

## Partner Search Form

Date	2006	March	Valid until:	2008	December
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### CONTACT DETAILS

Organisation full name	National Research Center		Contact person:	
Organisation acronym (Abbreviation)	NRC		Title	Assistant Professor
Department / Sector / Faculty	Flavour and Aromatic Chem. Dep.		First Name	Ahmed
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Former participation in EU research projects as Co-ordinator: YES  NO

### PPOJECT IDEA

<b>Title</b>	Technological applications of Maillard reaction and biotransformation in the production of Flavors and aroma	<b>Acronym</b>	
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**Project type:** Specific Targeted Research Project

### CALL REFERENCE

**Call identification code:** KBBE-2007-2-3-03

**Topic addressed:** (Bio)- Technologies for the production of food additives, colorants and flavours

### Short description of the project idea:

(Potential contribution of the Flavour and Aromatic Chem. Dep., (FACD) National Research Center, Dokki, Giza, Egypt.)

The research activities of the FACD are focused especially on three topics. The first relates to the Creating a thermal process flavorings (Functionality and interaction between proteins and sugars); the second concerns Creating savory flavors for snacks and crisps, however the third is focus on Creating Flavorings via Bioconversion (Functionality of fats and oils). With these three major topics of research, the FACD is very interested and can be contribute effectively to the proposed call related to the theme 2.2.3/KBBE-2007-2-3-03:"(Bio) Technologies for the production of food additives and flavours" of the FP7 Cooperation Work Programme. Hence, the research group of the FACD is ready and hopes to participate in one or more of these following themes:

1- Creating a thermal process flavorings (Functionality and interaction between proteins and sugars): The following strategy could be applied in order to create flavors and aromas that could be used industrially in the fields of snacks, confectionary, drinks and meat products:

a- Preparation of 'Basic Maillard' type flavoring product (basic process flavor). Basically, an aqueous mixture of amino acids or amino sources (commercial proteins resources) and reducing sugars or its sources is heated – by different ways – for a specified time. The reaction conditions are vital and the key ingredients for the reaction depend on the target. New and commercial ingredients

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will be introduced into Maillard technology, in order to create commercial and cheap flavors, which can meet the demands of both the industrial applications and the consumers.

b- In order to obtain a more full-bodied flavor, it may also be desirable to add hydrolyzed animal or plant proteins either prior to or after the reaction. Hydrolyzates are well known and are readily obtained from a variety of proteinaceous materials. In order to even further enhance and intensify the flavorings produced in the present invention, it may also be desirable to add fat to the reaction mixture before or after the reaction has taken place. If desired, flavor potentiators, enhancers, carriers, fillers or synergists e.g. spices, condiments, monosodium glutamate, nucleotides and the like may also be combined with the resulting flavorant. Alternatively, some of these additives may also be combined with the mixture prior to the reaction.

c- After the reaction is complete, the flavorant may be used as is, or alternatively, be recovered from solution by any conventional means such as by spray – drying, vacuum – drying, freeze – drying, and the like. Alternatively, the reaction product may also be dried with a conventional carrier system such as malto-dextrin, dextrin, or modified starches, the quantity of such a carrier being dictated by the solvent concentration of the reaction medium.

d- The flavorings of the present invention may be incorporated in soups and soup mixes, casserole dishes, canned and frozen vegetables, animal or pet foods, sauces, gravies, bakery products, snacks, crisps and many other food stuffs.

### 2- Creating savory flavors for snacks and crisps:

A very wide variety of natural and nature identical flavor blends are used as top notes, to boost or modify natural raw materials. Characteristic examples for this category are onion and cheese flavorings. Another example, mixtures of spice oils and extracts are used in adult chili, tortilla type products. Usually a combination of liquid flavors and sprayed dried products are used to give both an initial impact and lasting flavor. Different and simple drying technologies will be used in this project, in order to obtain such flavors. The key ingredients or the flavorings will introduced into batch blending with other ingredients e.g. acid regulators, anti – caking agents, colors, carriers or fillers, enhancers, potentiators and other additives, in order to obtain savory flavors. Both flavorings and recipes for the savory flavors will be created through this project. The prepared flavors and recipes will be applied for crisps, extruded maize snacks, fried snacks, nuts, snack biscuits, tortillas and similar products.

### 3- Creating Flavorings via Bioconversion (Functionality of fats and oils)

- a- Study the mechanism and action of different strains (lipolysis and  $\beta$ -oxidation) through using different fatty acids.
- b- Exploitate different types of commercial oils and fatty acids in order to synthesize other expensive flavoring compounds such as lactones and ketones as shown above.
- c- Screening the best and effective kinds of strains according to the oil used.
- d- Apply such experiments on a pilot scale

### 4- Analysis of the prepared flavorings and recipes:

- a- The aroma volatiles of the flavorings will be extracted using headspace techniques. One of our aims, is to introduce a new, cheap and simple headspace technique which could be valuable not only for our group, but for others care about the quality of food products. This technique called SPME (Solid Phase Micro-Extraction). Recently such technique was introduced in order to extract and desorbs volatiles from different extruded food systems.
- b- Analysis of volatiles using Gas Chromatography / Mass Spectrometry (GC / MS).
- c- Sensory evaluation for the resulting flavorings and recipes.

### 5- Evaluation of the Antioxidant properties for the resulting flavorings:

- a- Study of the free radical formation during Maillard reaction and formation of thermal process flavorings using ESR.
- b- Study the stabilization of the formed thermal process flavorings using ESR under different conditions.
- c- Study the effect of Maillard reaction conditions and reactants on the aminoreductones

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formation and examine their formation through different model systems using FT-IR.

- d- Synthesize and application of aminoreductones as antioxidants for the stabilization of the prepared thermal process flavorings, terpenes and other flavor compounds or oils in presence of proteins or carbohydrates as an imitation for the food matrices.

### 6- Safety of the prepared flavorings and recipes:

- a- Study the effect of the prepared flavorings and recipes on the growth rate and the main biological functions of the experimental animals (liver – kidney) after the assessment of the toxicity of those products (LD50).
- b- Elucidation of the hepatoprotective effect of these extracts on CCl<sub>4</sub> – induced liver damaged rats by determining the different biochemical parameters in liver sera of rats.
- c- Investigate the role of the prepared flavorings on the LDL – oxidation in vitro.
- d- Study the digestion of different functional proteins used for flavorings preparation as glycosylated proteins in vitro, in addition to their effect on both growing and adult rats.

### Expertise and reference in this field

- Principle investigator in internal NRC projects (2001-2004) under title "Production of antioxidant components from local aromatic plants"

- principal in the finished internal NRC project (99-2001) under title "The bioactivity of Maillard reaction Products".

- Experience in the field of modern extraction techniques concerning: flavors, aroma and essential oils. Especially, Super Critical fluid Extraction (SFE), Solid Phase Extraction (SPE) and Solid Phase MicroExtraction (SPME).

- Experience GC/MS and HPLC in Bonn Uni. From 1996 to 1998.

- Consultant at the Central Service lab, National Research Center (GC-MS Lab) from 99 - 2004. The main job at this department was, to develop experimental protocols, interpretation of data concerning scientific and industrial thesis and problems in addition to holding seminars and training courses for postgraduate students.

- Participating in the analysis & evaluation of flavor industry unit (member in board). Responsibilities in this unit include: sensory evaluation in addition to the GC analysis with interpretation of the resulting data.

- Participating in the analysis & evaluation of essential oil unit (member in board).

Responsibilities at this unit including the GC, GC-MS and HPLC analysis for the various oils and resins components in addition to their interpretation.

- Technical assessor training course (ISO / IEC 17025).

- Working as technical assessor at the International Laboratories Accreditation Bureau (ILAC). consultant for upgrading six labs for given the ISO17025.

- Participating in the committee of upgrading the following labs in order to get ISO 17025: At the Ministry of Health, Ministry of Agriculture, Ministry of Industry and Cairo University.

The participation comprises, awareness, implantation and auditing.

- Reviewer in Flavor and Fragrance Journal from 2003 – till now.

- Reviewer in J. Of Essential Oil Of Bearing Plants from 2006 - till now.

- Reviewer in Food Chemistry Journal from 2006 – till now

- Reviewer in J. Food Science and Agricultural 2007 – till now

### \*Expertise

#### \* Recent publications in this field

1- El-Ghorab, A, Ozecan, M; Shibamoto T (2007) Chemical composition and antioxidant activities of buds and leaves of Capers (*Capparis Ovata* Desf. Var. *canescens*) Cultivated in Turkey. Journal of Essential oil Research: 7277-7287

2- El-Ghorab, A, Fujioka, K; Shibamoto T; (2006) Determination of Acrylamide Formed in Asparagine/D-Glucose Maillard Model Systems Using gas chromatographic Headspace-Solid Phase Microextraction; J.AOAC International, 9 (2): 183-195

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3- Farouk, K., Mansour, A.F. and El-Ghorab, A. (2003): Volatile constituents of glutathione -ribose model system and its antioxidant activity. *Journal of Amino Acid* 24, 171-177

4- Farouk, A.M., Talkhane, F. and El-Ghorab, A. (2002): Olive oil as precarsor for g-dodecalactone by biotransformation using YARROWIA( *Lipolytica* isolates). *J. Bull. Fac. Agric. Cairo UnIllersity* 53, 427 - 442

5- El - massry, K.F. and El-Ghorab, A.H.Effect of Essential Oils and Non - Volatile Extracts of Some Aromatic Plants on Cu++ - Induced Oxidative Modification of Human Low- Density Lipoprotein (LDL), .), *J. Of Essential Oil Of Bearing Plants*, 9 (3):292-299

6 - El-Ghorab, A., Fadel, H.H.M. and El-massry, K.F. (2002): The Egyptian Eucalyptus Camaldulensis IVar. Brervirostris: chemical compositions of Fruits IVolatile oil and antioxidant ActIlllity. *J. of FlaIVour and Fragrance* 17, 306 - 312

B-Published contributions to academic conferences:

1 - Hoda, H.M. Fadel, A. M. Gad, and A. H. El-Ghorab Antioxidant activity of phenolic compounds isolated from Egyptian eucalyptus leaves. (1996): 18 th Inernational conference on polyphenols, France, July,

2 - El-Ghorab,A., Marx, F., Fadel, H.M. and Al-Sawy, A. Effect of extraction techniques on the chemical compositions and antioxidant activity of Eucalyptus camaldulensis var. brevirostris leaf oils (1998):. IV international ANQUE Chemistry Conference, Food Chemistry and Technology, Lugo, Galicia, Spain 21 – 25 September .

3- El-Ghorab,A., Marx, F., Fadel, H.M. and Al-Sawy, A., Effect of extraction techniques on the chemical compositions and antioxidant activity of Eucalyptus camaldulensis var. brevirostris leaf oils (1998). *Lebensmittelchemikertage*, Technische universitatMunchen, Germany Septemper, p. 169.

5- Farouk, A., El-Ghorab, A. and El-massry, K., Technological applications of Maillard reaction: Meat and Chiken flavourings and processes for Preparation (2001). 6th international conference on Chemistry and it's role in Development, April (2001) Mansoura university, Egypt p. 23.

B-Published contributions to academic conferences:

6 - El-Ghorab, A. Khaled F. El-massry, F. Marx, H. M. Fadel and A. M. Gad, Effect of different extraction methods on the chemical composition and antioxidant activity of Egyptian Eucalyptus. camaldulensis var. Berviorstris“ (2000). *Lebensmittelchemikertage* , Stuttgart, Hohenheim, Germany. September, (2000) , p. 16

7-El-Ghorab, A., El-massry, K. and Shaaban , HA. Antioxidant activity and antimicrobial of the volatile components of the Egyptian Cupressus macrocarpa (Cupressaceae), 13th world congress of food science & technology Food life 17-21 Sept. 2006 Nantes, France

<b>Keywords describing the project idea</b>	<b>Sustainable production and management of biological resources from land, forest and aquatic environments:</b>	
	<input type="checkbox"/> Biological resources <input type="checkbox"/> Biodiversity <input type="checkbox"/> Genomics/Proteomics/Metabolomics <input type="checkbox"/> Bioinformatics <input type="checkbox"/> Agriculture <input type="checkbox"/> Forestry <input type="checkbox"/> Fisheries <input type="checkbox"/> Aquaculture <input type="checkbox"/> Horticulture	<input type="checkbox"/> Novel feeds <input type="checkbox"/> Novel plants <input type="checkbox"/> Plant Health <input type="checkbox"/> Animal Production and Welfare <input type="checkbox"/> Animal husbandry <input type="checkbox"/> Vaccines and Diagnostics <input type="checkbox"/> Organic production methods <input type="checkbox"/> Dairy Production <input type="checkbox"/> Tracking and tracing
<b>Fork to Farm: Food, health and well being</b>		

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<input type="checkbox"/> Consumer behaviour <input checked="" type="checkbox"/> Functional Food <input type="checkbox"/> Nutrition Science <input type="checkbox"/> Physiology <input checked="" type="checkbox"/> Food Technology <input checked="" type="checkbox"/> Food Processing <input type="checkbox"/> Packaging <input checked="" type="checkbox"/> Food safety	<input type="checkbox"/> Potable/Safe Drinking Water <input type="checkbox"/> Animal Feed <input type="checkbox"/> Chemical Food Safety <input checked="" type="checkbox"/> Microbiological Food Safety <input type="checkbox"/> New detection methods <input type="checkbox"/> Risk Assessment <input checked="" type="checkbox"/> Food Chain Analysis/Management <input type="checkbox"/> Pesticide/BioActive <input type="checkbox"/> Additives/Substances Control
<b>Life sciences and biotechnology for sustainable non-food products and processes</b>	
<input type="checkbox"/> Biomass production <input checked="" type="checkbox"/> Bio-products <input type="checkbox"/> Bio-refinery <input type="checkbox"/> Bio-processes <input type="checkbox"/> Fibres (Wool, cotton, novel-bio-fibres)	<input type="checkbox"/> Wood-production <input type="checkbox"/> Pollution <input type="checkbox"/> Ecology <input type="checkbox"/> Waste Processing

### PROFILE OF PARTNER SOUGHT

#### Type

Research Organisation   
  University   
  SME   
  Other, please specify:

#### Role to cover in the project

technology development                     
  research   
  training  
 dissemination   
  demonstration   
  other

**Country / Region**    Egypt- Mediterranean Partner countries region

#### Start of collaboration

start-up phase   
  mid-term   
  end-phase

#### Expertise required

**I agree with the publication of my data!**  
 Please fill-in in English and return to: