AGRI-FOOD SAFETY

Reggio Emilia Campus

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What do we mean for "*Agri-Food*"?

Basically - Food of non-animal origin, as:

- Fruits and Vegetables
- Roots and Tubers
- Cereals
- Herbs and Spices

efsa
EUROPEAN FOOD SAFETY AUTHORITY

EN English | Menu

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Foods of non-animal origin: what are the risks?





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Agri-Food associated risks

Rapid Alert System for Food and Feed (RASFF)

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Why RASFF?

Learn more about RASFF

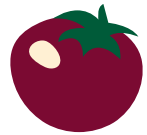
Related links

Why RASFF?

The EU has one of the highest food safety standards in the world – largely thanks to the solid set of EU legislation in place, to keep food and feed safe.

As part of the food safety tools, **the Rapid Alert System for Food and Feed** (RASFF) was established to ensure the exchange of information between member countries to support swift reaction by food safety authorities in case of risks to public health resulting from the food chain.

Its **legal basis** is Article 50 of Regulation (EC) N° 178/2002 also known as the General Food Law.







https://webgate.ec.europa.eu/rasff-window/screen/search



WHAT DO WE MEAN FOR AGRI-FOOD SAFETY?

Integrating food safety and **nutrition** in agri-food systems by:

- **Guidelines and regulations** on safety and sustainability of agri-food production;
- Knowledge on **risks**, their **mitigation** and **management**;
- Design of agri-food production systems to **reduce losses** and **increase nutrition**;
- Evaluation of **consumers' perceptions** and **awareness** and development of correct **communication strategies**;
- Ensuring **fair-trade practices**, market access and income generation across agri-food value chains.



01

CHALLENGES

1. Develop **sustainable** production systems
2. Produce **nutricious food** and contribute to **healthy diets**, especially in low income countries
3. Ensure **quality and safety of raw material** and protect consumers' health
4. **Avoid losses** in post-harvest
5. Ensure **traceability** and avoid frauds along the agri-food markets

02



Our Goal: prepare our graduates to be a **leading Actor** in the **Agri-Food** area through:

1. An offer of **advanced University classes** on key subjects
2. Participation in international research programmes
3. Training in **leading companies** or **international agencies**
4. Collaboration with our **young scientists** and/or our international PhD students

Who will be the Agri-Food specialist?

- A **professional** involved in the development and implementation of **international regulatory issues** concerning agri-food safety.
- A **skilled coordinator** of technical personnel that supervises production, supply and handling of raw materials.
- A **risk manager** able to **address problems and emergencies** that may arise along any step of the agri-food production chain.
- An **excellent communicator** that will play a key role in the **dialogue** among policy makers, companies, farmers, consumers.









LIST OF CLASSES, 2nd Year

01 **Good agricultural practices and identity preservation**
3 CFU
Prof. Enrico Francia

02 **Biotechnology and safety aspects of vegetable-based foods**
3 CFU
Prof. Maria Gullo

03 **Animal pests in stored agri-food products and their management**
6 CFU
Prof. Lara Maistrello

04 **Mycotoxigenic fungi in agri-food and pesticide contamination: analysis and risk management**
6 CFU
Prof. Emilio Stefani & Prof. Antonio Prodi

05 **Safety assessments of fruits and vegetables processing**
3 CFU
Prof. Patrizia Fava

06 **Control of microbial growth in mixed and selected fermentations**
3 CFU
Prof. Maria Gullo

LIST OF CLASSES, 2nd Year - free choices

01

Post-harvest losses and their management

6 CFU
Prof. Emilio Stefani

02

Chemical ecology and trophic interaction in agroecosystems

3 CFU
Prof. Elena Costi

03

Ethnobotany: the role of plants in our life

2 CFU
Prof. Anna Maria Mercuri

04

Insects as Food and Feed in a circular economy

4 CFU
Prof. Lara Maistrello

ROADMAP INFOGRAPHIC

		1st Semester			2nd Semester		
Class	CFU				Traineeship		
Animal pests in stored agri-food products and their management	6						
Biotechnology and agronomy for safety and identity preservation of agri-food products – Two modules	6						
Mycotoxigenic fungi in agri-food and pesticide contamination: analysis and risk management	6						
Safety assessments of fruits and vegetables processing – Two modules	6						
Free choice classes	X						

Classes and Professors:



Mycotoxins in AgriFood and Pesticide Contamination: Risk Assessment and Management
Emilio Stefani & Antonio Prodi

Safety assessments of fruits and vegetables processing
Patrizia Fava & Maria Gullo

Animal Pests in Stored Agri-food Products and their Management
Lara Maistrello

Biotechnology and Agronomy for Safety and Identity Preservation of Agri-food Products
Enrico Francia & Maria Gullo

Free choice classes:
Elena Costi, Anna Maria Mercuri and others

Our teaching classes: Details



Mycotoxigenic fungi in agri-food and pesticide contamination: analysis and risk management

The issue

Mycotoxins? What are they? Consumers' awareness and perception say: they do not exist.
Do you really know how to work or deal with **Mycotoxigenic fungi** in the lab?

And **Pesticides**? Is this a major issue? But: do we **really need** pesticide inputs in agriculture?

Do you really know **how many** and **how much** pesticides we introduce through each meal?

Multiresiduality: the real challenge!

And what about **Cumulative Risk Assessment**?

And the environment? How do we deal with **Environmental Toxicology**?



Myth Busting: A recent survey from the Consumer Reports National Research Center of 1,050 Americans found that consumers have some misconceptions about pesticides and organic produce.







Source: Consumer Reports Inc., USA

Mycotoxigenic fungi in agri-food and pesticide contamination: analysis and risk management

Course outcomes

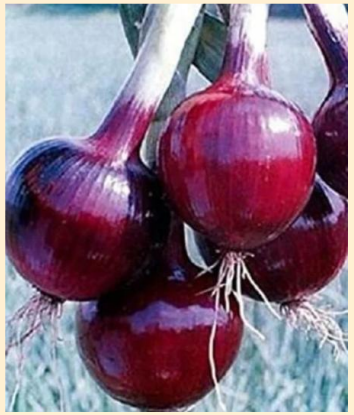
1. Knowledge of the **mycotoxigenic fungi**, their detection, their epidemiology, and their control.
2. Knowledge of the **most important mycotoxins**, their detection and indications for their management in food and feed.
3. A lab experience on how to **isolate** and **identify** mycotoxigenic fungi from agrifood
4. Knowledge on the “real” nature of pesticides: **toxicology** and development of **risk matrices**.
5. Introduction to the **environmental toxicology**.
6. **Cumulative risk assessment** of pesticides (EFSA Guidelines).
7. Knowledge of the **RASFF**: the European Alert System for Food and Feed
8. **Consumers’ perception** and indications for a correct **communication strategy** to face mycotoxins and pesticides risks in food and feed.
9. The hidden side of **Bio-pesticides:** a less known biosafety issue.

Biotechnology and agronomy for safety and identity preservation of agri-food products

The issue

Agri-Food Security and Safety: Combining good agricultural practices (**GAP**) and identity preservation (**IP**) in the different agricultural systems is **essential**. Additionally, **biotechnology** and **safety** aspects are crucial when applied to **plant-based foods** along the value chain.
A comprehensive approach is needed.











Biotechnology and agronomy for safety and identity preservation of agri-food products





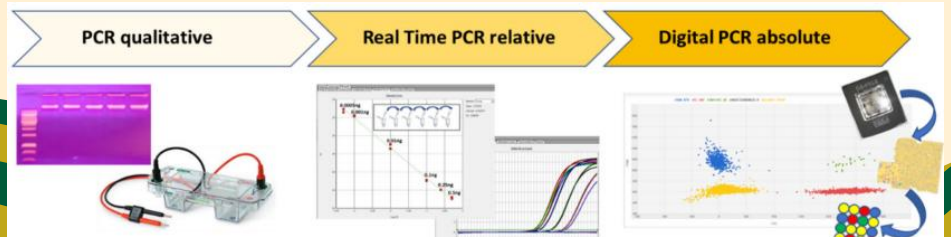
Course outcomes

Knowledge of GAP for the management of **phenotypic** and **genotypic** variability in different agricultural production chains.
Knowledge of the main methods of **traceability** and **identity preservation** of agri-food products in the value chains.

Knowledge of different vegetable fermented foods/beverages and the main **microorganisms** responsible for **fermentation processes**.

Knowledge of **bioprocesses** management considering raw materials, microorganisms, propagation methods and process parameters.





Safety assessments of fruits and vegetables processing – Effectivness of thermal treatment of low acid and acidified foods

The issue

- **The safety** of thermally processed low acidic or acidified (LACF) hermetically sealed (canned) foods is mandatory to protect the consumers against severe foodborne poisoning.
- The **right management of thermal processing** is mandatory to comply national regulations on this topic and to comply the **needings for the export sales.**



Canned chickpeas

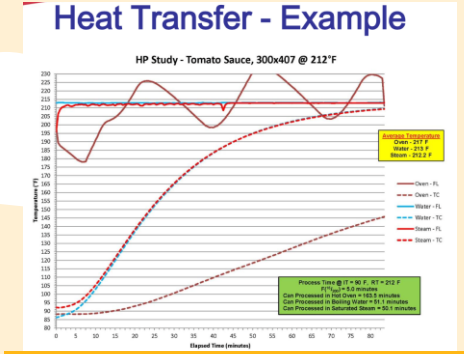


Canned tomato paste

Course outcomes

- **Knowledge** of the procedures to design and validate the thermal treatments of LACF: equipement, instrumentation and operations .
- The **proper management of the packaging** to avoid recontamination of processed food products.

Safety assessments of fruits and vegetables processing – Effectivness of thermal treatment of low acid and acidified foods



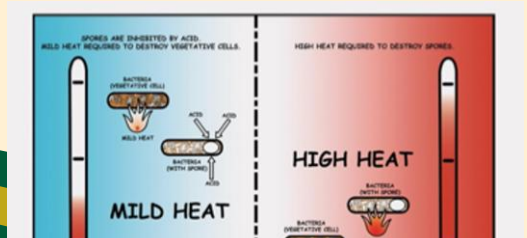
Evaluation of the temperature distribution curves



Teaching methods

- Classroom teaching with PowerPoint and scientific videos (2 CFU, 16 hours).
- Practical part (1 CFU laboratory, 8 hours):

- **Laboratory exercises** evaluation of the heat distribution inside a packaged filled with selected products
- Calculation of the Fo of a heat treatment





Example: Safety assessment of thermally treated chestnuts

Control of microbial growth in mixed and selected fermentations

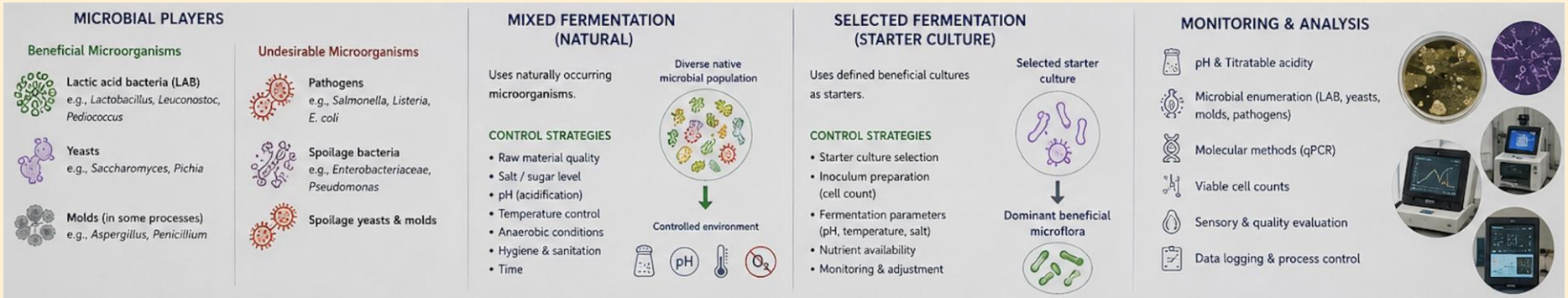
Fruits and Vegetable

Safety and Stability
- Inhibiting pathogenic and spoiling microorganisms through selective fermentations.
- Role of controlled mixed cultures.

Quality
- Preventing off-flavors and toxic by-products.

Process yield
- Optimizing microbial growth and function.

Who and How



Animal pests in stored agri-food products and their management

The issue



- **Animal pests** infest stored agri-food products, causing **serious quantitative and qualitative damage** and human health problems.
- The **discovery of pests** in food **seriously discredits the producers'** branding. However, the **protection of food** against pests is largely **underestimated**.
- **Chemical control is NOT an option.**





Course outcomes

- Knowledge of the **main animal pests** of stored foodstuffs, the damage they cause, the main factors affecting pest presence, **pest prevention**, control and monitoring techniques.
- Ability **to detect infestations** in products and facilities, correctly identify pests; evaluate and set up appropriate **prevention and monitoring plans**; select the best **management strategies**.
- Raise **awareness of the risks** (economic and health) associated with **pest infestations** in the agri-food sector and the **importance of integrated sustainable management.**



Animal pests in stored agri-food products and their management





Teaching methods

- Classroom teaching with PowerPoint and scientific videos (5 CFU, 40 hours).
- Practical part (1 CFU laboratory, 12 hours):
- **Laboratory exercises** with digital stereomicroscope observations of the most common pests of stored food products and their damage;

Seminars with professional pest control advisors;

Technical visit to agro-food companies to show how to identify potential infestations, prevention techniques, active and passive monitoring, management strategies in food production/processing/storage facilities.



Optional course: Insects as food and feed in a circular economy

The issue

- A growing human population
- Sustainability issues with 'traditional' livestock production
- **Need to provide alternative sources of nutrients** that are sustainable and risk resilient.
- **Insects are excellent bio-converters**
- **Insect farming is a sustainable and convenient solution** to convert agricultural by-products into high value products for food/feed, other industrial uses and plant fertilisers.





Course outcomes

- Provide the **knowledge and skills** needed to understand and contribute to the **growing field of insect-based food and feed**, emphasizing sustainability and innovation within a circular economy framework.
- Comprehensive **understanding of the ecological, economic, and practical aspects of utilizing insects in modern agriculture and food systems**.
- The course includes **12 hours of practical sessions** to provide hands-on experience.

Optional course: Insects as food and feed in a circular economy

Course contents

- Introduction: challenges in agro-food systems and the potential of insects as food and feed
- Circular economy and sustainability of insect farming
- Nutritional quality and implications of insect consumption for humans and animals
- Insect rearing and processing
- Regulatory framework and ethical issues
- Economic and social implications
- Practical session



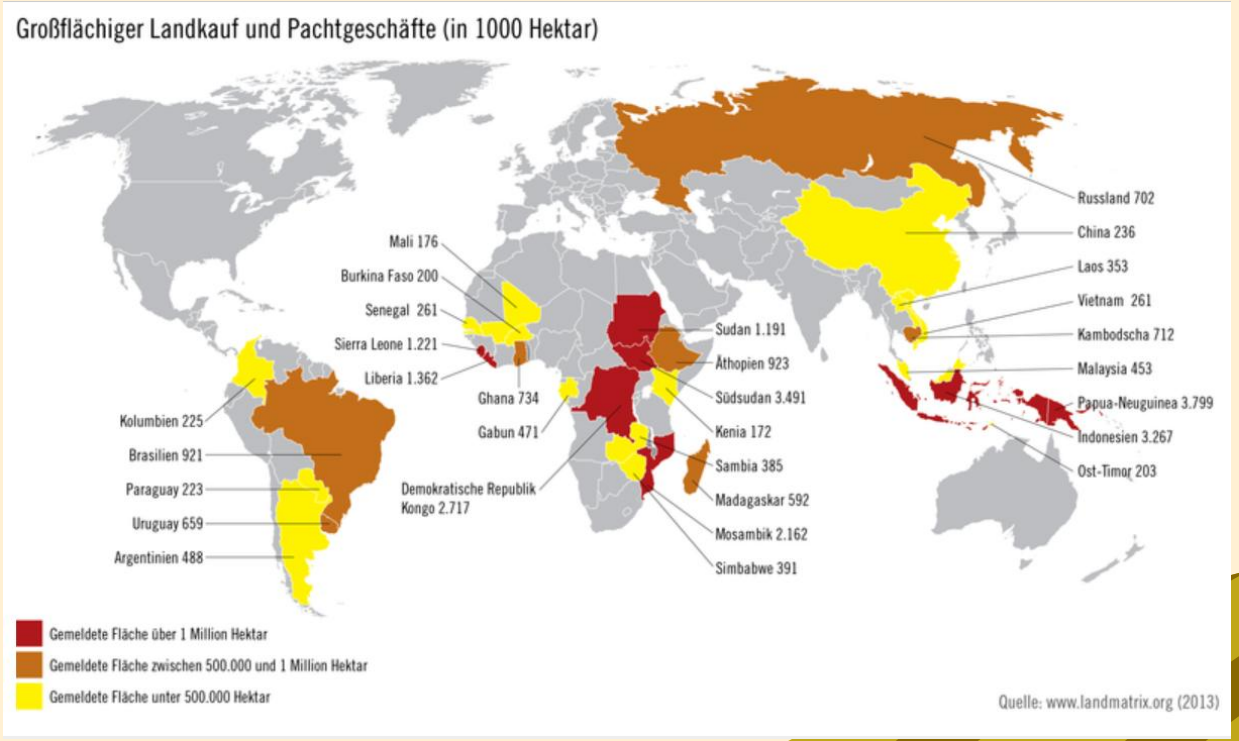
Teaching methods

- Classroom lectures with PowerPoint and technical seminars by specialists (3 CFU, 24 hours).
- Practical part: technical visits to insect rearing and processing facilities in research centres and industry (1 CFU, 12 hours).



Optional course: Post-harvest losses and their management

"Do you not understand that one needs a little more than nothing in order to exist? " - Jean Baudrillard, La société de consommation, Paris, 1970 (free quoting of Shakespeare, King Lear, Act 2, scene 4)



Over one third of AgriFood products are lost between harvest and consumption.

Landgrabbing:
a solution to feed the world?

Optional course: Post-harvest losses and their management

"Do you not understand that one needs a little more than nothing in order to exist? " - Jean Baudrillard, La société de consommation, Paris, 1970 (free quoting of Shakespeare, King Lear, Act 2, scene 4)

The issue

The **post-harvest system** should be thought of as encompassing the delivery of a crop from the time and place of **harvest** to the time and place of **consumption**, with **minimum loss**, maximum efficiency and **maximum return** for all involved. *(D. Spurgeon: The Hidden Harvest, 1976).*



The course programme

1. **Historical** and **Regional views** of post-harvest losses.
2. **Farm-to-Fork system analysis**: where do we suffer major crop losses.
3. What do we mean for "**Agrifood quality**": the parameters and **Crop Physiology**.
4. The **Commodity System Assessment Methodology**.
5. Sustainable solutions to diminish losses.
6. Operations and management of **Packinghouses**.
7. A list of post-harvest **disorders** and **diseases**



Optional course: Post-harvest losses and their management

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Course outcomes

1. Knowledge of the **value chain** for Agri-Food produce: **quality indicators** and **safety issues**.
2. Knowledge on factors and reasons for **post-harvest losses** and approaches for their **mitigation** and **management**.
3. Case studies: Post-harvest of **Mangoes** in India, The **Banana** production chain in Kenya
4. Introduction to **crop physiology** as as a subject to ensure agri-food safety and prevent loss reduction.
5. The **Packinghouse**: design, operations, management, problem solving during the storage time for fruits and vegetables.
6. Knowledge of some important **disorders** and **diseases** affecting fruits and vegetables in post-harvest and methods for their management.







The Campus in Reggio Emilia





THANKS!

Do you have any questions?

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