

EVALUATION OF FRUIT GENETIC RESOURCES IN BOSNIA- HERZEGOVINA WITH THE AIM OF SUSTAINABLE, COMMERCIAL UTILIZATION

PROJECT LEADERS

Mekjell Meland, Bioforsk

Fuad Gasi, FAFS

OBJECTIVES AND GOALS

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Objectives

- ▶ Stimulate the local food processing industry by providing, scientifically based recommendations, as to which autochthonous B&H apple, pear and plum cultivars are suitable for processing into different fruit products.
- ▶ Through the multidisciplinary approach of the project improve the faculty's scientific-research infrastructure and increase the institutions international competitiveness in the area of research and education of young professionals and researchers.

Goals

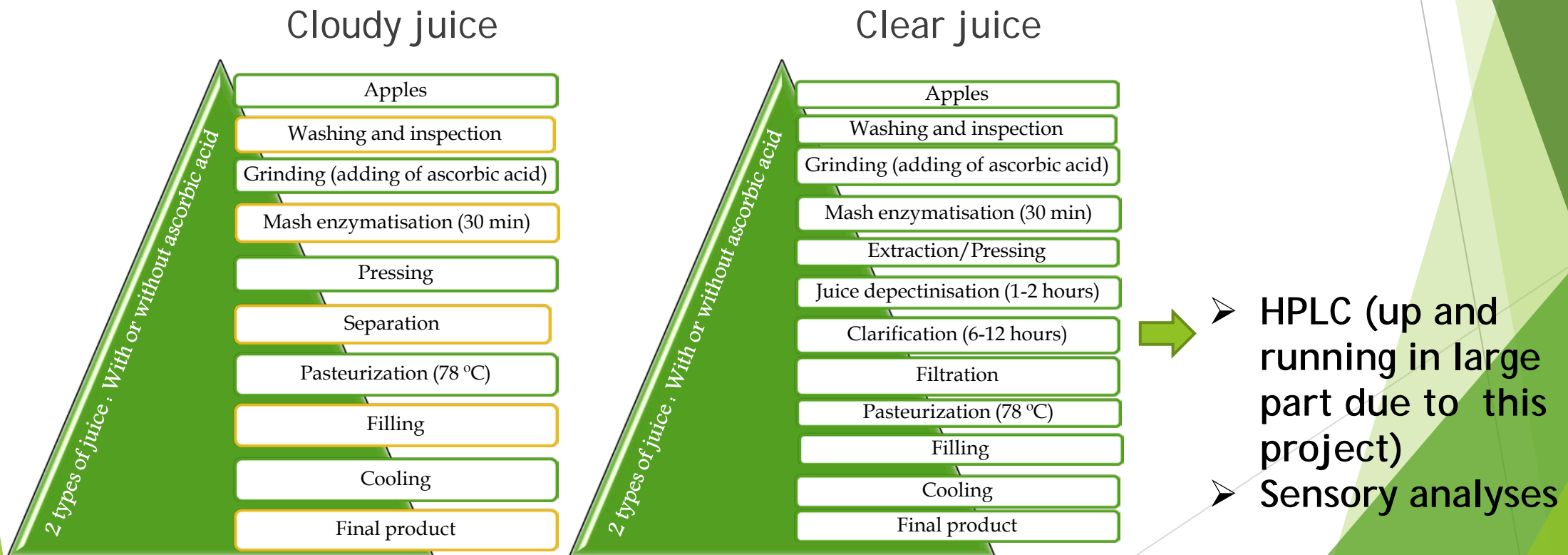
1. To assess the genetic diversity and genetic relationships of autochthonous cultivars of apple and pear and identify the synonyms and homonyms in order to make the evaluation and conservation process more efficient, as well as to estimate the present genetic diversity.
2. To evaluate important commercial, agronomic traits within the analyzed groups of genotypes and to put the information in a database, which will serve as a source of valuable data for future breeding programs.
3. To evaluate the sensory characteristics and characteristics important for food processing industry of the fruit collected from the analyzed cultivars.
4. To evaluate sensory characteristics and characteristics important for food processing industry of the distillates, juices and jams obtained by processing the autochthonous fruits.
5. To make the data gathered through the above mentioned analyses available to the local food processing industry.

OUTCOMES OF THE PROJECT I

...improve the faculty's scientific-research infrastructure and increase the institutions international competitiveness in the area of research and education of young professionals and researchers.

PhD candidate - Amila Vranac

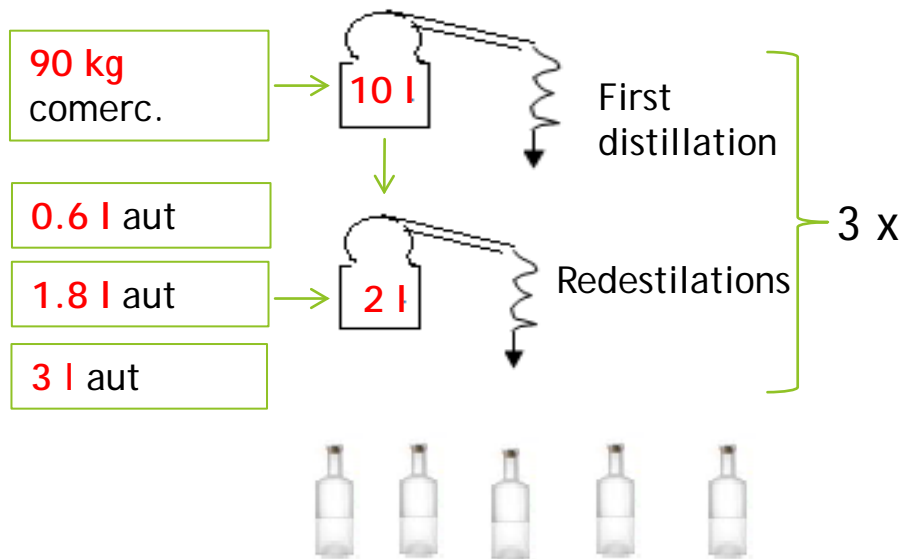
- Has received several trainings within the project,
- Receives an annual scholarship,
- Will enroll in the second year of PhD studies in autumn 2013.



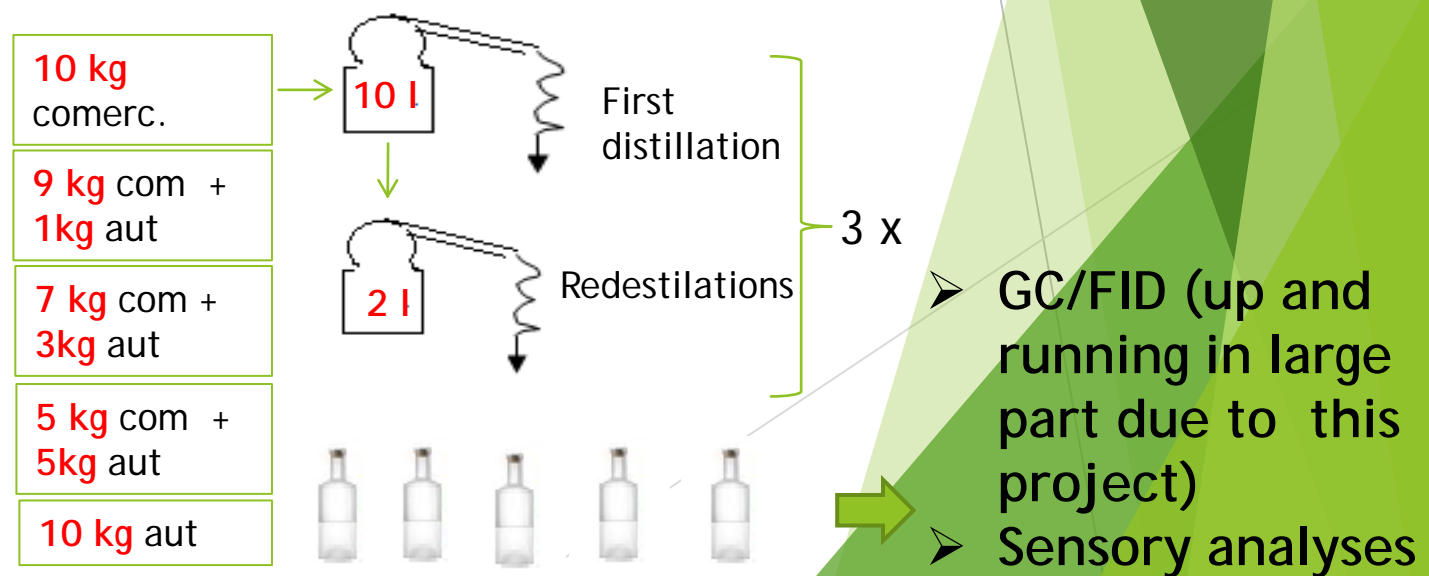
PhD candidate - Adnan Alihožić

- Has received several trainings within the project,
- Receives an annual scholarship,
- Will enroll in the second year of PhD studies in autumn 2013.

Experiment 1



Experiment 2



PhD students (additional)

Maida Đapo

- ▶ Accepted title: Polyphenolic profiles of autochthonous apple cultivars from (*Malus domestica* L.) B&H,
- ▶ Maida has finished all her exams,
- ▶ Maida and Amila work together on the sample preparation for HPLC analyses, as well as the analyses themselves.

Kenan Kanlić

- ▶ Proposed title: Diversity of apple, pear and plum genetic resources in eastern Bosnia, examined using SSR markers,
- ▶ Kenan has finished all his exams,
- ▶ He is currently working on genotyping the pear samples.

MSc students

Thesis pending

- ▶ Haris Halilović
- ▶ Esmin Brzika
- ▶ Maida Bajrić
- ▶ Sabina Palić
- ▶ Jasmin Babić
- ▶ Mustafa Hinović
- ▶ Sanita Durek
- ▶ Elvir Srebrović
- ▶ Lejla Fako
- ▶ Enisa Ohran
- ▶ Selma Vejzović

Defended thesis

- ▶ Zlate Hodžić
- ▶ Nadira Berbić
- ▶ Amela Bulbulušić
- ▶ Azira Mahmutović

BSc students

Thesis pending

- ▶ Adis Alispahić

Defended thesis

- ▶ Haris Pašalić

Curriculum development - PhD courses

Molecular methods in plant breeding

- ▶ Primary aim - provide the PhD students with knowledge needed to explore and discuss methods related to conventional breeding and breeding using molecular markers
- ▶ Secondary aim - together with the PhD students define and explore their potential needs for molecular methods in their respective research area.
- ▶ Tertiary aim - enable PhD students to use molecular methods in order to gain a competitive edge in writing and publishing scientific papers.
- ▶ Course leader - Fuad Gasi, ass. professor
- ▶ 6 ECTS

Plant genetic resources of agricultural crops

- ▶ Primary aim - provide the PhD students with knowledge needed to freely discuss a wide range of topics related to plant genetic resources of agricultural crops
- ▶ Secondary aim - together with the PhD students give a definition of plant genetic resources in respect to their individual research goals.
- ▶ Tertiary aim - together with the PhD students determine the framework of sustainable utilization of PGR in Bosnia and Herzegovina, in accordance to their own field of research
- ▶ Course leader - Fuad Gasi, ass. professor
- ▶ 6 ECTS
- ▶ Interesting for UMB

PUBLICATIONS - journals

1. Begic-Akagic, P. Drkenda, A. Vranac, P. Orazem and M. Hudina: Influence of Growing Region and Storage Time on Phenolic Profile of Cornelian Cherry Jam and Fruit. *Europ.J.Hort.Sci.*, 78 (1). S. 30-39, 2013
2. Gasi F., Simon S., Pojskic N., Kurtovic M., Pejic I., Meland M., Kaiser C. (2013). Evaluation of Apple (*Malus x domestica*) Genetic Resources in Bosnia and Herzegovina Using Microsatellite Markers. *HortScience*. 48(1):13-21.
3. Halapija Kazija, D., Drkenda, P., Šimon, S., Žulj, M., Gaši, F., Nikolić, D., Vujević, P., Jelačić, T., Milinović, B., Kurtović, M., Pejić, I. (2013): Genetic identification of 'Bistrica' and her synonyms 'Požegača' and 'Hauszwetsche' (*Prunus domestica* L.) using SSRs. *Acta Hort.* 976, pp. 285-290.
4. Gasi F., Kurtovic M., Kalamujic B., Pojskic N., Grahic J., Kaiser C., Meland M. (2013). Assessment of European pear (*Pyrus communis* L.) genetic resources in Bosnia and Herzegovina using microsatellite markers. *Scientia Horticulturae*. 157, 74-83
5. Gasi F., Žulj Mihaljević M., Šimon S., Grahic J., Pojskic N., Kurtovic M., Nikolić D., Pejić I. (2013). Genetic structure of apple accessions maintained ex situ in Bosnia and Herzegovina examined by microsatellite markers. *Genetika*. DOI: 10.2298/GENSR1301145V
6. Gaši F., Topuz H., Kurtović M., Hadžimurtezić F., Grahić J., Šimon S. (2013): Characterization of apple germplasm from on-farm collections located in the municipality Stari Grad, Sarajevo. *Proceedings of the 23rd International Scientific-Expert Conference of Agriculture and Food Industry: In press* / Gaši F., Topuz H., Kurtović M., Hadžimurtezić F., Grahić J., Šimon S. (2012): Characterization of apple germplasm from on-farm collections located in the municipality Stari Grad, Sarajevo. In Yercan Murat, Tosun Duygu & Albayram Zubeyde (ed.). *Book of Abstracts of the 23rd International Scientific-Expert Conference of Agriculture and Food Industry*. pp. 110.

PUBLICATIONS – conferences

1. Gasi F., Kurtovic M., Akagic-Begic A., Spaho N., Drkenda P., Meland M., Grahic J. (2013). Evaluation of apple and pear genetic resources in Bosnia-Herzegovina with the aim of sustainable, commercial utilization. In Ortiz R (ed.). Pre-breeding - fishing in the gene pool. Abstracts of oral presentations and posters of the European Plant Genetic Resources Conference 2013, (EUCARPIA) NordGen, SLU, Alnarp, Sweden. pp. 93.
2. Alihodzic A., Gasi F., Drkenda P., Begic-Akagic A., Kurtovic M., Meland M., Spaho N. (2013). Autochthonous fruit varieties as a basis of B&H food industry sustainable competitive advantages. 2013 EFFoST Annual Meeting: Bio-based Technologies in the Context of European Food Innovation Systems, Bologna, Italy. Accepted.
3. Vego, D., Šaravanja, P., Ivanković, A., Sabljo, A., Gaši, F., Beljo, J. (2013): Analysis of vineyard peach populations diversity in Herzegovina region. Bosnia and Herzegovina. In Blesić Milenko & Dučić Belma (ed.). Book of Abstracts of the 24th International Scientific-Expert Conference of Agriculture and Food Industry. pp. 200.
4. Berbić, N., Bulbulušić, A., Hodžić, Z., Velagić-Habul, E., Đapo, M. (2013). Determination of some quality parameters of B&H autochthonous apples. In Blesić Milenko & Dučić Belma (ed.). Book of Abstracts of the 24th International Scientific-Expert Conference of Agriculture and Food Industry. pp. 84.
5. Bulbulušić, A., Berebić, N., Hodžić, Z., Velagić-Habul, E., Đapo, M. (2013). Determination of some quality parameters of B&H autochthonous apples. In Blesić Milenko & Dučić Belma (ed.). Book of Abstracts of the 24th International Scientific-Expert Conference of Agriculture and Food Industry. pp. 86.

OUTCOMES OF THE PROJECT II

Stimulate the local food processing industry, by providing scientifically based recommendations...

Cultivar selection based on fruit analyses

- ▶ Over 30 apple and 20 pear accession were evaluated through various chemical and sensory analyses in 2012.
- ▶ Almost half of the analyzed accessions were found to be suitable for processing into various which is currently being carried out in 2013.
- ▶ However, due to a extraordinary drought that occurred in 2012, we felt that many accessions did not have the opportunity to display their standard characteristics. Also many accession did not bear fruit because of late spring frost and devastating hail.
- ▶ 2013 on the other hand has proved to be an excellent year for fruit growing. Almost all the analyzed accessions are giving record yields.
- ▶ That is why we are giving numerous accessions a “second chance” and have so far analyzed 15 apple and 25 pear accessions.
- ▶ New results have *and will* (we have one more month of harvesting) increase the number of accessions planned for processing.
- ▶ In 2014 we will complete the selection and present the results our partners from the industry...

Cultivar selection based on fruit product analyses

- ▶ We are currently making juice and brandy from the selected cultivars.
- ▶ These and other fruit products will go through a detailed chemical and sensory evaluation before being recommended for use to the industry.
- ▶ Our choice is NOT TO GO OUT WITH PREMATURE CONCLUSIONS AND TO MAINTAIN THE TRUST OF OUR INDUSTRY PARTNERS.
- ▶ Also we chose a HOLISTIC approach because we wish to offer our industry partners the following information:
 - ▶ Which cultivars are best suited for a specific processing purposes!
 - ▶ Can these cultivars truly be considered autochthonous and are there a lot of cases of misidentifications regarding them!
 - ▶ What are the agronomic properties of the cultivar (alternative bearing, low yield etc.).

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COOPERATION WITH THE INDUSTRY AND OTHER PARTNERS

Presentation of fruit products to industry partners

- ▶ In the beginning of 2014, after completing the processing and blending (coupage), finished products will be presented to project partners from the industry.
- ▶ A tasting of the products will be conducted, as well as the presentation of sensory and other commercial traits.
- ▶ The results of the project will be presented at the fruit fairs in the country (Strawberry fair, Čelić; Plum fair, Gradačac; Apple fair, Goražde).
- ▶ A joint platform for disseminating the results of the projects will be formed together with the participants of another HERD project "DEVELOPMENT OF EDUCATION AND TRANSFER OF KNOWLEDGE IN THE AREA OF FOOD TECHNOLOGY - EDUFOOD"

STRENGTHENING THE PARTNERSHIP WITH BIOFORSK

- ▶ In October 2013, molecular marker experts from Sarajevo are staying at the Bioforsk station in Ullensvang and are working with the resident staff on setting up the PCR laboratory at the station for molecular analyses.
- ▶ One of the first projects will be connected to solving fruit set issues with the Norwegian cultivar 'Ingeborg'.
- ▶ The other one is related to genotyping apple accessions maintained at various *ex situ* collections in Norway.
- ▶ This project will strengthen the collaboration between Bioforsk and FAFS, Sarajevo

STRENGTHENING THE PARTNERSHIP WITH MOSTAR

- ▶ In 2012 we provided a genotyping service for the Faculty of Agriculture and Food Technology University of Mostar
- ▶ The preliminary results of the genotyping analyses has already been presented:
 - ▶ Vego, D., Šaravanja, P., Ivanković, A., Sabljo, A., Gaši, F., Beljo, J. (2013): Analysis of vineyard peach populations diversity in Herzegovina region. Bosnia and Herzegovina. In Blesić Milenko & Dučić Belma (ed.). Book of Abstracts of the 24th International Scientific-Expert Conference of Agriculture and Food Industry. pp. 200.
- ▶ Full paper will be submitted shortly...
- ▶ Joint dissemination of results with the project "DEVELOPMENT OF EDUCATION AND TRANSFER OF KNOWLEDGE IN THE AREA OF FOOD TECHNOLOGY - EDUFOOD"

THANK YOU!

Beyond 2014...

- ▶ Goals we are trying to obtain through HERD projects:
 - ▶ Educate our graduate and PhD students, and invest in them, so that they can stimulate both the growth of the food and the research sector in B&H
 - ▶ Enhance the research capacities of our institution, both through investment in staff and equipment
 - ▶ Transfer knowledge and technology to B&H agro and food industry, in order to give them sustainable competitive advantages
- ▶ Why continue this HERD project:
 - ▶ We want to give even more generations of our graduate and PhD students the possibility to develop their skills through an advance research project
 - ▶ In order to further explore the potential of traditional fruit germplasm in B&H we need to invest in new equipment as well as enhance the research capabilities of our staff.
 - ▶ We want to widen our offer to agro and food industry, so that we strengthen the relationship between the industry and the academic sector.
 - ▶ We want more time to develop the mutually beneficial relationship between Bioforsk and FAFS, Sarajevo!