



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	
ACADEMIC YEAR	
ANNO ACCADEMICO EROGAZIONE	
SUBJECT	
CODE	
SCIENTIFIC SECTOR(S)	
HEAD PROFESSOR(S)	CARRUBBA ALESSANDRA Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	
TERM (SEMESTER)	
ATTENDANCE	
EVALUATION	
TEACHER OFFICE HOURS	CARRUBBA ALESSANDRA Monday 09:00 12:00 Dipartimento SAF (Agronomia) Friday 09:00 12:00 Dipartimento SAF (Agronomia)

DOCENTE: Prof.ssa ALESSANDRA CARRUBBA

PREREQUISITES	Basic knowledge of botany, plant morphology and physiology; general agronomy (soil tillage, fertilization, water management); plant chemistry (primary and secondary metabolism)
LEARNING OUTCOMES	<p>Knowledge and understanding Demonstrated highly specialised knowledge of characteristics, ways of use, cropping techniques and suitability into specific supply chains of the major industrial herbaceous crops, also including the most relevant medicinal and aromatic plants. Exploitation of native species suitable to various industrial uses, in compliance with on-farm multifunctionality and production sustainability.</p> <p>Applying knowledge and understanding Ability in conceiving correctly, within different conditions, the most proper technical protocols for growing, managing and carrying out the first processing of several industrial herbaceous crops, to be inserted within environmentally-friendly, high-yielding and sustainable agroecosystems, with the main goal to obtain raw and semifinished matters, complying with the required market and industrial standards.</p> <p>Making judgements Ability to autonomously individuate situations that are suitable to the growing and management of industrial herbaceous crops, also including medicinal and aromatic plants. Ability to formulate judgements about the outcomes of the applied cropping techniques, and therefore to make the most proper choices according to the environment, the crop and the aim of the production process. Ability to solve problems by means of technical choices that are at the same time sustainable and able to exploit farm multifunctionality.</p> <p>Communication abilities Ability to communicate unambiguously, to specialist and nonspecialist audiences, the pros and cons of the introduction of industrial herbaceous crops, including medicinal and aromatic plants, in the most diverse economic and productive conditions. Ability to communicate clearly and adequately the non-agricultural (environmental, landscape-oriented, social and cultural) benefits.</p> <p>Learning skills Self-directed updating ability, by means of referencing to oriented scientific papers, of attending workshops and meetings on topics related to the agro-industrial, pharmaceutical, cosmetic and food chains, of achieving information coming from external sources (economical, industrial and political).</p>
ASSESSMENT METHODS	Oral examination at the end of the course, aimed to ascertain the theoretical and practical level of the specific knowledge about the subject, the ability to establish coherent connections among the different acquired pieces of information, and the ability to communicate with a satisfactorily correct use of language. The grade will be assigned on a scale of thirty. The exam will be passed after achieving a minimum grade of 18/30, that will be assigned after the ascertainment of a basic level of knowledge, until a maximum grade of 30 with laude, that will be assigned in the acknowledged cases of excellent knowledge of the subjects, ability to detect not immediately apparent linkages and relationships, ability to extend the acquired information to different productive frames.
EDUCATIONAL OBJECTIVES	To provide highly specialised information about the major herbaceous field crops (including medicinal and aromatic plants) that may be included into industrial processes. The topics will be inserted in the frame of the newest environmental, economic and market issues, and the possibility to fit within the existing cropping systems will be explored. By means of applicative examples, the major aspects of suitable cropping technique will be analysed, in relation with the suitability to industrial transformation, with a special concern in the effects of these techniques on the quality aspects of the obtained products.
TEACHING METHODS	Academic lessons, on-farm activities
SUGGESTED BIBLIOGRAPHY	<ul style="list-style-type: none">• Baldoni, R., Giardini L. Coltivazioni erbacee. Ed. Patron.• Catizone P, Marotti M, Toderi G, Tetenyi P (1986) Coltivazione delle piante medicinali e aromatiche. Patron Editore.• Marzi V, De Mastro G (2008) Piante officinali. Coltivazione, trattamenti di post-raccolta, contenuti in principi attivi, impieghi in vari settori industriali ed erboristici. Mario Adda editore.• Basso F (2009) Piante officinali, aromatiche e medicinali. Pitagora editrice.• Monografie e articoli scientifici indicati dal docente.

SYLLABUS

Hrs	Frontal teaching
2	Introduction. Agriculture and agroindustry. Cultivating industrial herbaceous crops: social, economic and environmental impact. Agroindustry in Mediterranean environments: characteristics and constraints. The major agroindustrial sectors.
16	Oil crops: sunflower, soybean, Brassicas (rapeseed, mustard, Crambe), peanut, safflower, castorbean, sesame, "minor" oilseed crops for cosmetic and pharmaceutic purposes. Morphology, physiology, botanical aspects. Environmental requirements and cropping techniques. characteristics of the different obtained oils, extraction methods and industrial uses. Biodiesel, production possibilities, environmental and market issues.
14	Crops for fibre and cellulose: cotton, flax, hemp, ramie, jute, sorghum, kenaf. Morphology, biology, botanical classification. Ecological requirements and cropping techniques. Production, quality and market traits of the obtained fibres. Crops and by-products for cellulose extraction and to produce pulp and papers.
6	Energy crops: sugarbeet, cichory, sweet sorghum, Jerusalem artichoke. Morphology, biology, botanical classification. Ecological requirements and cropping techniques. Preparation of sugar extracts. The fermentation industry. Production and use of bioethanol: possibility and constraints to practical application, with a special concern to its use as fuel.
4	Dye crops: colourant agents attainable from plants and possibility of their use. Marigold, safflower, woad, indigo, henna, karkade, stinging nettle, rubia, spinach. Ecological requirements and basic cropping technique. Extraction methods. Use and practical applications, law and technical constraints to the food and no-food use of natural dyes.
4	Crops with biocidal, insecticidal and antifeedant activity: pyrethrum, derris, neem. Morphology, biology, botanical classification and ecological requirements. Possibility of cultivation and potentiality of use of the obtained products.
2	Crops for extracting gums, resins, waxes and mucilages: guayule, guar, psyllium. Botanical classification, ecological requirements, possibility of cultivation and cropping techniques. Practical possibilities to use.
4	Medicinal and aromatic plants (MAPs). Definitions and overall aspects. Herbal products, drugs and active compounds. In-plant production of secondary metabolites. Chemotypes. Quality. The exigencies of industry and consumers. Wild and cultivated MAPs. Cultivation as a supply opportunity. Effects of cultivation and cropping techniques on MAPs quality features and yields. Methods for industrial and on-farm processing.
2	Farming systems including MAPs. Organic and conventional cropping techniques. Market features.
2	MAPs for food purposes: plants for extracting food additives, condimentary plants, spices. Main characteristics and specific goals of cultivation. Active compounds and extraction methods. Possibility to use.
6	MAPs for food purposes: oregano, sage, thyme, rosemary, mint, fennel, coriander. Morphological, biological and botanical aspects. Ecological requirements and cropping techniques.
2	Medicinal plants: pharmaceutically and cosmetically active plants. Balsamic time, harvest, storage. Drying, distillation, classification and use of the diverse products. Phytocomplexes. Active compounds: quality, safety, effectiveness. Health care products and nutraceuticals, including plants or plant parts. Spreading in the world, in Europe and in Italy. Traditional uses and ethnopharmacology. Law and technical constraints.
6	Medicinal plants: chamomile, St. John's Wort, Californian poppy, feverfew, milk thistle, annual wormwood, psyllium, ginseng, marigold. Morphological, biological and botanical aspects. Ecological requirements and cropping techniques. Use of the whole plants and extraction of the active compounds.
2	MAPs for no-food use. Plants for the extraction of essences and perfumes. Clary sage, vetyver, lavender and lavandins.
Hrs	Practice
18	Technical visits to specialized farms; identification of plants, semifinished and end products.