



Conference under HERD/Agriculture



**Practical use of knowledge and knowledge transfer,
institutional development and, sustainability related
to agricultural activities**

Sarajevo, 30 September – 5 October 2013

Project:

**Antioxidant activity and stability of bioactive
compounds during processing of certain raw
materials of plant origin in Bosnia and
Herzegovina**

Lead institutions and project leaders:

1. Norwegian University of Life Sciences/NLH, Department of Chemistry, Biotechnology and Food Science (IKBM) - Roland Kallenborn, Ph.D
2. Faculty of Agriculture and Food Sciences, Sarajevo/FAFS, Department of Food Technology – Sanja Oručević, Ph.D

Academic staff and researchers involved in project

Norway

- Roland Kallenborn, Ph.D; Professor
- Dag Ekeberg Ph.D, Assoc. Professor

Academic staff and researchers involved in project

B&H

- Sanja Oručević, Ph.D; Assoc. professor
- Asima Begić-Akagić, Ph.D; Assoc. professor
- Nermina Spaho, Ph.D; Assoc. professor
- Dževad Jarebica, Ph.D; Professor emeritus
- Drena Gadžo, Ph.D; Assoc. professor
- Pakeza Drkenda, Ph.D; Assoc. professor
- Teofil Gavrić, M.Sc. Assistant
- Amila Vranac, MA; Associate

Academic staff and researchers involved in project

B&H

PhD candidates

Amela Bulbulušić, MA

Nadira Berbić, MA

MA candidates

Munevera Begić, BSc.

Aldin Islamović, BSc.

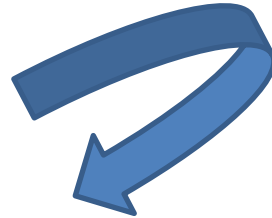
Main objectives

- Determining technological properties of certain forest plant fruits and grains and drawing attention to their additional values,
- The project should also instigate cultivation of different varieties of grain, which are relatively rarely used in B&H, and encourage food industry to buy off highly valuable forest plant fruits.
- Examining antioxidant activities of plant raw materials,
- Analyzing stability of biologically active components of highly valuable final products during processing and storing,
- Research on the use of forest plant fruits aimed at enriching the food industry with highly valuable raw material, while preserving biodiversity and strengthening rural development,
- Strengthening of cooperation between the partner institutions.

General objectives

1. The possibility of using forest plant fruits in food industry and to establish the stability of their biologically active components, depending on processing and storing methodology.
2. Examination bioactive components in some cereal during storage and baking.

1st workshop



Held in Sarajevo, 20-21.11. 2012.

1st workshop was held in Sarajevo, at Faculty of agriculture and food sciences. Main objectives of the workshop were meeting and introducing of researchers and PhD and MA candidates on the Project; introducing and detailed elaboration of activities and goals, specially during 1st year of the Project and presenting activities already done.

Bioactive components

Examine
antioxidant
activities

Establish the
stability

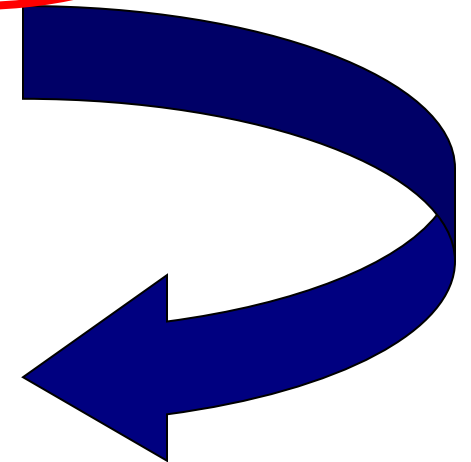
Raw material

...

Producing

...

Products



Material

Forest plant fruits:

- Cornelian cherry (*Cornus mas L.*)
- Woodland strawberry (*Fragaria vesca*)
- Bilberry (*Vaccinium myrtillus L.*)
- Rose hip (*Rosa canina*)



Cereals:

- Barley (*Horedeum sativum*)
- Spelt (*Triticum spelta L.*)
- Common and tatarly buckwheat (*Fag. esculentum* and *Fag. tataricum*)
- Wheat (*Tr. aestivum*)

ACTIVITIES PLANNED AND REALISED

Collecting grain samples,
transport and storage



| No. | Grain sample | Location |
|-----|-------------------|-------------------|
| 1. | Wheat | Fojnica |
| 2. | Barley | Fojnica |
| 3. | Buckwheat | Fojnica |
| 4. | Wheat | Trnovo |
| 5. | Buckwheat | Trnovo |
| 6. | Barley | Istočna Bosna |
| 7. | Buckwheat | Istočna Bosna |
| 8. | Barley | Nišići |
| 9. | Wheat | Nišići |
| 10. | Spelta | Breza - Bionatura |
| 11. | Buckwheat | Breza - Bionatura |
| 12. | Wheat | Breza - Bionatura |
| 13. | Tataric buckwheat | Trnovo |

BOSNA I HERCEGOVINA



Location 1

Location 2

Location 3

Location 4

Location 5

- ✳ Glavni grad
- Gradovi, sela
- Medunarodne granice
- Entitetske granice
- Medunarodni putevi
- Lokalni putevi
- Željeznica

JADRANSKO MORE

HERD-Agriculture: visit and conference in

ACTIVITIES PLANNED AND REALISED

Collecting available wild fruit samples, transport and storage



| Species | Products | Factors of variability |
|---------------------|---------------|--|
| Cornelian cherry | jam | locality, way of production, storage conditions (temperature, duration) |
| Rose hip | pekmez | locality, way of production, storage conditions (light, temperature, duration) |
| Woodland strawberry | jam and juice | locality, way of production, storage conditions (temperature, duration) |
| Wild blueberry | jam and juice | locality, way of production, storage conditions (light, temperature, duration) |

Locality of Bosnia and Herzegovina



HERD-Agriculture: Visit and conference in
B&H

ACTIVITIES PLANNED AND REALISED

Physical and chemical analyses of wild fruits samples and related products



- pH value
- Total Acidity,
- Fruit and seed weight, length, width, fruit flesh ratio,
- Color measurement,
- Pectin content,
- Anthocyanin content,
- Total phenol content,
- Reducing and total sugars,
- Soluble solids,
- Total dry matter,
- Vitamin C (ascorbic acid)
- Sensory analyses of fresh fruits and their products



ACTIVITIES PLANNED AND REALISED

Physical and chemical analyses of grain samples

- Test weight
- 1000 kernel weight
- Vitriosity
- Amount of impurities
- Germination

- Moisture
- Titrable acidity
- pH values
- Fats
- Proteins
- Ash
- Total phenolic content
- Antioxidant activity



ACTIVITIES PLANNED AND REALISED

Milling and analyses on the obtained flours

- Moisture
- Granulation
- pH value
- Swelling capacity
- Bulk density
- Water and oil absorption capacity
- Ash



ACTIVITIES PLANNED AND REALISED

Biscuits

Combination of biscuits samples

1. Wheat – 100%
2. Barley – 100%
3. Barley – wheat 75/25
4. Barley – wheat 50/50
5. Barley – wheat 25/75
6. Buckwheat – 100%
7. Buckwheat – wheat 75/25
8. Buckwheat – wheat 50/50
9. Buckwheat – wheat 25/75
10. Spelt – 100%
11. Spelt – wheat 75/25
12. Spelt – wheat 50/50
13. Spelt – wheat 25/75

For all samples two ways of baking (200 °C and 100 °C) and two fraction of flours were used ($13 \times 2 \times 2 = 52$ samples)

Also, all samples (them 52) were made in two replications.
In total, 104 samples were made.

ACTIVITIES PLANNED AND REALISED

Analyses of the products



Physical, chemical and sensory analyses of biscuit in relation to flour extraction and temperature of baking.



Physical analyses:

- Width
- Height
- Spread ratio
- Volume
- Color measurement on colorimeter

Chemical analyses:

- Moisture
- pH value
- Total phenolic content
- Antioxidant activity

Sensory analyses

- 10 trained sensory evaluators

Activities planned and realized sensory analysis

Team leader of sensory analysis: Prof.dr. Nemina Spaho

1. To form a panel

Total of 35 voluntary 10 panelist were selected from screening tests that included a basic taste recognition test, an odor identification test, a texture discriminating ability (according to ISO-standards /ISO-8586-1, 1993);

2. To carry out sensory evaluation

Calibrate panelist (index of reproducibility is supposed not to be higher than 1,5.)
To perform sensory analyses – all samples will be evaluated by each panelist.
Panellists will be assessed for visual, olfactory and gustative qualities using Likret scala 1-5 intensity perceived for each attributes ; (1-“very weak” and 5-“very intense”).

**The samples were evaluated by Quantitative Descriptive Analysis (QDA)
using scale 1-5-scores**

Activities planned and realized sensory analysis

Timetable for implementation of activities in 2013

| Activities | Months | | | | | | | | | |
|---------------------------------------|--------|-------|-----|------|------|--------|-------|-------|------|-----|
| | March | April | May | June | July | August | Septe | Octob | Nove | Dec |
| Selection of panelist | | | | | | | | | | |
| Sensory evaluation of fruits | | | | | | | | | | |
| Sensory evaluation of biscuit samples | | | | | | | | | | |
| Sensory evaluation of fruits products | | | | | | | | | | |

What are we doing now?

- Determination of raw material samples from this growing season;
- Processing fruit and grain samples into final products, using different technology modes;
- Keeping monitoring samples of fruit products on bioactive component stability;
- Sample preparations (extraction) for carrying to Norway
- ...
- The others basic physical and chemical analysis

... and analysis in Norway!

- Individual phenol compounds in wild fruit and related products (chlorogenic acid; coffee acid, synapic acid, procyanidine, catehine, epicatehine, quercatin derivates, anthocyanins);
- Antioxidative capacity;
- Individual phenol compounds in cereal products (rutin, vanillin, quercatin derivates);
- Beta glucans;
- Individual amino acids

Improving the courses

Improving the lecture and especially practical work in laboratory on courses:

1. Functional food
2. Fruit and vegetable processing
3. Flour production and processing

Bacalaureat theses

| Student | Theses title | Status |
|----------------|---|-----------------------|
| Tea Dervišić | Phenol content during storage hip 'pekmez' storage | Defended (17.09.2013) |
| Nedžija Šarić | Influence of production method on bioactive compounds of cornelian cherry jam | Defended (23.09.2013) |
| Dino Karahusić | Technological properties of rose hip fruit | Defended (24.09.2013) |
| Semir Maksumić | Physical and chemical characteristic of organic and conventional buckwheat grain | Defended (25.10.2013) |
| Elmina Kuris | Influence of production method on anthocyanin content of rose hip 'pekmez' | in proceeding |
| Azra Živojević | Determination of bread quality produced from common and spelt wheat wholemeal flour | In proceeding |

Master theses

| Student | Theses title | Status |
|-------------------|---|-----------------------|
| Asmira Alekić | Stability of bioactive compounds during the processing and storage of rose hip 'pekmez' | Defended (12.07.2013) |
| Nermin Omerhodžić | Antioxidant activity of wheat cake related to the level of flour extraction | Defended (24.04.2013) |
| Emina Fetić | Influence of production method and storage on bioactive compounds of cornelian cherry jam | in proceedings |
| Aldin Islamović | Seasonal variation of physical and chemical parameters in rose hip fruits | in proceedings |
| Merjem Mlaćo | Seasonal variation of physical and chemical parameters in cornelian cherry fruits | in proceedings |
| Ahmed Golić | Influence of storage conditions on anthocyanin content in wild blueberry juice | in proceedings |
| Selma Isić | Content of bioactive compounds in woodland strawberry products | in proceedings |

Participations on conference and congress

| Title | Publication and presentation |
|--|---|
| Influence of production method on phenol content of rose hip ‘pekmez’ | 24 th International scientific-expert conference on agriculture and food industry 25 - 28 September 2013, Sarajevo, Bosnia and Herzegovina |
| Antioxidant activity and baking quality of bread produced of spelt (<i>Triticum spelta</i> L.) and common wheat (<i>Triticum aestivum</i> L.) wholemeal flour | 24 th International scientific-expert conference on agriculture and food industry 25 - 28 September 2013, Sarajevo, Bosnia and Herzegovina |
| Total phenol content and antioxidant activity of wheat biscuits related to flour types – accepted | 7 th International Congress Flour-Bread '13 and the 9 th Croatian Congress of Cereal Technologists Brašno-Kruh '13, Opatija, Croatia, 16 - 18 October 2013. |

Purchased equipment

- Office equipment (PC, laptops, projector)
- Chemicals and small equipment (standards, cooling chambers, cooker and oven, mixer, planimeter, high pressure cooker, digital thermometers)
- Pressing device for juice production
- **CENTRIFUGE S16/16R,with cooling TH-75004030**
- **Ultra sonic bath S60/H with heating, 5.75L EL-1002238**
- **TMS- Pro Texture analyzer, Food Technology Corporation USA**
- **Furnace**
- **Nitrogen evaporator (EVA-EC1-S; do 130 C 24x16,2mm; VLM)**

Network

Associations

UG "Brusnica" Konjic;

UV "Drina" Goražde

Food industry – Supplying market with new products;

- Fruit production ("Ein-natural" Sarajevo; "Fruit fresh " Bugojno)
- Mills ("APIECO" Sarajevo; "Bio Natura" Breza)
- Pak-Rampart d.o.o. Visoko (biscuit and cake production)

Thank you for your attention!