

# **First Winter School on Industrial Biotechnology**

**CAIRO, EGYPT**

**2-6 December 2012**

## **BRIEF REPORT**

Industrial biotechnology, popularly known as white biotechnology, involves the successful utilisation of various aspects of biotechnology for the environmental-friendly production and processing of chemicals, pharmaceuticals, materials and bio-energy. It is being widely considered as the solution to find alternatives for the diminishing amount of fossil resources such as oil and natural gas and thus symbolises its import in providing clean and sustainable processes. Industrial Biotechnology makes an efficient use of enzymes and micro-organisms to produce bio-based products in sectors such as chemicals, food and feed, detergents, paper and pulp, textiles and bioenergy (such as biofuels or biogas) by incorporating renewable raw materials. This has been one of the most promising, innovative approaches towards lowering greenhouse gas emissions. Most recently, the World Wide Fund for Nature (WWF) has confirmed about the potential of industrial biotechnology to cut CO<sub>2</sub> emissions and hence its significance in building a greener economy.

Industrial Biotechnology, although already successfully established in some sectors, is still in its infancy. More in-depth knowledge is essential to fully explore the wide-range of possibilities of Industrial Biotechnology and to transform the traditional chemical and chemical-related sector to a sustainable, competitive, innovative and sophisticated sector. And to achieve this, a multidisciplinary approach is required, including such areas as biotechnology, organic chemistry, biochemistry, microbiology, genomics, proteomics, bio-informatics and process engineering. Since in last few years an advanced set of genomics tools has become available, there are wider prospects of fully exploring and implementing the possibilities of these tools. It is evident that the Industrial Biotechnology sector must be explored to unravel the wide range of possibilities so as to provide a more sustainable foundation for the developing world's transition from an agrarian to an industrial economy.

In order to enhance and develop the research skills of the young and senior scholars in various aspects of industrial biotechnology and to deliberate on the recent developments in this field in the developing countries, the Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) jointly with the Science and Technology Development Fund (STDF) of Egypt organised the First Winter School on Industrial Biotechnology at the National Research Centre (NRC), Giza, Egypt during 2–6 December 2012. The Winter School was sponsored by the Academy of Scientific Research and Technology (ASRT) of Egypt; Arab Biotechnology Association (ABA); Federation of Arab Scientific Research Councils (FASRC); University of Technology, Malaysia; and Arab Society for Genetic Engineering and Biotechnology.

In the Inaugural Session of the Winter School, Prof. Mahmoud M. Sakr [Executive Director, STDF and Secretary General, ABA and FASRC] welcomed the delegates to the Winter School followed by an address by Prof. Arun P. Kulshreshtha, Director, NAM S&T Centre, who talked about the relevance of the Winter School for the developing countries

and gave the background and activities of the Centre aimed at the promotion of South-South cooperation and also about the launch of a new Research Training Fellowship for Developing Country Scientists (RTF-DCS) by the NAM S&T Centre for affiliation with the Indian Scientific Centres of Excellence. Prof. Ashraf Shalen, President, National Research Centre (NRC) made a brief speech also welcoming the participants to NRC, the Centre of Excellence in Egypt and the venue of the Winter School. The Chief Guest Her Excellency Prof. Dr. Nadia Zakhary, Honourable Minister of Scientific Research of Egypt in her inaugural address mentioned about the reconstruction of national scientific research system, development of the national S&T plan for harnessing knowledge and new initiatives to be shortly launched in her country.

The Winter School was attended by 65 participants from 18 countries that included Colombia, Ethiopia, The Gambia, India, Indonesia, Malaysia, Myanmar, Nepal, Nigeria, Pakistan, South Africa, Sri Lanka, Sudan, Togo, Uganda, Vietnam, Zimbabwe, and the host country Egypt (38 participants).

The overseas Resource Persons / Moderators / Trainers were from India [**Prof. Dr. Navin Chandra Khanna** and **Dr. Vanga Siva Reddy**, Group Leader, International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi], Malaysia [**Prof. Dr. Hesham A. El-Enshasy**, Dr. rer. Nat. Industrial Biotechnology, Assistant Director (Research and Innovation), Institute of Bioproduct Development, Universiti Teknologi Malaysia (UTM), Johor Bahru] and Pakistan [**Dr. Mudassir Asrar**, Chairperson, Pakistan Council for Science and Technology (PCST), Ministry of Science and Technology]. The other foreign participants were from Colombia [**Mr. Javier Andres Davila Rincon**, Researcher, Universidad Nacional de Colombia]; Ethiopia [**Mr. Teshome Sahilemariam Ashagre**, Director, Technology Transfer and Development Directorate, Ministry of Science and Technology]; The Gambia [**Mrs. Absa Jaw**, Senior Research Officer, National Agricultural Research Institute (NARI)]; India [**Dr. Sambandam Anandan**, Associate Professor, Nanomaterials & Solar Energy Conversion Lab, Department of Chemistry, National Institute of Technology, Tiruchirappalli]; Indonesia [**Dr. Rofiq Sunaryanto**, Chief Engineer on Development and Production of Antibiotic Programme, Center of Biotechnology, Agency for the Assessment and Application of Technology (BPPT), PUSPIPTEK, Serpong, Tangerang Selatan]; Malaysia [**Ms. Zuleen Delina Fasya Binti Abdul Ghani**, Researcher, Sirim Berhad, Selangor]; Myanmar [**Ms. Kyi Pyar Win**, Research Officer, Ministry of Science and Technology (MOST)]; Nepal [**Dr. Chiranjivi Regmi**, Chief Planning Division, Nepal Academy of Science & Technology (NAST), Lalitpur]; Nigeria [**Mrs. Madu Josephine M.**, Principal Technical Officer; **Engr. Olusegun Adeyinka Adetunji**, Principal Scientific Officer, Food & Industrial Biotechnology Department, (FIB); **Mr. Adekunle Adefemiwa Ayobami**, Scientific Officer; and **Mr. Muhammad Taoheed Abdulkareem**, Scientific Officer at the National Biotechnology Development Agency (NABDA), Abuja]; South Africa [**Dr. Maranda Esterhuizen – Londt**, Post Doctoral Researcher, Inno Venton Nelson Mandela Metropolitan University, Institute for Chemical Technology & Downstream Chemicals Technology Station, Summerstrand Campus (North), Port Elizabeth]; Sri Lanka [**Dr. Kosmapatabendige Sandun Lamika Dalpatadu**, Research Scientist, Industrial Technology Institute (ITI), Colombo]; Sudan [**Dr. Abdelhalem A. Hamza**, Assistant Professor and Head, Department of Microbial Biotechnology, Commission for Biotechnology and Genetic Engineering, National Centre for Research, Khartoum]; **Dr. Eiman. E. Diab**, Assistant Professor and Head, Environment and Natural Resource Research Institute (ENRRI), National Center for Research; **Dr. Ms. Hind Elzain Maki Elmana**, Researcher, Department of Plant Tissue Culture, Commission for Biotechnology and Genetic Engineering, National Centre for Research; and **Dr. Mrs. Mai Abdalla Ali Abdalla**, Plant Pathology Center, Gezira University]; Togo [**Dr. Ameyapoh Yaovi Agbekponou**, Senior Lecturer-Researcher,

Universite De Lome]; Uganda [**Ms. Deborah Wendi**, Head of Microbiology/ Biotechnology Department, Uganda Industrial Research Institute, Kampala]; Vietnam [**Mrs. Thi Thuy Le**, Researcher, Food Industries Research Institute, Ha Noi]; and Zimbabwe [**Ms. Faith Muvhunzi**, Biosafety Officer, National Biotechnology Authority, Harare].

The Egyptian participating Moderators and Trainers included **Prof. Dr. Hassan Moawed Abd Elal** [Former President of Mubarak City for Scientific Research and Technology Applications and Professor of Microbiology, NRC]; **Dr. Hamdy Abd El-Aziz El-Moursy** [Director, Scientific Research Academy, Ministry of High Education]; **Prof. Dr. Ossama Mohammad El-Tayeb** [Professor Emeritus (Microbiology and Immunology), Founding Director, Microbial Biotechnology Center at Cairo University, and Adviser to the Egyptian Biosafety Clearing House, Faculty of Pharmacy, Cairo University]; **Prof. Dr. Mahmoud Abdel-Aziz Ibrahim** [Head, Biotechnology Division, NRC]; **Prof. Yehia M. Shaker** [Clinical Chemistry Lab, NRC]; **Prof. Yasser Abdel-Fattah** [Secretary General, Supreme Council for Research Centres and Institutes, Ministry of Scientific Research]; **Prof. Dr. Abdelfattah Badr** [Professor of Genetics, Botany & Microbiology Department, Faculty of Science, Helwan University, Cairo]; **Prof. Hager Emam Mohamed Ahmed Amer** [Research Institute of Ophthalmology, NRC]; **Ms. Nayera A.M. Abdelwahed** [Chemistry of Natural and Microbial Products Department, Pharmaceutical Industry Division, NRC]; **Mr. Hossam El Din M.** [National Institute of Laser Enhanced Sciences, Cairo University]; **Ms. Eman O. Abdel Fattah** [Research Assistant, Department of Therapeutic Chemistry & Plant Molecular Biology Group, Center of Scientific Excellence, NRC]; **Ms. Radwa Youssef Mahmoud** [Researcher Assistant, Department of Genetics & Cytology, Genetic Engineering and Biotechnology Division & Plant Molecular Genetics Group, Center of Scientific Excellences, NRC]; and **Ms. Rasha Abdallah Mahmoud Salem** [Department of Chemistry of Natural and Microbial Products, NRC].

Training Lectures, two each, were delivered in Six Sessions by Prof. Hesham A. El Enshasy on 'Integrated Industrial Bioprocess: From Platform Design to Economic Assessment' and 'Measurement and Control Systems in Bioprocess Industries (on-line; off-line and in-line systems)'; Prof. Navin Chandra Khanna on 'Strategies for Enhanced Expression of Proteins in *Pichia Pastoris* - HBsAg as a Case Study' and 'Tailor Made Proteins for Diagnostic Use'; and by Dr. Vanga Siva Reddy on 'Plant based Molecular Farming: Progress Made and Future Perspectives' and 'Experience in the Expression of Recombinant Proteins and Enzymes Useful in Human Health and Industrial Applications based on Chloroplast Genetic Engineering Approach';

24 scientific papers and country status reports were presented in three Workshop Sessions by the overseas participants, respectively on 'Bio Refinery from Panelera Cane: Colombian Case' [by Mr. Javier Andres Davila Rincon of Colombia]; 'Identification of Near-Isogenic Lines Resistance to Rice Yellow Mottle Virus' [by Mrs. Absa Jaw of the Gambia]; '- Binding of Serum Albumins with Bioactive Substances - Nanoparticles to Drugs' [by Dr. Sambandam Anandan of India]; 'Development of Drug Derived from Marine Microorganism in Indonesia' [by Dr. Rofiq Sunaryanto of Indonesia]; 'Non Invasive Methods of Nucleic Acid Extraction: Analysis of Human Saliva Samples' [by Ms. Bidisha Pal of India]; 'Antinociceptive Activity of Haruan (*Channa Striatus*) Traditional Extract' [by Ms. Zuleen Delina Fasya Binti Abdul Ghani of Malaysia]; 'Research and Application of Biotechnology for Food Industry in Viet Nam' [by Mrs. Thi Thuy Le of Vietnam]; 'The Pathogenicity of *Beauveria bassiana* on *Spodoptera litura* in Cotton Field' [by Ms. Kyi Pyar Win of Myanmar]; 'Extraction, Purification and Production of Actinomycin D by a Newly Isolated *Streptomyces* sp. AH 11.4' [by Prof. Abdelhalem A. Hamza of Sudan]; 'The Role of Industrial Biotechnology for the Economic Growth of Ethiopia' [by Mr. Teshome Sahilemariam Ashagre of Ethiopia]; 'Status of

Biotechnology and Prospects of Biotechnology related Small and Medium Size Enterprises in Nepal' [by Dr. Chiranjivi Regmi of Nepal]; 'Microbial Effect of Environmental Degradation Due to Wrong Channeling of Sewage Water in Abuja Municipal Area' [by Mrs. Madu Josephine M. of Nigeria]; 'Adoption of Industrial Biotechnology in Zimbabwe' [by Ms. Faith Muvhunzi of Zimbabwe]; 'Molecular Characterization of Lactic Acid Bacteria involved in the Fermentation of Traditional Cereal Foods and Milk' [by Dr. Ameyapoh Yaovi Agbekponou of Togo]; 'Derivation of Xanthan Gum from Cassava by Action of Neurospora Sitophila Fungi and Xanthomonas Campestris pv. Campestris Bacterium' [by Ms. Deborah Wendi of Uganda]; 'Prospect and Current Biotechnology Status in Sudan' [by Dr. Mai Abdalla Ali Abdalla of Sudan]; 'Production of Alpha Amylase by Bacillus Subtilis Local Isolate Grown on Cassava Starch' [by Engr. Olusegun Adeyinka Adetunji of Nigeria]; 'Modern Fermentation Technology and the Nigeria Cottage Industries' [by Mr. Adekunle Adefemiwa Ayobami of Nigeria]; 'Phytoremediation of Cadmium Contaminated – Soil by Maize (Zea mays) Plant' [by Dr. Eiman. E. Diab of Sudan]; 'Temporary Immersion Bioreactors in Nigeria: Status and Prospects' [by Mr. Muhammad Taoheed Abdulkareem of Nigeria]; 'Recent Technical Advancements in the Areas of Industrial Biotechnology in Pakistan: A Case Study' [by Dr. Mudassir Asrar of Pakistan]; 'Large Scale Culture of a Microalgae/ Cyanobacteria/ Bacteria Consortium for Biofuel Production' [by Dr. Maranda Esterhuizen – Londt of South Africa]; 'Industrial Enzyme Production using Cassava Root Extract' [by Dr. Kosmapatabendige Sandun Lamika Dalpatadu of Sri Lanka]; and 'Callus Induction and Antimicrobial Activates of Callus Extracts of Black Seed (Nigella Sativa)' [by Dr. Hind E.M. Elmana of Sudan].

5 presentations by the Egyptian participants were on 'Nanocompounds as Antimicrobial Agent' by Dr. Nayera A.M. Abdelwahed; 'Histological and Immunohistochemical Study of the Effect of Long Period Gold Nanoparticles Exposure on the Brain of Adult Male Albino Rat' by Dr. Hossam Eldin Mostafa (Egypt); 'Microbial and Physiological Studies on Some Mannooligosaccharides' by Ms. Rasha Abdallah Mahmoud Salem; 'Stem Cell Therapy in Retinitis Pigmentosa' by Dr. Hager Emam Amer; and 'Towards Improvement of Drought Tolerance in some Egyptian Rice Cultivars using Genetic Transformation' by Ms. Radwa Youssef Mahmoud.

The participants were divided in three groups for the laboratory work during which the functioning of various equipment / systems was explained by Prof. Navin Chandra Khanna, Dr. Vanga Siva Reddy, Prof. Dr. Hesham A. El-Enshasy, Dr. Mudassir Asrar and a number of NRC researchers on Transformation, Bioreactors (Microbial & Plant), Protein Purification (AKTA-HPLC), Downstream Process (Spray Dryer), Downstream Process (Ultra-filtration), Downstream Process (Continuous Cooling Centrifuge) and Super Critical Fluids Extraction.

A formal Banquet Dinner was organised for the participants on the Nile River Cruise. The participants were also provided the transport to visit the famous Pyramids of Egypt.

In the Concluding Session, valuable feedback and critical comments of the participants were received. It was proposed by one of the participants from the Sudan to host the next international event on this theme sometime in 2014 jointly with the NAM S&T Centre, subject to the availability of funds and required internal approvals. The participants of the Winter School expressed gratitude for this kind gesture. This was followed by the distribution of the Certificates of Participation to them. The Winter School concluded with the participants thanking and greatly applauding the efforts made by the NRC and the NAM S&T Centre in organising such a useful Training Course.

#####