NEW APPROACH TO GASTRONOMY FROM BIOECONOMY AND ACADEMIC ACTIVITY

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Abstract

The Complutense University of Madrid offers, besides the official educational programs, others specialized courses which aim is to update the knowledge and develop personal and professional competitions. These programs answer to a social demand on providing formation with professional immediate projection establishing a direct relation between the academic activity and the social reality. In this context we develop our project "Science and art in gastronomy: gastronomic botany and molecular gastronomy" with the aim to establish and organize the exchange of knowledge and business in this area. In this way we are working to join the scientific knowledge to the health and the social well-being, without losing the current perspective from the bioeconomy which look forward the generation of wealth and work.

Keywords: Gastronomy, Bioeconomy, Health, Social well-being, New learning and teaching model.

1 INTRODUCTION

Agriculture has experienced significant shocks in recent years due to high fluctuations in oil prices, commodity price spikes, food security fears and resultant trade restrictions, not to mention the most serious global economic recession since the 1930s (OECD-FAO Agricultural Outlook 2010). In this context it is important to consider the social, economic and health perspectives of plant foods. International organizations such as the United Nations (UN), the United Nations Food and Agriculture Organization (FAO), Organisation for Economic Co-operation and Development (OECD), and World Health Organization (WHO) are concerned with the study, monitoring and improving continuous "food-nutrition-health" in the world, evaluating the international prices of major and basic agricultural products and developing international policies and protocols regarding food security.

1.1 Nutrition

Nutrition is the science of food and its relationship to health. Nutrients are chemicals in foods that are used by the body for growth, maintenance, and energy. Nutrients that cannot be synthesized by the body and thus must be derived from the diet are considered essential. They include vitamins, minerals, some amino acids, and some fatty acids. Nutrients that the body can synthesize from other compounds, although they may also be derived from the diet, are considered nonessential. Macronutrients are required by the body in relatively large amounts; micronutrients are needed in minute amounts. Lack of nutrients can result in deficiency syndromes (kwashiorkor, pellagra) or other disorders. Excess intake of macronutrients can lead to obesity and related disorders; excess intake of micronutrients can be toxic. Also, the balance of various types of nutrients, such as how much unsaturated versus saturated fat is consumed, can influence the development of disorders.

Macronutrients constitute the bulk of the diet and supply energy and many essential nutrients. Carbohydrates, proteins (including essential amino acids), fats (including essential fatty acids), macrominerals, and water are macronutrients. Carbohydrates, fats, and proteins are interchangeable as sources of energy.

Dietary proteins are broken down into peptides and amino acids. Proteins are required for tissue maintenance, replacement, function, and growth. However, if the body is not getting enough calories from dietary sources or tissue stores (particularly of fat), protein may be used for energy. As the body uses dietary protein for tissue production, there is a net gain of protein (positive nitrogen balance). During catabolic states (starvation, infections, burns), more protein may be used (because body tissues are broken down) than is absorbed, resulting in a net loss of protein (negative nitrogen balance). Nitrogen balance is best determined by subtracting the amount of nitrogen excreted in urine and feces from the amount of nitrogen consumed.

Fats are broken down into fatty acids and glycerol being required for tissue growth and hormone production. Saturated fatty acids, common in animal fats, tend to be solid at room temperature. Except for palm and coconut oils, fats derived from plants tend to be liquid at room temperature; these fats contain high levels of monounsaturated fatty acids or polyunsaturated fatty acids. Partial hydrogenation of unsaturated fatty acids (as occurs during food manufacturing) produces trans fatty acids, which are solid or semisolid at room temperature. In the US, the main dietary source of trans fatty acids is partially hydrogenated vegetable oils, used in manufacturing certain foods (eg, cookies, crackers, chips) to prolong shelf-life. Trans fatty acids may elevate LDL cholesterol and lower HDL; they may also independently increase the risk of coronary artery disease. Essential fatty acids (EFAs) are linoleic acid, an ω-6 (n-6) fatty acid, and linolenic acid, an ω-3 (n-3) fatty acid. Other ω-6 acids (arachidonic acid) and other ω-3 fatty acids (eicosapentaenoic acid, docosahexaenoic acid) are required by the body but can be synthesized from EFAs.

Macrominerals (Na, Cl, K, Ca, P, and Mg) are required in relatively large amounts per day. Water is considered a macronutrient because it is required in amounts of 1 mL/kcal (0.24 mL/kJ) of energy expended, or about 2500 mL/day. Needs vary with fever, physical activity, and changes in climate and humidity.

Vitamins and minerals required in minute amounts (trace minerals) are micronutrients. Water-soluble vitamins are vitamin C (ascorbic acid) and 8 members of the vitamin B complex: biotin, folate, niacin, pantothenic acid, riboflavin (vitamin B_2), thiamin (vitamin B_1), vitamin B_6 (pyridoxine), and vitamin B_{12} (cobalamin). Fat-soluble vitamins are vitamins A (retinol), D (cholecalciferol and ergocalciferol), E (α-tocopherol), and K (phylloquinone and menaquinone). Only vitamins A, E, and B_{12} are stored to any significant extent in the body; the other vitamins must be consumed regularly to maintain tissue health.

Essential trace minerals include chromium, copper, iodine, iron, manganese, molybdenum, selenium, and zinc. Except for chromium, each of these is incorporated into enzymes or hormones required in metabolism. Except for deficiencies of iron and zinc, micromineral deficiencies are uncommon in developed countries. Other minerals (aluminum, arsenic, boron, cobalt, fluoride, nickel, silicon, vanadium) have not been proved essential for people. Fluoride, although not essential, helps prevent tooth decay by forming a compound with Ca (CaF_2), which stabilizes the mineral matrix in teeth (all trace minerals are toxic at high levels).

Fiber occurs in various forms (cellulose, hemicellulose, pectin, gums). It increases GI motility, prevents constipation, and helps control diverticular disease. Fiber is thought to accelerate the elimination of cancer-causing substances produced by bacteria in the large intestine. Epidemiologic evidence suggests an association between colon cancer and low fiber intake and a beneficial effect of fiber in patients with functional bowel disorders, Crohn's disease, obesity, and hemorrhoids. Soluble fiber (present in fruits, vegetables, oats, barley, and legumes) reduces the postprandial increase in blood glucose and insulin and can reduce cholesterol levels. Some diets are low in fiber (about 12 g/day) because of a high intake of highly refined wheat flour and a low intake of fruits and vegetables. Increasing fiber intake to about 30 g/day by consuming more vegetables, fruits, and high-fiber cereals and grains is generally recommended. However, very high fiber intake may reduce absorption of certain minerals.

That a food whether or not a good source of nutrients depends on: first, the amount of nutrients (foods containing a large amount of nutrients in relation to their contribution to food energy are called "nutrient rich") and secondly, the amount of food normally consumed.

The daily human diet typically contains as many as 100,000 chemicals (coffee contains 1000). Of these, only 300 are nutrients, only some of which are essential. However, many nonnutrients in foods are useful. For example, food additives (preservatives, emulsifiers, antioxidants, stabilizers) improve the production and stability of foods. Trace components (spices, flavors, odors, colors, phytochemicals and many other natural products) improve appearance and taste.

The best way to achieve nutritional status is to accommodate a wide variety of foods to our daily diet.

1.2 Plant Foods

A discussion of human life would not be complete without a look at the role of plants. Since the beginning of civilization, people have used plants as food and medicine. Perhaps as early as Neanderthal man, plants were believed to have healing powers. The earliest recorded uses are found in Babylon circa 1770 BC in the Code of Hammurabi and in ancient Egypt circa 1550 B.C.

There are two scientific aspects related with Public Health: food security and advances in functional foods and nutrigenomics. The latter field can be defined as a young science that studies the interaction of food and its components with the genome at molecular, cellular and systemic levels, with the aim of using diet to prevent or treat disease. Born as a result of the confluence and interaction of Plant Biochemistry, Genomics and Human Nutrition at the sight of the metabolic pathways in plants can be manipulated or modified to improve the nutritional quality of crops for human health. Functional foods refer to product development with beneficial effects on physiological functions that contribute to improving health and wellbeing, and reduce the risk of disease. In this regard, a few decades ago seeds were obtained with high content of polyunsaturated fatty acids to reduce cholesterol levels. Accordingly and in relation to plant foods, we can speak of "development of food" when we consider the methods for preparation which can modify their nutritional content end and becomes embedded in what we call "molecular gastronomy" non-nutritive components and their bioactive components (which are phytochemicals).

1.3 Gastronomy

Gastronomy is a cultural object changing over time based on several factors:

1. The raw materials (animal and plant) that man could be found naturally in the environment.
2. The knowledge passed on the properties of some of those raw materials.
3. The availability of them.
4. The methods and techniques that are processed for consumption.
5. The introduction of new raw materials, which came to be grown or raised in specialized areas.

Moreover, in recent years has been expanding and using the term "molecular gastronomy", coined by Hervé This and Nicholas Kurti in the 1970s, to refer to the changes experienced in processing food.

2 COMPLUTENSE QUALIFICATIONS

The Complutense's own in-house qualifications (master, specialist and expert) are specialized professional studies organized and taught by the university which cover courses not included in the official national curriculum and its awards system. These courses are intended for postgraduates wishing to complement their professional, scientific, technical or artistic academic training. They cover new research areas with possible professional applications and may also establish collaborative relationships with external institutions and enterprises.

As well as its official degrees and in-house courses, the Complutense University of Madrid also offers Courses for Lifelong Learning in response to the social demand for knowledge updating and the development of personal and professional competencies. These courses are designed for students and others, employed or not, who want to complement their academic, scientific, technical or artistic background, improve their professional skills, embark on a career change, join the labour market and develop related strategies and skills and their personal profile and outlook.

2.1 Science and Art in Gastronomy

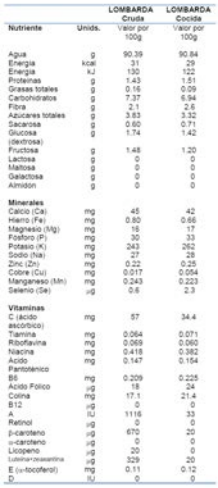
We have developed educational and tutorial materials for the Complutense University Virtual Campus (Fig.1) that serves to organize and structure a new learning and teaching model (Figs. 2) on Science and Art in Gastronomy.

Figure 1. Complutense Virtual Campus (https://www.ucm.es/campusvirtual/CVUCM/index1.php).

Figure 2. Science and Art in Gastronomy webpage (https://cv2.sim.ucm.es/moodle/course/view.php?id=17936&lang=es_utf8).

This work provides formation with professional immediate projection and establishes a direct relation between the academic activity and the social reality. Materials for virtual campus incorporate several documents and information about the following matters:

- Algal, Fungal and Plant products as foods (Fig.6)
- Food safety
- Trends in gastronomy
- Food and health: Plant Biochemistry-Nutrition-Health and functional foods
- Plant products market



Nutriente	Unids.	LOMBARDA Cruda Valor por 100g	LOMBARDA Cocida Valor por 100g
Agua	g	90.39	90.84
Energía	kcal	31	29
Energía	kJ	130	122
Proteínas	g	1.43	1.51
Grasas totales	g	0.16	0.09
Carbohidratos	g	7.37	6.94
Fibra	g	2.1	2.6
Azucares totales	g	3.83	3.32
Sacarosa	g	0.60	0.71
Glucosa (dextrosa)	g	1.74	1.42
Fructosa	g	1.48	1.20
Lactosa	g	0	0
Maltosa	g	0	0
Galactosa	g	0	0
Almidón	g	0	0
Minerales			
Calcio (Ca)	mg	45	42
Hierro (Fe)	mg	0.80	0.66
Magnesio (Mg)	mg	16	17
Fósforo (P)	mg	30	33
Potasio (K)	mg	243	262
Sodio (Na)	mg	27	28
Zinc (Zn)	mg	0.22	0.25
Cobre (Cu)	mg	0.017	0.054
Manganeso (Mn)	mg	0.243	0.223
Selenio (Se)	µg	0.6	2.3
Vitaminas			
C (ácido ascórbico)	mg	57	34.4
Tiamina	mg	0.064	0.071
Riboflavina	mg	0.069	0.060
Niacina	mg	0.418	0.382
Ácido Pantoténico	mg	0.147	0.154
B6	mg	0.209	0.225
Ácido Fólico	µg	18	24
Colina	mg	17.1	21.4
B12	µg	0	0
A	IU	1116	33
Retinol	µg	0	0
β-caroteno	µg	670	20
α-caroteno	µg	0	0
Licopeno	µg	20	0
Luteína+zeaxantina	µg	329	20
E (α-tocoferol)	mg	0.11	0.12
D	IU	0	0

Figure 6. Science and Art in Gastronomy webpage: example of plant data (https://cv2.sim.ucm.es/moodle/course/view.php?id=17936&lang=es_utf8)

In summary, the user has access to updated and complete information on the use, composition and nutritional value of food. Furthermore, who concerned have additional data available that allow an overall view on Science and Art in Gastronomy.

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