

NEWSLETTER

Project News – Work Package 2 (WP2)

One of the objectives of WP2 is to develop strategies and methodologies for the integrated characterisation of the by-products involved into the project. The Namaste project is trying to define new valorisation routes for citrus, wheat (Namaste – EU), and rice, pomegranate and mango (Namaste – India) by-products and their characterisation is the first necessary step. When the objective is to process by-products to obtain new ingredients and products for the food industry, special care must be taken to the safety of the raw material. By-products are in general more susceptible to contamination and sometimes preventive measures can be put in practice like a pre-selection of the raw material and or the inclusion of treatments to minimize the microbial load.

Review of use of the by-products involved into the project, list of potential usage

The characterisation is not restricted only to the analysis of physicochemical component of the materials but also involves collecting information on other topics related to the by-product and its valorisation. The use of cereal and citrus processing by-products as feed for cattle and other ruminants is a well established practice. The utilisation as a feed has lower economic value but otherwise the companies must face with the high waste management costs.

Higher value uses of wheat bran are in pet food or in dietary supplements.

Some juice processors separate the essential oil fractions and the small flavedo fragments are generated in the extraction process that they sell for the extraction of essential oils but this constitutes only a small part of citrus by-products. Many other commercial value by-products can be obtained from citrus by-products, such as essential oils, d'limonene, terpenes, aromatic liquids and pectin. Some of these products have different applications in the domestic and international markets, and include the production of chemical products and solvents, flavours and fragrances, substances for the paint industry, cosmetics and animal feed and human food supplements. Apart from the more studied valorisation alternatives other possibilities are being studied like bioethanol production.

The above given case would be similar to the rice bran, mango and pomegranate.

Namaste EU – Main outcomes of characterisation of wheat and citrus by-products:

- Wheat bran is composed mainly of polysaccharides but it is also rich in protein and lignin. Cell-wall bound phenolics are a minor but important component of the bran. Their extraction is potentially an important source of oligosaccharides with prebiotic activity and for production of biovanillin. Milling wheat must satisfy stringent regulations for limits of pesticide residue. Since residues can be concentrated in the outer layers of the grain then the wheat bran may have higher, but still safe, levels of pesticide residues. Any novel product arising from wheat bran should be screened for pesticides. Heavy metal contamination must also satisfy the requirements of stringent EU regulations. The level of contamination of the samples analysed within the Namaste project was well within the legal limits.
- Orange and lemon by-products were analysed for physicochemical composition. The centesimal compositions of the analysed fractions were similar to those expected from the bibliography. Content in specific bioactive compounds confirms that the citrus by-products may be an interesting source of bioactive materials. No relationship was observed between the total phenol content and variety or production site. Differences within the previously reported bioactive compounds content suggest a high variability dependent on the climate conditions and ripening degree that shall be considered when trying to valorise these molecules. Considering that the peel samples have high water content, usually low levels of certain contaminants like specific heavy metals or pesticides' residues commonly used in citrus crops may reach or even exceed the established maximum levels of reference once the material has been dried. Therefore, a study of these specific contaminants during the course of the development of new ingredients and food products is recommended.

Main direction of further research:

As a next step stabilization strategies and techniques will be developed and implemented for these by-products, which guarantee the quality and the safety of the raw material.

Namaste India – Main outcomes of characterisation of rice bran and mango & pomegranate by-products:

- Rice bran is rich in vitamins, minerals, amino acids, essential fatty acids and antioxidant nutrients. It has an impressive nutritional quality suitable for nutraceutical production. Milling methods vary from simple hand- pounding with a mortar and pestle to large scale processing in highly mechanized mill plants. Milling rice must satisfy stringent regulations for maximal limits of pesticide residue but since residues can be concentrated in the outer layers of the grain therefore the rice bran is expected to have higher but safe level of pesticide residues. Any novel product arising from rice bran should be screened for pesticides. Heavy metal contamination must also satisfy the requirements of stringent Indian regulations. The level of contamination of the samples analysed within the Namaste project was under the legal limits.
- Mango and pomegranates by-products were analysed for physicochemical composition. Two different fractions could be easily distinguishable in case of mango processed and pomegranate processed by-products. The centesimal compositions will be analysed. No relationship was observed between the total phenol content and variety or production site. Differences within the previously reported bioactive compound content suggest a high variability dependent on the climate conditions and ripening degree that shall be considered when trying to valorise these molecules. Considering that the peel samples have high water content, it should be taken into consideration that levels of lead may reach or even exceed the established maximum level of reference of safe use once the material has been dried.

Main direction of further research:

Nutritional value determination and antimicrobial activity in different combination are in progress and as a next step stabilization strategies and techniques will be developed and implemented for these by-products, which guarantee the quality and the safety of the raw material.

Glossary:

Bioactive compounds: Referring to a substance that can be acted upon by a living organism or by an extract from a living organism.

Bran: The outer layers of the grain of cereals such as wheat, removed during the process of milling and used as a source of dietary fibre.

By-products: A secondary or incidental product deriving from a manufacturing process, a chemical reaction or a biochemical pathway, and is not the primary product or service being produced. A by-product can be useful and marketable, or it can be considered waste. Water can also be a by-product.

Dietary fibre: Refers to the indigestible residues found in fruit, vegetables, grain and nuts and is mainly cell wall polysaccharides and lignin. Dietary fibre content in meats or dairy products is limited. Soluble dietary fibre plays a role in lowering blood cholesterol and regulation of blood sugar levels. Insoluble dietary fibre assists in maintaining optimal bowel movements, reducing the risk of colon cancer, haemorrhoids and diabetes. Dietary fibre is not absorbed by the body but provides a few calories through fermentation.

Dietary supplement: A dietary supplement, also known as food supplement or nutritional supplement, is a preparation intended to supplement the diet and provide nutrients, such as vitamins, minerals, fibre, fatty acids, or amino acids, that may be missing or may not be consumed in sufficient quantities in a person's diet. Some countries define dietary supplements as foods, while in others they are defined as pharmaceuticals or natural health products.

Fibre: Fibre, also spelled fiber, is a class of materials that are continuous filaments or are in discrete elongated pieces, similar to lengths of thread. They are very important in the biology of both plants as a cell wall material and animals, for holding tissues together.

High pressure homogenisation: Homogenization (high-pressure) technology is based on high pressure forced on liquids to subdivide particles or droplets present in fluids into the smallest sizes (submicron) and create stable dispersions ideal for further processing. High-pressure homogenization creates a high concentration of energy which is released on the processed liquids or emulsions. This high pressure (energy) creates a number of fluid mechanical effects like cavitations, turbulence, shear and impact which result in a homogeneous particle size distribution. Homogenization is a term used in many fields such as chemistry, agricultural science, food & beverage technology, drug discovery, and cell biology.

Prebiotics: Non-digestible food ingredients that stimulate the growth and/or activity of bacteria in the digestive system which are beneficial to the health of the body. They are considered a functional food.

Probiotics: Live microorganisms which when administered in adequate amounts confer a health benefit on the host. Lactic acid bacteria (LAB) and bifidobacteria are the most common types of microbes used as probiotics; but certain yeasts and bacilli may also be helpful. Probiotics are commonly consumed as part of fermented foods with specially added active live cultures; such as in yogurt, soy yogurt, or as dietary supplements.

Waste: Unwanted or very low value materials.

Main outcomes of the Industrial Platform meeting in Bangalore

An Industrial platform (IP) has been established in order to boost the interaction between knowledge generating organizations and industries of Europe and India, thus enabling a better targeting of research activities and favouring technology transfer.

The members of the platform will be informed on the progress of the project through a half yearly electronic newsletter and will have the opportunity to be invited to annual meetings. The annual meeting of IP meeting was held in Bangalore in February, 2011. In this meeting, NAMASTE EU & India project partners and IP members formally met for the first time and the IP members contributed to the strategic orientation of the project to this occasion and had opportunity to discuss and exchange on various topics.



PICTURE: NAMASTE EU and INDIA Project Team and Industrial Platform members along with European and Indian Scientific Officers

The main outcomes of the meeting were the followings:

- All NAMASTE project partners from EU and India presented their work with respect to industry needs.
- All the IP members who were present in the meeting appreciated NAMASTE project and the concept of 'Industrial platform' and expressed their views to support the project.

Some main views and suggestions of the IP members are:

1. Views and Suggestion from Akshay Food Park

They said it's a very good project especially the fruit aspect i.e. citrus, mango and pomegranate. As far bran is concerned, they suggested reducing the percentage of bran and considering increasing nutritious availability in rice and wheat. They also mentioned that they are interested in feed industry and suggested to provide contacts concerning feed industry and have agreed to support the project.

2. Views and Suggestion from Centre for Food Processors

They complemented the project and suggested to increase industry interaction by informing large mass of industry about Namaste activities and network with industry in order to further add value to the results of the project. Namaste project can develop another brochure or flyer with the project activities and industry needs and send it to potential industries. They also introduced the concept of 'natural colours' and promoting natural colours to products such as food, snack etc is essential these days. They mentioned that feed industry is growing big way not only aquaculture but also dog feed, poultry feed etc and supported to provide feed industry contacts to enhance the industry platform. Centre for Food Process (CFP) has expressed their willingness to share their database to NAMASTE project team.

3. Views and Suggestion from Indo Nissin Food

They said that they learnt many things from the meeting and the project as a whole and expressed their willingness to support the project.

Up-coming events

- **Campden BRI Day, Chipping Campden, 09. 06. 2011.**
 - The lectures and displays this year will be based around processing technology and quality, ingredients and raw material, product development and quality and operational support. The achievements of Namaste project also will be presented at Campden BRI Day.

- **9th Meeting of National Food Technology Platforms, Budapest, 02. 05. 2011.**
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- **Conference on Knowledge transfer as a key tool of innovation in sustainable bio-economy, Budapest, 3-4. 05. 2011.**
 - The presentations will introduce the new European strategies to foster innovation, application of knowledge transfer tools and networks in innovation promotion and practical tools of knowledge transfer.

- **5th European Bioremediation Conference, Chania, Crete, Greece, 4-7. 07. 2011.**
 - The European Bioremediation Conferences started in 2001 organized by TU-Crete with the support of Marie Curie high level conferences programme and by now they have been established as a European forum for scientists and engineers from all over the world to present and exchange information on recent advances in the bioremediation and phytoremediation of contaminated sites.

- **World Congress on Biotechnology -21-23 March 2011, Hyderabad, India**
 - Biotechnology-2011 is a remarkable event which brings together a unique and international mix of large and medium pharmaceutical, biotech and diagnostics companies, leading universities and clinical research institutions making the Congress a perfect platform to share experience, foster collaborations across industry and academia, and evaluate emerging technologies across the globe

➤ **Agri & Horti Tech 2011, 27-30 May 2011, Coimbatore, Tamil Nadu, India**

- Agri & Horti Tech is an International exhibition for agricultural & horticultural industry. This leading trade fair will showcase all the latest products and services for related industry under single roof at the Vijaya Fair Grounds. For three days this event will be taking place between 27 to 30 May 2011, which is being organized by Trade India Fairs & Exhibitions (p) Ltd.

➤ **Bangalore INDIA BIO 2011 - 4-6 May 2011, Bangalore India**

- Bangalore INDIA BIO (BIB) 2011 has evolved over the last ten successful editions, adding new dimensions. The scale of the event has increased enormously with growing international participation and is now acknowledged as India's biggest and most sought after biotech event.

Training and career development within Namaste

Namaste provides opportunity for training and career development for the young participants of the project. Young scientists will learn about role of the by-products and their exploitation opportunities in cereal and citrus fruit production chains, including the latest advances in food process, product development and practical aspects of industrial quality management. The procedure of selection of young participant has been established and the practical implementation is already in progress. The young scientists will have opportunity to present their research and the host also gives demonstration of the practical work carried out at his company and the current trends in the relevant research. Namaste also promotes joint training for young scientists within and between the EU and Indian Namaste consortia.

Meet the NAMASTE project partners!

University of Bologna (UNIBO) - NAMASTE EU Scientific Coordinator at a glance

The University of Bologna, Alma Mater Studiorum, was founded in 1088 and is considered to be the oldest university in Western Europe. Nowadays, it still remains one of the most important institutions of higher education across Europe with more than 90.000 enrolled students, 23 faculties, 69 departments, 3000 academics and 3000 administrative staff. In the present project, UNIBO is represented by the Environmental Biotechnology and Biorefinery unit of the DICAM, the Department of Agricultural Economics and Engineering and the Department of Food Science.

The DICAM Unit of Environmental Biotechnology e Biorefinery offers expertise in the development of biotechnological processes for the production of fine chemicals, biomaterials and biofuels from agrofood by-products, wastes and effluents. The Department of Agricultural Economics and Engineering offers expertise in agricultural policy and technology evaluation, agriculture and environmental resources economics, economic evaluation of projects and investments, evaluation of the impact of research activities, farm planning models and decision support models. The Department of Food Science cover various topics related to the food production, technology, quality, and safety, and is involved in national/international projects aimed at the improvement, differentiation, preservation of animal and vegetal raw materials and their derivatives as well as all expertise required for the analysis of all food components, in view of prevention, promotion of optimal nutrition, and health.

The integrated team of UNIBO is involved in the following FP7 projects related to the subjects of NAMASTE project: HIGHQ RTE FP6 (2007-2010), as the coordinator, BaSeFood.FP7 (2008-2011), as the coordinator; CAP-IRE FP7, as the coordinator; EcoBioCap (2011-2013), as a partner and CHANCE (2011-2013), as the coordinator.

Fabio Fava, (PhD, Full Professor) is the scientific coordinator of NAMASTE EU, has a long research experience in the field of environmental and industrial biotechnology, documented by more than 80 research papers on international peer-reviewed journals. He is the Chair of the Environmental Biotechnology section of the European Federation of Biotechnology (EFB), the coordinator of the "Industrial & Environmental Biotechnology" section of the Italian Technology Platform SusChem and a member of the Core Group of the Industrial Biotechnology section of the European Technology Platform SusChem. He is also member KET on Industrial Biotechnology and member, as the delegate of the Italian Government, of the Task Forces on Industrial Biotechnology and of that on Environmental Biotechnology of the Working Party on Biotechnology at the OECD (Paris) and of the Ad hoc advisory group for biobased products of the DG Enterprise and Industry (EC, Brussels).

For more info on UNIBO, visit <http://www.unibo.it>

North East Institute of Science and Technology (NESIT) - NAMASTE India Scientific

Coordinator at a glance

North East Institute of Science and Technology, Jorhat, Assam, a constituent establishment of Council of Scientific and Industrial Research (CSIR), New Delhi, has been engaged in multidisciplinary R&D work relevant to the country in general and North Eastern Region in particular. Its major thrust of R&D activities has been to develop indigeneous technologies by utilising the immense natural wealth of India. The North Eastern Region of the country being bestowed with an abundance of material resources like petroleum, natural Gas, Minerals, Tea as well as aromatic and Medicinal plants and hence the laboratories was targeted to undertake research for development of Know-How for a wide a range of industries and extension works. Over the years, the laboratory has generated more than 100 technologies in the areas of Agrotechnology, Biological and Oil Field Chemicals of which about 40% were of commercial success culminating in setting up of various industries through out the country. The laboratory also developed expertise in the areas like Natural Products Chemistry, drug and drug intermediates, VSK cement, Plant Technology, Agro-technologies, Petroleum Microbiology and Petrochemicals, Crude oil transportation, Paper and Paper Products, beneficiation Chemicals, ecology and environmental studies, Geotechnical investigations, foundation design engineering, soil and building materials etc. The annual turn over of the products produced with RRL technologies within the country is estimated to be Rs. 110 crores.

Some of the significant achievements:

- Development of know-how for 'Arteether', a potent new generation anti-malarial drug active against Chloroquin resistant malaria strains. The know-how has been transferred to M/s FDC Ltd., a Bombay base pharmaceutical company, for commercial production.
- Development of Vertical Shaft Kiln (VSK) for mini cement plants. Currently 35 mini cement plants are in operation in the country based on RRL-Jorhat technologies. A modified VSK technology for 30,000 TPA plant has also been developed to cater to the national and international needs.
- Development of a series of pour point depressants for transportation of high waxy crude oils. Development of oil field chemicals/materials like high and medium-strength cc, propants, chrome free lignites, oil-well formation stabilizer, etc.
- Development of agro-technologies for important medicinal and aromatic plants.
- The laboratory's contributions to extensive cultivation of citronella grass and extraction of oil have led to the establishment of a major citronella based agro- industry in the North-eastern region. The production of citronella is about 500 tonnes and this has generated employment for 22,000 persons in the rural sector alone.
- Development and introduction of Agro-technologies for mushroom cultivation and popularisation of several protein-rich edible mushroom varieties in different areas of North-East India.
- Process development for pesticides viz. Phosphamidon, Quinalphos and Chlorfenvinphos, isolation and characterisation of compounds of plant origin having insecticidal and antifeedant properties
- Development of a new process for utilisation of Banana plants for production of fibbers useful for making twines and fabrics in the conventional jute processing machines and

also for making Eco-friendly products like Carpets, Doormats, Bags, Flower vase, Table mats, Purse, Flower basket, Wallhangings, Shopping bags, etc.

- Establishment of an ecology park named North-East Ecology Park (NEEP) and introduction of several important medicinal perfumery and endangered plants growing wildly in the North-Eastern states. NEEP will act as a gene park-cum- research park for plant breeders and biotechnologists
- Establishment of a network of digital 3D seismic station along with a Central Recording Observatory equipped with remote dial-up facility for on-line data transmission and processing.

Dr. Pradip Kumar Goswami – Scientific Coordinator of NAMASTE India is an R &D Scientist in Chemical Engineering. He leads the research group on Food and Nutraceuticals and coordinates the multi laboratory project on food and nutraceuticals. During the period 2002-2008, was responsible for the Food and nutraceutical works. In the field of food and nutraceutical, two projects were carried out sponsored by Ministry of Consumer Affairs and Department of Bio Technology, New Delhi. He worked in different process development and design work on the following:

Agrobased:	Tartaric Acid from Tamarind Leaves
	Caffeine from Tea waste
	Oxalic acid from agro- waste
Oil field Chemical	Flow improver for crude oil transportation
Pesticides	Phosphamidon
	Chlorfenvinphos
	Chloquine phosphate
Drugs and drugs	16 DPA
Intermediate	Diosgenin
	Caffeine from Tea waste

For more info on NEIST, visit <http://www.rrijorhat.res.in/>