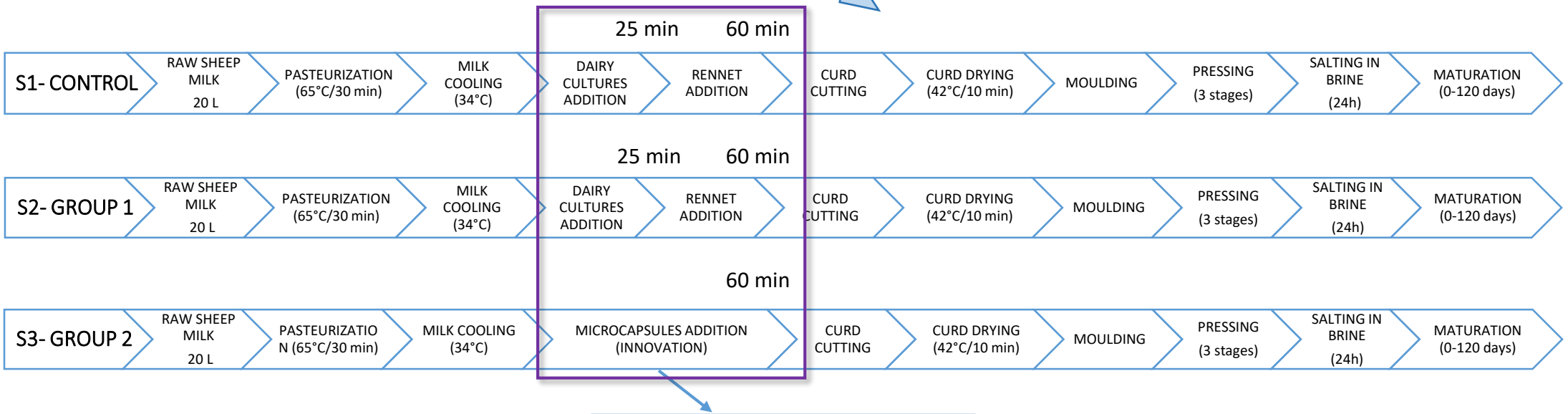
Case Study → „Paški sir" cheese

- **The aim of the experiment** → to investigate the influence of rennet and dairy cultures on „Paški sir" cheese during production and maturation stage
- **3 groups**:
  - Control →**S1** – Bioren (Christian Hansen, Denmark) + DIPROX LH1 (Bioprox, France)
  - Group 2 →**S2** – freeze-dried rennet isolated from the abomasa of Pag lambs and indigenous dairy cultures isolated from the milk of Pag sheep and „Paški sir" cheese produced in microencapsulated form;
  - Group 3 →**S3** – innovative microencapsulated formulation containing indigenous rennet and dairy cultures.

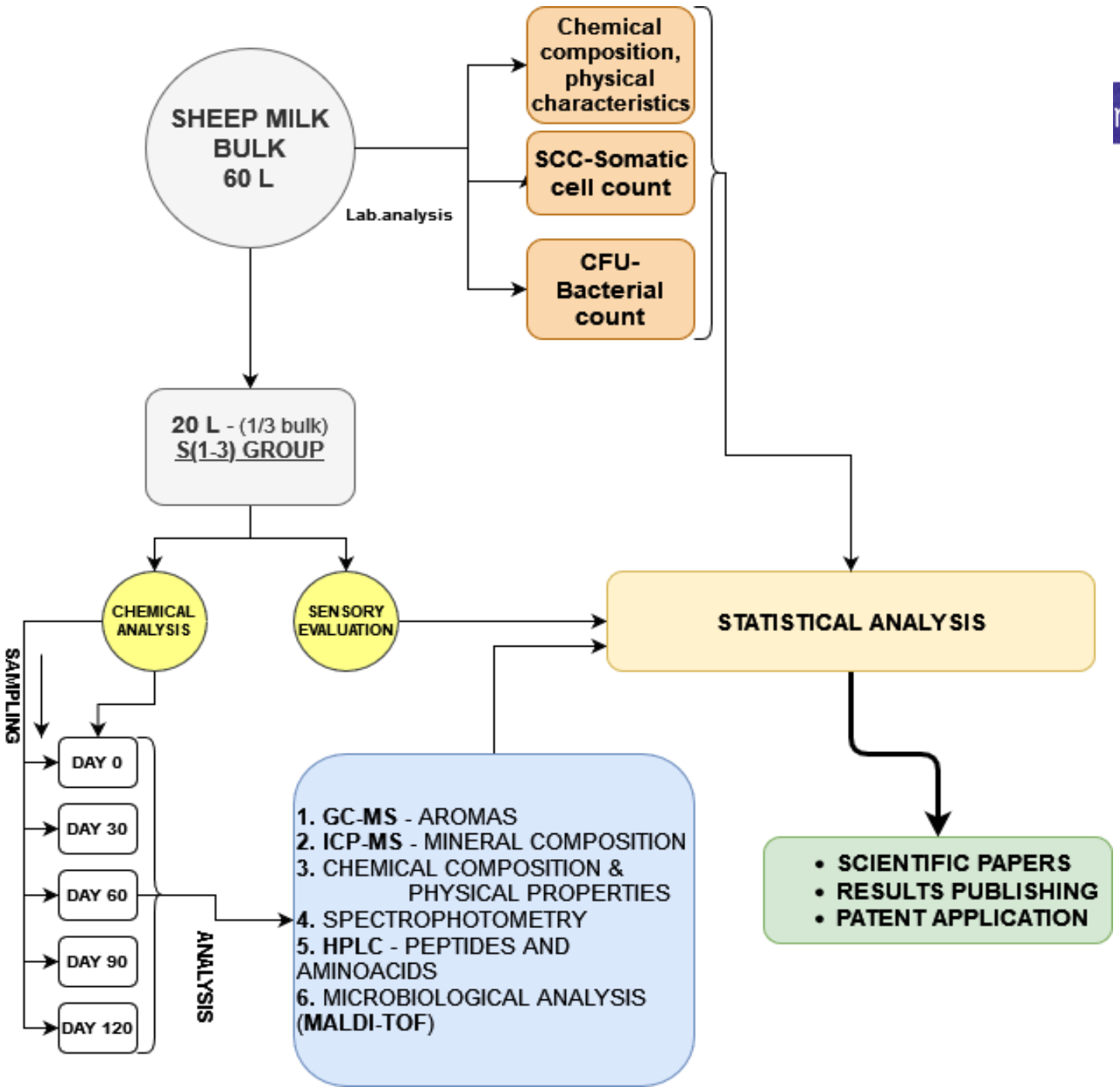
Case Study → „Paški sir" cheese

- 6 days
- 60 L raw sheep milk in bulk (3x20L)

Expected effect



↓ one step (25-30 min)


SHEEP MILK BULK 60 L
Lab.analysis
Chemical composition, physical characteristics
SCC-Somatic cell count
CFU-Bacterial count
20 L - (1/3 bulk)
S(1-3) GROUP
CHEMICAL ANALYSIS
SENSORY EVALUATION
STATISTICAL ANALYSIS
SAMPLING
DAY 0
DAY 30
DAY 60
DAY 90
DAY 120
ANALYSIS
1. GC-MS - AROMAS
2. ICP-MS - MINERAL COMPOSITION
3. CHEMICAL COMPOSITION & PHYSICAL PROPERTIES
4. SPECTROPHOTOMETRY
5. HPLC - PEPTIDES AND AMINOACIDS
6. MICROBIOLOGICAL ANALYSIS (MALDI-TOF)
• SCIENTIFIC PAPERS
• RESULTS PUBLISHING
• PATENT APPLICATION

Expected results from model cheeses:

- ✓ Complete peptide and amino acid profile
- ✓ Complete mineral composition
- ✓ Determination of compounds which define aroma and flavor
- ✓ Obtained spectral data (future research)
- ✓ Isolated, determined and preserved indigenous dairy cultures
- ✓ Sensory evaluation
- ✓ Conservation of biodiversity

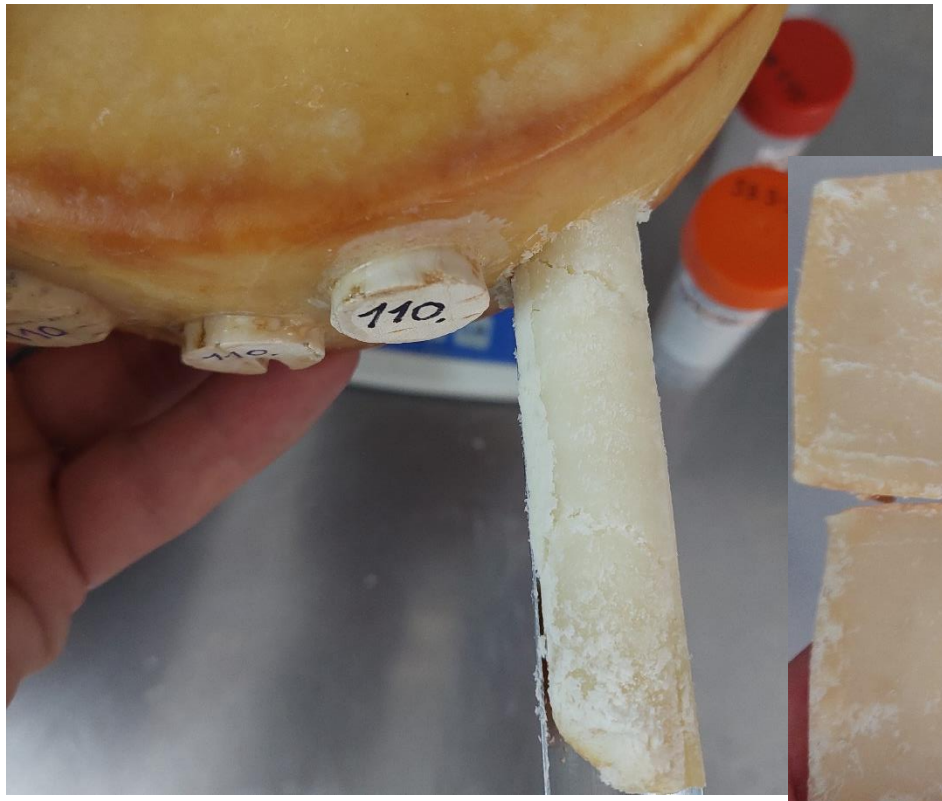
4th International Congress on Food Safety and Quality
ONE HEALTH
November 9th-12th, 2022 | Dubrovnik, Croatia

Institut Ruđer Bošković
REPUBLIKA HRVATSKA Ministarstvo regionalnoga razvoja i fondova Europske unije
EUROPSKI STRUKTURNI I INVESTICIJSKI FONDOVI
Operativni program KONKURENTNOST I KOHEZIJA
Sir je IN

4th International Congress on Food Safety and Quality

ONE HEALTH

November 9th–12th, 2022 | Dubrovnik, Croatia



Agronomski fakultet Zagreb MCMXIX

Veterinarski fakultet Sveučilišta u Zagrebu 1919

Institut Ruđer Bošković

Europska unija Zajedno do fondova EU

Republika Hrvatska Ministarstvo regionalnoga razvoja i fondova Europske unije

Europski strukturni i investicijski fondovi

Operativni program Konkurentnost i kohezija

Sir je IN

- The organoleptic properties of the cheeses were evaluated according to the Rulebook for evaluating the quality of milk and milk products (2004).

- To evaluate the cheeses, a systematic scoring of individual parameters was used with the maximum number of points for:
  external appearance (2 points),
  texture (2 points),
  cross-section (3 points),
  color (1 points),
  aroma (2 points),
  taste (10 points) - total of 20 points.

Committee members (5) used the terminology and standards prescribed in FIL-IDF (1997).

- Laboratory for sensory properties of agricultural food products

Project: Centar za sigurnost i kvalitetu hrane K.K.01.1.1.02.0004 (2018. – 2022.)

Project coordinator: NZJZ Andrija Štampar

Project partner: Faculty of Agriculture, University of Zagreb

Results

- The results were statistically processed in the SAS 9.4 program.

✓The results showed that the innovative product (microencapsulated rennet with the addition of indigenous dairy culture) is suitable for the production of Pag cheese.

✓This approach allows producers the use of pasteurization and production of cheese with the same character as the one made from raw milk, but without risk of microbial contamination.

✓The application of this innovative approach in traditional cheese production can siginficantly maximize their recognition in the global market

Acknowledgments:

- The research was done as part of the project: "Potential of microencapsulation in cheese production", KK.01.1.1.04.0058.
- The funding was ensured from the Operational Program Competitiveness and Cohesion 2014 – 2020. Investment in science and innovations - first call, KK.01.1.1.04.

Thank you for the attention

CONTACT INFO:

1. Assoc. prof. Nataša Mikulec PhD, Project Manager

Tel.: +385 1 2393904
fax.: +385 1 2393988
e. nmikulec@agr.hr

2. Fabijan Oštarić, mag.in.agr., Assistant

Tel.: +385 1 2393904
fax.: +385 1 2393988
e. fostaric@agr.hr

- Potential of microencapsulation in cheese production (*KK.01.1.1.04.0058)*

W. http://sirjein.agr.hr/
E. sirjein@agr.hr