

Biology of crops - Curriculum

1. Introduction

Presentation of the semester's content and the modes of evaluating the students: moodle work, power point presentation (each student has to choose a topic and the presentations will be held and evaluated at the end of the semester), test. Classification and uses of crops. Economic vs. biological terms and definitions (e.g. fruits, vegetables), crop classification on the basis of used/edible organs.

2. Overview of the cultivation of crops

History of plant cultivation and crop plants (their aspects related to the climate and to the history of agronomy). Origins of major crops, how they were spreading, how they are used, cultivated and bred. World production (output) data. Newly spread 'fashion' crops, potential tendencies, future perspectives.

3. Fruits (botanical and economic terms)

Overview of the most important cultivated/used fruit species on the basis of their origin, active ingredients, anatomical traits and cultivation. Overview of fruit types, their characterization and classification on the basis of their used/edible parts. Characterization of tropical fruits and their types, anatomy; physiological aspects of their transportation (postharvest ripening, etc.).

4. Vegetables I.

Cultivated vegetables - botanical definition of the species, their classification on the basis of the edible organ(s). Their most important nutrients and active ingredients. Anatomy of the edible organs. (Anatomical, cellular and physiological features of e.g. cabbage, lettuce, brussel sprouts, cauliflower, endivia, onions, garlic, asparagus, carrot, persil, celery, potato, Jerusalem artichoke, spinach, sorrel, beetroot and avocado.)

5. Vegetables II.

Botanical characterization, description of the anatomy of the edible organs of other species important for the global market - e.g. manioc/tapioc/cassava; taro; sweet potato and yam. World output/production data, uses and characterization of the cultivars.

6. Cereals I.

Overview of cereal species and cultivars cultivated worldwide (e.g. spring and autumn barley, different wheat cultivars, ancestral wheat cultivars/relatives) on the basis of their origin, active ingredients, anatomical features and cultivation. Changes at the tissue and cellular level in the wheat stem and fruit during fruit ripening.

7. Cereals II. - Non-conventional species (e.g. legumes belonging to Fabaceae), flours. Oil crops.

Overview of other (exotic) species providing flour (millet, sorghum, corn, rice, buckwheat, wild rice, amaranth, quinoa, mungbean, dahl, chickpea, etc.). Physiological features and specialities of C3 and C4 species. Gluten-free food, ways of its detection/quality control, analyses of flour mixtures. Oil crops and their plant biology and food industry aspects.

8. Economically important alkaloids, alkaloid-containing plants and related industries

Definition of alkaloids, their major groups. Nicotine: the tobacco plant (its cultivation, biology) and the tobacco industry. (Other aspects: water pipe, betel, beedi.) Coffeine, theobromine, theophylline -

coffee, kola nut (and preparation of kola-flavoured drinks), cocoa (and the sweet/chocolate industry), tea (see next lecture). Cultivation, global market, production, trade and history of cultivation of the plants mentioned above. Important plant families/species with alkaloids (e.g. coca, poppy, potato family, cinchona tree, lobelia).

9. Tea and other infusions, herbal teas

History of cultivation and biology of tea plants; different tea types, modes of preparation. Most important herbs used as infusion/herbal teas (e.g. hibiscus, lime, elderberry, rooibos, etc.) and their anatomical, plant biological aspects. Plant tannins and their uses (e.g. leather tanning, fixation, etc.)

10. Plant biological aspects and ingredients of the wine-, beer- and spirit drink industries

Cultivation of grapevine and grapevine cultivars, preparation of wine and champagne, plant materials influencing wine quality. Ingredients of plant origin in the beer industry, its production steps. Vinegar-, starch- and yeast production. Plant biological aspects of the soft drink industry (beverage industry).

11. Other industrial plants

Plants used by the timber industry, construction industry, textile industry and other industries (sugar industry, rubber industry, plants used for coloring, plant pigments, plant biology aspects of E numbers). Species important for the cosmetic industry. Anatomical, morphological characterization of the most important cultivated and used plants, characterization of the used organs from anatomical and physiological aspects. Dendrology, dendrochronology, xylotomy.

12. Spices and spice mixtures

Overview of spices cultivated worldwide by species, origin, used organ, active ingredients, anatomical features and cultivation. Anatomical/histological characterization of the fruit wall of caraway, normal and hull-less pumpkin seed, flaxseed, paprika (red pepper) seed and paprika fruit wall. History and 'evolution' of various spice mixtures, their ingredients and uses. Identification of the components, quality and adulteration control of spice mixes on the basis of anatomical features.

13. Algae

The multiple industrial potential of various alga (and lichen) species in medicine, food and cosmetic industry. Sea plantations and their harvest. Japanese and Chinese recipes using algae (and the parts used). Types of cells, anatomical characteristics, body structure and elemental composition of algae consumed, their economically important ingredients (astaxanthin, fucoxanthin, phyobilins, alginate, etc.).

14. Outlook

Plant science (and crops) in forensic science, archaeology, history. Anatomy and cultivation history of drug crops. Scientific basis of food industrial quality analyses. Post-harvest biology. Plant and produce pests.

Exam

At the end of the semester moodle test questions (multiple choice questions) from topics related to the course. Moodle definitions, forum and test questions have to be actively prepared by the students during the semester. In addition, a 20-minute presentation has to be prepared by the student in a topic defined in consultation with the lecturer. (At the end of the presentation or during

it the students may ask each other questions, and will evaluate each other, as the lecturer will also evaluate them.)

Evaluation

As described above (presentation - 50%, moodle test questions - 40%, other moodle activity 10%).

Moodle activity during the semester (5 h), presentation (15 h), preparation for the exam consisting of test questions (20 h)

Moodle 'dictionary' with terms (definitions), forum comments and preparation of test questions, preparation of an oral presentation.

Drafts of the presentations discussed in the class (altogether approx. 800 slides)