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The New Executive Director COMSATS, Dr. S.M. Junaid Zaidi, with other Officials of COMSATS Secretariat

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From the Executive Director's Desk

It is a matter of honour and pleasure for me to write the Editorial of the first issue of the year 2017 for the esteemed readership as new Executive Director of COMSATS. For me, COMSATS is a familiar forum owing to my association with the organization since its inception in various ways, including being its acting Executive Director back in 1998-1999 as well as the founder Rector of COMSATS Institute of Information Technology (CIIT), a top class Pakistani university established in 1998, which is a Flagship Project of COMSATS. It has been a matter of pride for me to be associated with COMSATS that is a unique Intergovernmental/International organization hosted by the Government of Pakistan.

The establishment of the Commission was a dream of Prof. Abdus-Salam to bring change in the socio-economic conditions of developing countries, as he strongly believed that only science and technology can work as an engine for bringing betterment to the quality of life of the masses. The world has changed since industrial revolution to present Information era and it is driven by knowledge economy, and disparities among the countries of the South and North can be gradually overcome through Science and Technology based education, research and industrial projects in all sphere of life. For a period of over two decades, COMSATS has been striving to bring the necessary change by building human capital and critical mass of scientists in its member/developing countries in accordance with its mission of achieving science-led socio-economic sustainable development.

Today, COMSATS has 24 member states having strong ties with their governments through focal points, relevant S&T institutions and a number of international partner organizations having common mandates. The COMSATS Network of International S&T Centres of Excellence having 20 members from 4 continents is working to

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NEWS/ACTIVITIES/HIGHLIGHTS FROM COMSATS SECRETARIAT

Appointment of New Executive Director COMSATS

Dr. S. M. Junaid Zaidi has assumed the charge of the Executive Director, COMSATS Secretariat, on 27th February 2017. Dr. Zaidi succeeded Mr. Fazal Abbas Maken, the Federal Secretary, Ministry of Science and Technology (MoST), Government of Pakistan, who held the interim charge of the position for three months since 19th October 2016. Dr. Zaidi had also held the interim charge of the Executive Director from 1998-2000.

Dr. Zaidi is probably best known for his over two decades of association with COMSATS Institute of Information Technology (CIIT). He has been the founding Rector of the degree-awarding institution till early 2017. Due to the phenomenal growth the university has undergone during the years, his reputation as an academician proceeds him.

Dr. Zaidi is highly regarded for his intellectual achievements and pragmatic approach to conceiving and implementing innovative ideas. His work has earned him accolades both nationally and internationally. In recognition of his services to the education and I.T sectors, Dr. Zaidi has been awarded two Civil Awards by the Government of Pakistan, namely Sitara-i-Imtiaz and Hilal-i-Imtiaz.

Congratulatory Messages for the incoming Executive Director COMSATS

"The National Research Centre of Egypt would like to congratulate you in your new mission as a new COMSATS Executive Director. The NRC is looking forward to cooperate with your good self to enhance the role of COMSATS in promoting cooperation in science and technology among Member States."

Prof. Ashraf Shaalan, Chairperson COMSATS Coordinating Council

"Please accept on behalf of my humble self, the Mission and the Nigerian Government our heartfelt felicitations. It is our prayers that the Almighty God gives you the courage, wisdom and protection to justify the confidence reposed on you by this appointment."

Mr. Aminu Abdulkadir, Minister/Ag. High Commissioner at Nigeria High Commission in Pakistan

"Your appointment is no doubt a clear demonstration of the confidence that the Government of Pakistan reposes in your good self. The Embassy of Ghana in Tehran congratulates you on your appointment..."

Herbert Addy-Nettey, Acting Head of Mission, Embassy of Republic of Ghana in Tehran

Dr. S. M. Junaid Zaidi
Executive Director COMSATS

Brief Introduction

Dr. Zaidi holds a doctorate in Optimisation of Algorithms on Networking from the University of Birmingham, England, (UK) (1984). He has expertise in diverse disciplines, including Technology and Economic Policy Making, Operations Research, Industrial Information Networking, Project Planning and Management, Technology Commercialization and Utilization, Technology Forecasting, Technology Transfer, and Build-Operate-Transfer mode of Project Financing.

Dr. Zaidi's is perhaps the most well-known name in the history of Information Technology (IT) in Pakistan and facilitation of the Government of Pakistan in this regard, especially with regard to developing and training human resources. He has prepared and implemented plans for training of youth as well as diverse sections of the society in basic and advanced concepts of IT. One of the high points of his career is the establishment of IT ventures and development of the IT Policy in Pakistan in the late nineties. Prior to that, he had been a key architect of similar policies in Asia-Pacific countries, including Malaysia – the front runner in the region.

Dr. Zaidi established the first international online information sharing network in Pakistan in the mid-eighties – much ahead of the rest of the countries in the region. He is considered an authority in the field of Networking. Dr. Zaidi has been a driving force behind a number of initiatives in Higher Education, Science & Technology and Information Technology sectors in Pakistan, which include Virtual University, National Testing Service, Inter Islamic Network on Information Technology (INIT), ISESCO Center for Promotion of Scientific Research (ICPSR), Edward De Bono Foundation Pakistan. He has completed a number of consulting assignments for multilateral institutions, governments of a number of developing and developed countries, and has lectured extensively both in Pakistan and abroad, on matters relating to Science and Technology Policy and Human Resource Development.

Dr. Zaidi has served in many high-profile positions at the United Nations (UN) and with the Government of Pakistan. He worked as an Advisor with the UNESCAP Asian and Pacific Centre for Transfer of Technology (APCTT), from 1987 to 1991. At APCTT, he contributed significantly to enhancement of technology and information handling capabilities of developing countries of the region and also established a computerized online network of Asian and Pacific countries. During this period, Dr. Zaidi undertook several advisory missions as an IT specialist to Fiji, Ghana, Indonesia, Malaysia, Nepal, the Philippines, Sri Lanka, Tanzania, Thailand and Vietnam, and helped them establish their technology-transfer and industrial technology information systems.

Preparations for 20th Meeting of COMSATS Coordinating Council

Preparations continue at COMSATS Secretariat for the 20th Meeting of COMSATS Coordinating Council to be held in Cairo, Egypt, on 15-16 May 2017. The meeting will be hosted by COMSATS' Centre of Excellence, the National Research Centre (NRC), Egypt. The Coordinating Council is the most active forum of COMSATS that meets every year for real time cooperation between the Network Members.

The Executive Director COMSATS had extended invitations to all members of the Council, selected members of COMSATS' Technical Advisory Committee (TAC), as well as representatives of some international partner organizations as Observers. Apart from the host Centre of the meeting, confirmation of participation has, so far, been received from the following 16 Centres of Excellence: BCSIR-Bangladesh, ICCES-China, CSIR-Ghana, IROST-Iran, ICENS-Jamaica, KazNU-Kazakhstan, NMC-Nigeria, ICCBS-Pakistan, CIIT-Pakistan, ITI-Sri Lanka, IRCC-Sudan, HIAST-Syria, TIRDO-Tanzania, CERTE-Tunisia, CIF-Colombia, and TUBITAK MAM-Turkey, as well as the Honorary Lifetime Member of Coordinating Council, Prof. M. H. A. Hassan, Executive Director TWAS. A representative of the Mohamed V University, Morocco, is also expected to participate in the meeting, in order to make presentation on the activities and scientific profile of the University, for the Council's consideration of its request for induction in COMSATS' Network of International S&T Centres of Excellence.

The representatives of UNESCO and SESRIC, as well as a member of COMSATS' Technical Advisory Committee belonging to Egypt will also participate in the meeting as Observers.

COMSATS Headquarters is closely coordinating with the local organizing committee of the event to ensure timely arrangements. The host institution, NRC-Egypt, will soon extend invitations to the confirmed participants of the meeting for visa formalities, whereas visa-on-arrival is being arranged for those participants who do not have Egyptian Embassy in their respective countries. The Working Paper of the meeting will be electronically distributed to the Council members and other invitees during April 2017.

ISESCO-COMSATS Cooperation Programme 2017 Finalized

Since 2004, COMSATS and ISESCO have been collaborating for executing various activities in different fields of science and technology. These collaborative activities have proved to be productive for both the organizations and have contributed to the socio-economic development of their common member countries. The collaboration is reviewed and revived through signing of periodic agreements between the two organizations.

During Jan-Feb 2017, COMSATS and ISESCO have been making consultations in order to finalize the cooperation programme for 2017. In this regard, six capacity building events are scheduled to be jointly organized by COMSATS and ISESCO during 2017, in Nigeria, Gambia, Kazakhstan, Morocco, and Pakistan. These events would relate to ICTs, Biotechnology, Mathematical modeling, vaccine, and repair and maintenance of laboratory equipment. COMSATS has already initiated work for organizing two of these events: 4th International Workshop on 'Applications of ICTs in Education, Healthcare and Agriculture' (Nigeria) and the 3rd International Conference on 'Agriculture, Food Security and Biotechnology' (Pakistan) in collaboration with other local partners.

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facilitate South~South cooperation in order to achieve the organization's mission. Every year, the heads of Centres of Excellence meet to share their expertise and technological resources as well as to initiate collaborative projects.

During the coming years, my aim as the Executive Director shall be to enhance the membership of the Commission as well as the Network of Centres of Excellence with an objective of increasing the scope and impact of COMSATS' programmes and activities. For the purpose of launching new initiatives in-line with the priorities and socio-economic needs of the Member States, guidance shall be sought at regular intervals from the esteemed members of COMSATS' Consultative Committee, Technical Advisory Committee and Coordinating Council. COMSATS shall join hands with more international organizations, donor/development agencies, and scientific institutions in the South and North, in order to initiate and execute new collaborative projects to achieve common objectives.

I welcome feedback from all readers of this document regarding its contents and COMSATS.

S&T INDICATORS OF A MEMBER STATE

In Spectrum: The Republic of Philippines

The Philippines, officially the Republic of Philippines, is a sovereign island country located in Southeast Asia at the western bank of the Pacific Ocean. The Philippines comprises of 7,641 islands constituting an archipelago between South China Sea (on West), the Philippine Sea (on East) and the Celebes Sea (on South West). The Philippines shares its borders with Taiwan in the North, Vietnam in the West, Palau in the East and Indonesia and Malaysia in the South. The Philippines is divided into three geographical divisions from the North to the South. These divisions are known as Luzon, Visayas and Mindanao.

The supreme law of Philippines is its constitution which was adopted on 2nd February 1987. The law was drafted by Constitutional Commission in 1986. As per the constitution, the country has democratic government with a presidential system. The country is governed as a unitary state with the exception of Autonomous Region in Muslim Mindanao. The President of the country functions as head of state, head of government and commander in chief of the armed forces. The President is directly elected by people for a period of six years.

The Philippines is located near equator as well as on the ring of fire. This makes it susceptible to earthquakes and typhoons. It has an area of 300,000 square kilometers and a population of 100 million making it 8th most populated country in Asia and 12th most populated country in the world (World Factbook, 2017 est.). As per the estimates from World Bank, Philippines population was over 102,624,209 in July 2016. The annual population growth rate of Philippines is 1.59%. The largest segment of the country's population (36.86%) is between the age 25 to 54 followed by population segment (33.71%) aged under 14 (CIA World Factbook).

The Philippines is an ethnically, religiously, culturally and linguistically diverse country. Although Filipino and English are the official languages of the country, a number of other local languages are also spoken in other parts of the country. The country is very rich in terms of biodiversity and abundance of natural resources. Due to its rich biodiversity, Philippines is a main tourist attraction with most popular tourist destinations in the world.

According to Human Development Index, Philippines ranks at 115 out of 188 countries with an HDI value of 0.668 (UNDP Human Development Report, 2015). HDI value of Philippines increased from 0.557 to 0.668 between 1980 and 2014, which suggests an increase of 20%. Between 1980 and 2014, the life expectancy by birth in Philippines increased by 6 years, mean years of schooling increased by 3.5 years and expected years of schooling increased by 1 year. GNI per capita of Philippines increased by 79.5% between the years 1980 and 2014.

The Philippines is currently one of the most dynamic economies in the East Asia, with sound economic fundamentals and a globally recognized competitive workforce. Growth in the country has been robust in the past five years, registering an average 6.2 percent from 2010-2015, significantly higher than its average 4.5 percent annual growth in 2000-2009. In the first half of 2016, the Philippines economy grew at 6.9% which exceeds the rate of the same period in 2015 (World Bank, 2016).

Table-A: The Philippines HDI Trends Based on Consistent Time Series Data and New Goalposts

Year	Life Expectancy at Birth	Expected Years of Schooling	Mean Years of Schooling	GNI per Capita (2011 PPP$)	HDI Value
1980	62.2	10.3	5.4	4,410	0.557
1985	63.8	10.5	6.2	3,487	0.565
1990	65.3	10.8	6.6	3,962	0.586
1995	66.1	10.8	7.1	4,111	0.598
2000	66.7	11.4	7.6	4,994	0.623
2005	67.2	11.6	7.9	6,058	0.64
2010	67.7	11.3	8.2	7,478	0.654
2011	67.8	11.3	8.4	6,853	0.653
2012	67.9	11.3	8.5	7,166	0.657
2013	68.1	11.3	8.7	7,598	0.664
2014	68.2	11.3	8.9	7,915	0.668

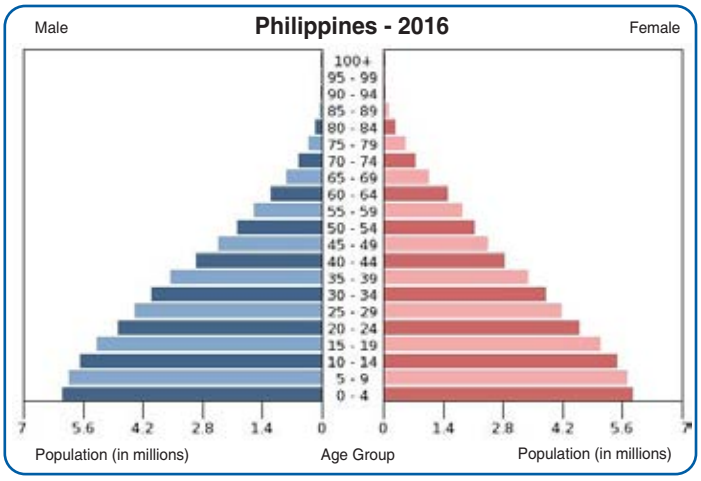
Source: *UNDP, 2016*

Philippines is a newly industrialized country and its economy largely depends on agricultural sector. The economy of Philippines is based on transition from agriculture to manufacturing and processing. The industrial sector in the country is based on manufacturing of electronics and high technology components. Projections from economic indexes reveal that its economy will be the 16th biggest in world by 2050.

The reported public expenditure on education in the country is 2.7% of GDP. The adult literacy rate in 2015 was 97%. Primary and secondary gross enrolment ratio of both sexes was 109 and 84.253, respectively (World Bank, 2016). The Commission on Higher Education; and Technical Education on Skills Development Authority are two of the many bodies that oversee the education sector of the country making it one of the states having highest literacy rates.

Agriculture comprises of 30% labor force and contributes to 10.6% of the annual GDP while industrial sector comprises 14% labor force and contributes to 30.77% of the annual GDP (World Bank, 2016). Exports are largely based on fruits, semiconductors, coconut oil, electronic products, petroleum products, transport equipment, copper products and garments. The country is in trading relationships with economic giants, like Japan, Thailand, China, Taiwan, United States of America, Germany, Singapore, Hong Kong, South Korea and Netherlands. Primary imports of the country include electronic products, plastic, mineral fuels, chemicals, machinery and transport equipment, grains, iron, steel and textile fabrics.

The Department of Science and Technology (DoST) is the executive department for coordination of science and technology related projects of government of Philippines. The department is meant to generate policies for development of Science and Technology in the country. Collegial and scientific bodies; sectoral planning councils; research and development institutes; and scientific and technological services, work under the umbrella of DoST. Philippines Space Science Education Program (PESSAP) is a venture of Department of Science and Technology-Science Education Institute (DoST-SEI). Under PESSAP, Philippines launched its first ever micro-satellite named Diwata-I in the year 2016. The Department of Science and Technology currently deals with 19 offices. The focal point of COMSATS organization in Philippines is Secretary DoST, Hon. Furtunato T. De La Peña.



Philippines is one of the founding members of United Nations, Asia-Pacific Economic Cooperation, Association of Southeast Asian Nations, East Asia Summit and World Trade Organization. The country is also the host of Asian Development Bank Headquarters. The Headquarters of International Rice Research Institute (IRRI) is located in Laguna, Philippines. IRRI having research centers in 16 countries of the world is one of the internationally independent organizations focusing on development and research on rice.

The IPP stats of Philippines emphasize on a new industrial policy which is intended for transformation of industries to engage more youth and create more jobs. Philippines is a country with great infrastructure for research in science and development in technology. Flourishing in the state of many challenges, Philippines' development in science and technology is a good sign for the socio-economic development of the country in future.

Key Development Indicators of Philippines			
Development Indicator	**1990**	**2000**	**2015**
Population, total (millions)	61.95	77.93	100.7
Urban population growth (annual %)	4.5	1.9	1.3
Agriculture, value added (% of GDP)	22	14	10
Industry, value added (% of GDP)	34	34	31
Services, etc., value added (% of GDP)	44	52	59
Exports of goods and services (% of GDP)	28	51	28
Imports of goods and services (% of GDP)	33	53	35
Mobile cellular subscriptions (per 100 people)	0	8.3	118.1
Internet users (per 100 people)	0	2	40.7
High-technology exports (% of manufactured exports)	32	73	53
Merchandise trade (% of GDP)	48	95	44
Source: *World Bank Indicators, 2016*			

ACTIVITIES/NEWS OF COMSATS' CENTRES OF EXCELLENCE

The President of RSS-Jordan Receives an Order of Merit of Federal Republic of Germany

The President of Royal Scientific Society (RSS), Jordan, H.R.H Princess Sumaya bint El Hassan was honored with Order of Merit of Federal Republic of Germany on 6th February 2017. H.R.H. Prince El Hassan bin Talal and Princess Sarvath El Hassan also graced the ceremony with their presence.

Princess Sumaya has received this award for fostering cooperation between Germany and Jordan in research and education. Among other institutions, Her Royal Highness has supported German Archeological Institute (GAI), as well as the German Protestant Institute of Archaeology (GPIA).

The Order of Merit of Federal Republic of Germany was instituted in 1951 by Former President of Germany, Theodor Heuss. It is the only honour that may be awarded in all fields of endeavour and is the highest tribute by the Federal Republic of Germany given to individuals for services to their nation. The Order of Merit may be awarded to Germans as well as foreigners for achievements in the political, economic, social or intellectual realm and for all kinds of outstanding services in the field of social, charitable or philanthropic work.

HRH Princess Sumaya receiving Order of Merit of Federal Republic of Germany

CIIT-Pakistan Conducts Webinar in Collaboration with Belarus State University of Informatics and Radioelectronics

COMSATS Institute of information Technology (CIIT), Pakistan, in collaboration with Belarus State University of Informatics and Radioelectronics (BSUIR), organized a webinar on 'Stimulating the Optimization of Energy Consumption in Homes' on February 15, 2017. Dr. Victor R. Stempitsky, Head of Computer-Aided Design Laboratory, Department of Micro and Nanoelectronics of BSUIR, headed the event. Dr. Nadeem Javaid, Associate Professor, Department of Computer Science and Ms. Zainab Ali from International Office of CIIT facilitated the event. The webinar was attended by graduate students of Electrical Engineering and Computer Science Departments of CIIT. Dr. Stempitsky delivered a lecture followed by a brief questions & answers session from students. The webinar was very beneficial for CIIT students as well as professionals.

Participants of CIIT's Webinar

NRC-Egypt Signs a Cooperation Protocol for Environmental Conservation with Environmental Affair Agency

On 8th January 2017, Mr. Ahmed Soud, Chief Executive, Egyptian Environmental Affair Agency; and Dr. Ashraf Shaalan, Head, National Research Center, signed a cooperation protocol. The protocol was based on promotion of technical and applied research capacity in the field of conservation and protection of environment. By signing the protocol, both the parties pledged to work on new areas of scientific research to sort out environmental sustainability and development.

The protocol stipulates cooperation on environmental issues, like danger of solid and liquid wastes; climate change; preservation of biodiversity; preservation of natural reserves; and studies of environmental impact assessment.

KazNU-Kazakhstan Holds International Scientific-Methodical Online Conference

On February 28, 2017, an International Scientific Methodical Online conference was held at Department of the Faculty of Oriental Studies, Al-Farabi Kazakhstan National University (KazNU), Kazakhstan. The conference was entitled 'New Trends in the Development of Arabic Studies'. Professors from Al-Azhar University (Egypt); UNISZA (Malaysia); Al-

Arish University (Egypt); and the Islamic Culture Nur-Mubarak University (Kazakhstan) attended the conference. Apart from KazNU, the event also had participation from Ablai Khan University of International Relations and L.N. Gumilyov Eurasian National University.

The conference covered a number of topics including: scientific and educational dialogue and communication between researchers and teachers of Kazakhstan and Arab countries; general scientific approaches in preserving historical and cultural and spiritual heritage; cooperation between Kazakhstan and the Arab countries; and traditional and innovative methods of teaching Arabic language and literature.

First Postdoctoral Researcher of ICCES-China Completes Research under CAS PIFI Fellowship

In January 2017, Dr. Bushra Khalid, the first foreign postdoctoral researcher under Chinese Academy of Sciences President's International Fellowship Initiative (CAS PIFI) at International Center for Climate Change and Environment Sciences (ICCES), China, completed her research work spanning over 20 months. Dr. Bushra Khalid got her degree in Ph.D. in Meteorology from COMSATS Institute of Information Technology, Islamabad, Pakistan, in 2014. She then joined ICCES under support of CAS President's Fellowship Program in 2015.

Under the kind supervision of Prof. Bueh Cholaw, Deputy Director, ICCES, Dr. Bushra studied the relationship of weather and societal factors with dengue transmission in various metropolitan cities of Pakistan; characterization of energy exchange parameters in Margalla Hills, National Park, Islamabad; and technique of numerical weather prediction and its verification by using various measures of skill scores.

During her research period, Dr. Bushra was awarded Gro Bruntland award in Taiwan, China, which is only awarded to five young female scientists for their contributions to public health or sustainable development in Asia annually. She was also reported by New York Times for her outstanding work on dengue transmission.

Science and Technology Exhibition Conducted by BCSIR-Bangladesh

Bangladesh Council for Scientific and Industrial Research held an exhibition on Science and Technology from 19th to 21st January 2017. On this occasion, a seminar on 'Biomass for Greener World' was organized by the Pulp and Paper Research Division of BCSIR Laboratories, Dhaka. The exhibition was attended by entrepreneurs from pulp, paper and allied industries of Bangladesh. Participants of the event interacted on current research and development in related fields, as well as its applications and contributions towards the industries.

Farmers of Paty do Alferes Participate in Field Day on Cowpea Co-organized by Embrapa Agrobiologia

On February 8, 2017, about 30 farmers in the vicinity of Paty do Alferes, a municipality in the center-south of the state of Rio de Janeiro, participated in a special field day on 'the cowpea culture and its potential for the region'. The day was organized to show the potential of cowpea culture to the local farmers, as despite the high location of Paty do Alferes, the culture develops very well there. The day was organized by Embrapa Agrobiologia in partnership with Pesagro-Rio, Emater-Rio, the Cedro Institute, the Institute for Community Development and Action (Idaco), the Rio de Janeiro Biological Farmers Association (Abio), and the Rio Rural Program of the City Hall of Paty do Alferes. The day was carried out at the experimental station of Pesagro-Rio in Avelar, district of the municipality.

Seeds of two cowpea varieties with potential for grain production were distributed to the participants and their use was demonstrated. The researchers conducting the field day also told the participants about biological nitrogen fixation and seed inoculation.

Some farmers took keen interest in the field day as they were interested in utilizing their land for produce other than vegetables and fruit, while others eager to test the inoculation.

The two types of seeds were planted, some with inoculation and some without. The planted seeds would be observed for their growth and productivity of plants.

Participants of the Field Day on Cowpea

RECENT ADVANCES IN ENHANCED PRODUCTION OF VALUE-ADDED COMPOUNDS FROM MEDICINAL PLANTS

Asma Nasib*

Plants are known for their uses for food, fibers, construction material and medicinal purposes, since pre-historic times. As the scientific knowledge regarding the biochemistry and molecular biology of the plants increased, man came to know that plants are capable of producing a large number of compounds, having numerous medicinal values. Hence plant-based chemicals have a very high potential to be used as drugs. These chemical compounds are called 'Secondary Metabolites'.

These secondary metabolites are chemically very diverse and can be classified as alkaloids, terpenes, antibiotics, volatile oils, resins, cardiac glycosides, tannins, sterols, saponins and phenolics, etc. They are proven to be very useful in pharmaceutical, agrochemical, food and fragrance industries (Zhang et al., 2005). The secondary metabolites produced from plants are known to play key functions associated with the physiology of plants, including adaptation of plants to their environment (Lewinsohn et al., 2001); determination of the quality of food (color, taste, aroma); colors and pigments of ornamental plants (Dixon, 1999); acquiring resistance against pests and diseases; attracting pollinators; and building symbiotic relationships with the microorganisms (Harborne, 2001).

Phytochemicals are also known for their various health improving and disease preventing properties, such as antioxidative, anticancer, anti-inflammatory, antibacterial, antifungal, antiviral and anticholesterol. Many compounds originally isolated from the plants are now used as drugs after refining, e.g., Paclitaxel, which is isolated from the *Taxus* species, exhibit anti-tumor activity (Verpoorte et al., 2000); and Nicotine, isolated from tobacco plant, is the most physiologically addictive drug used by humans. Caffeine, from coffee, tea and chocolate, is a central nervous system stimulant as well as mild diuretic. Triterpene digitalis isolated from Foxglove is an effective drug against congestive heart failure. The opium plant is known for the production of most abundant and potent painkiller, commonly known as morphine. Vincristine and Vinblastine, derived from Periwinkle (*Catharanthus roseus*), are strong antineoplastics and can be used to treat Hodgkin's disease and other different types of lymphomas (Rao et al., 2008).

Although research has been conducted by chemical industries for synthesis of some important plant-derived chemicals, a very little success has yet been achieved, and hence plants still are the main source of these compounds. Plant derived medicines are of great importance. The use of herbal medicines and natural products is rapidly increasing. Facts show that about 70% of the sold prescriptions are natural products or their derivatives. Because of this emerging trend among people, the world market for the plant extracts and isolated secondary metabolites exceeds 10 billion US dollars annually. More than 20,000 different chemicals are produced from plants, and about 1,600 new plant chemicals are discovered each year. The isolation of different compounds, important for agriculture, food and pharmaceutical industry along with optimization of a process capable for the large-scale production of these compounds, still needs to be explored.

The focus of this article is on different aspects regarding enhancement in production of these phytochemicals by applying different techniques and methodologies hyphenated with the plant cell suspension culture technique.

In the past few decades, great efforts have been made to produce valuable plant-derived chemicals by implication of different biotechnological tools. The *in vitro* culture technique, i.e., plant cell, tissue or organ culture, basically works on two properties exhibited by the plant cell, Plasticity and Totipotency. These two properties enable each cell of the plant to develop into a whole plant. Moreover, by adapting techniques, like *in vitro* regeneration and genetic transformation, enhanced production of bioactive metabolites is possible (Abdin & Kamalullah, 2006). The application of *in vitro* culture technique to grow plant tissues, organs and undifferentiated cells inducing plant derived chemical synthesis and accumulation is in much more practice as compared to the uses of plants grown in the natural environment (Zhang et al., 2005). Many strategies have been applied for the large scale culturing of the plant cells, from which valuable secondary metabolites can be extracted (Dixon, 1999).

Advancements in the field of tissue culture in combination with genetic transformation has opened new ways for high value bioactive metabolite production, for pharmaceuticals and nutraceuticals. Large scale production of metabolites using plant tissue culture is an attractive alternate to traditional methods of plantation, because it is independent of plant availability (Sajic et al., 2000; Kieran et al., 1997). Since this technique is a bit expensive and requires expertise, it is very important to develop a cost effective method which allows continuous generation of high yields from the cultured plant cells. There are many advantages of the cell culture system over the traditional production of plants. Some of these advantages are listed below:

*** About the Author:** Asma Nasib is a Biotechnologist at Plant Tissue Culture & Research Lab under Pakistan Defense Housing Authority, Karachi. Ms. Nasib established the facility and protocols for some elite ornamental as well as fruit plants, with a greenhouse which is equipped with mist irrigation system. She has a research experience of over 10 years in plant tissue culture of various ornamental and medicinal plants, and has a number of publications in the field.
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- Useful compounds can be produced under controlled conditions independent of climatic changes and soil conditions;
- Cultured cells would be free from microbes and insects;
- Cells of any plant could easily be multiplied to yield specific metabolites; and
- Automated control of cell growth and rational regulation of metabolite processes would reduce labor costs and improve productivity.

Research and advancement in the area of plant tissue culture technology for the production of a wide variety of pharmaceuticals is increasing exponentially. There are many successful attempts to produce some of these valuable compounds by plant cell suspension cultures, e.g., Taxol from *Taxus chinensis*; Ginseng from *Panax ginseng*; Vinblastine and Vincristine from *Catharanthus roseus*; Tanshinones from *Salvia miltiorrhiza*; Podophyllotoxin from *Podophyllum peltatum*; and Berberine from *Coptis japonica*, etc. (Zhao, et al., 2001 a & b).

Recent development in plant tissue culture technology indicates that transcriptional factors are new efficient molecular tools for plant metabolic engineering for the increment or decrement of valuable compounds (Gantet and Memelink, 2002). Combinatorial biosynthesis; a process of combining genes from different microorganisms for the production of novel and interesting metabolites is a new and emerging tool in production of valuable natural products. There are many pharmaceuticals in the market that are very expensive as the active ingredients in them are very rarely found in plants and very low in concentration. Research is being conducted to produce cost-effective alternatives of many pharmaceuticals. The technology utilizes important classes of mature products, i.e., alkaloids (vincristine, vinblastine), terpenoids (artemisinin, paclitaxel) and flavonoids. For single gene analysis, conventional strategies for expression profiling such as northern blot, reverse northern blot, reverse nuclease protection, enzyme linked immunosorbent assay (ELISA), western blot, *in situ* hybridization and immunohistochemsitry are optimized. However, there are chances for modification of at least some of these techniques for multiplexing. Hence the method becomes increasingly burdensome. For analysis of expression of genome, it is necessary to widen technologies having high degree of automation, since in any living organism thousands of genes and their product functions in an intricate and orchestrated way. In response to the need for a high-throughput, efficient and comprehensive strategy, that can simultaneously measure all the genes or a large defined subset encoded by a genome DNA, microarrays has been developed (Schena et al.,1995; Schena et al., 1996). The technique has been used in many physiological and pathological conditions, leading to mining of novel genes and molecular markers for diagnosis, prediction or prognosis of those specific states (Mathias, 2004).

For commercial exploitation of secondary metabolites the potentials of *in vitro* plant cell culture system has been used. Micro-propagation in combination with genetic engineering provides a method of genetic transformation for many important medicinal plants and species which result in increased production of bioactive compounds using bioreactors. The past decade has witnessed great breakthrough in plant genetic-transformation technology. Application of genetic transformation with combinatorial biosynthesis strategies, for production and development of plant natural products at different levels in biosynthetic pathways, open the avenues for a new era of possibilities. DNA microarray has the potential for application in different phases of herbal drug discovery and development. These tools would certainly be of increasing importance in the field of medicinal plant biotechnology research in near future.

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SCIENCE, TECHNOLOGY AND DEVELOPMENT

Discovery of Earth-Sized Planets in Habitable Zone

The National Aeronautics and Space Administration (NASA) revealed this February the discovery of first ever known system comprising of seven earth sized planets revolving around a single star, through Spitzer Space Telescope (*Science Daily*, February 22, 2017). The scientists are positive that out of these seven planets, three are located in habitable zone, which refers to the area around the star of the planet it is most likely for a rocky planet to have liquid water. This discovery is in fact the first of its kind because up till now, it is the greatest number of habitable planets around a single star outside our solar system.

Although the scientists claim that all of these seven planets might possess liquid water which is vital for presence of life, but highest chances for existence of water lie with the three found in habitable zone. This system of planets exists at a distance of around 40 light years or 235 trillion miles from earth. It is found in the constellation Aquarius, which is relatively closer to Earth. Spritzer data was used to figure out the precise size as well as the density of planets which suggest that these planets are likely to be rocky and rich in water. The star around which these planets revolve, is cooler as compared to our sun, hence it is likely that water may exist in liquid form even in the planets nearer to it, unlike Mercury and Venus.

Controlling the Plant Pests through Green Technology

Biological control of pests is one of the aspects of modern green technology. A research has been conducted by researchers at University of Queensland, Sydney, Australia, to control plant pests and insects without the use of harmful pesticides and insecticides. An interesting aspect of this research is that nano sized biodegradable clay has been produced which contains double stranded ribonucleic acid (dsRNA). It can be a cost-effective and clean alternative to commercial pesticides (*SciDev.Net*, January 20, 2017). For killing viral pests of tobacco plants, a green silencing spray also known as BioClay which include combination of biomolecules, has been used. When it is sprayed on plants, viral ds RNA, which is very specific for viruses, releases from the nanosheet and activates natural defense mechanism of plants due to which the dsRNA is chopped into pieces. This chopped dsRNA attacks RNA viruses without altering the plant genome.

Another method of insect control has recently been innovated by agro-biotechnologists and entomologists at the Pakistani chapter of the UK-based Centre for Agriculture and Bioscience International (CABI). Paracoccus marginatus, the papaya mealybug has been a serious threat to papaya yield for many years. Agro-biotechnologists from the country decided to get rid of this pest biologically. Hence Acerophagus papaye has been introduced to control mealybug infestation. It is a small parasitoid whose larvae parasitize the mealybug and kill it (*SciDev.Net*, January 04, 2017).

It is a non-laborious, highly affordable process and the fact that it is self-sustainable process, makes it the method of choice. With this innovation in pest control technology, farmers can now also increase their profit because they do not require spending money on pesticides.

Flying Airplanes on Biofuel

According to a *SciDev.Net* news (February 27, 2017), researchers in Cairo, Egypt, have produced a biofuel which might be suitable for aeroplanes. According to the report, biodiesel from the seeds of Jatropha trees has been produced. Jatropha is a non-edible tree for both human and animals. It grows in sandy desert soils and can be irrigated by sewage water.

The Jatropha biodiesel has different properties, including viscosity, density and combustion degree, when compared to traditional diesel. It, therefore, has to go through simple chemical processes to be adapted for running engines. The biodiesel which has been produced can also be used in vehicles and cars. By enhancing its resistance towards freezing, this fuel can be used in jet engines. This research is motivated by a desire to considerably reduce carbon dioxide emission in the country by 2050.

Although, at this time, the price of biofuel produced by Jatropha is quite high because of different procedures used in its refining, however innovation in procedures and elimination of materials used to lower freezing point of fuel by adding hydrogen, might decrease the price. It is hoped that after completion of all industrial experiments, locally manufactured biofuel will be used in airplanes by the end of 2017.

PROFILE OF MEMBER COMSATS' TECHNICAL ADVISORY COMMITTEE

DR. MOCTAR TOURE, NATIONAL ACADEMY OF SCIENCES, SENEGAL

An esteemed member of COMSATS Technical Advisory Committee, Dr. Moctar Toure is currently, inter alia, serving as the Vice President for Africa in the Governing Council of the TWAS, and is an active member of the Senegalese National Academy of Sciences (SNAS) and the African Academy of Sciences (AAS).

Moctar Toure was born in Dakar, Senegal, in 1944. He completed his B.Sc. in Biology and Natural Sciences from University of Orleans, France, in the year 1967. He continued his education and completed his MS in Agronomy and Soil Sciences from Ecole Nationale Superieure Agromique de Rennes (ENSAR), France, in 1970. In just a matter of three years, he completed his Ph.D. in Soil Sciences from University of Rennes, France (1973). Thereafter, he served for a year as a Technical Advisor to the Extension Department on Education and Training, at the Ministry of Agriculture, Kingdom of Morocco, for a year.

Dr. Toure later joined Senegalese Institute for Agricultural Research (ISRA), first as Program Leader for Soil Chemistry and Nutrients Management (1974-1981) then as Director of National Rice Research Center (1975-1981), and later as Scientific Director (1985-1986). He served as Director General of ISRA from 1986 to 1988. From 1981 to 1985, he also worked at the Ministry of Science and Technology, Senegal, as Director of the Department of Agriculture and Agro-Industrial Research.

From 1976-1977, he was also a visiting scientist for Louisiana State University (Wetland Research Center) and University of California Riverside (US Soil Salinity Laboratory). Dr. Moctar Toure has served at the World Bank from 1989 to 2004 under capacities, including the Executive Secretary of the Special Program for African African Research (SPAAR). He then served as the Team Leader for Land and Water Resources at the Global Environment Facility (GEF) from 2004 to 2006.

Since retiring from World Bank and the GEF, Dr. Toure has been working as an Independent Consultant for many national and international institutions, including: the United Nations Development Program (UNDP); the United Nations Convention to Combat Desertification (UNCCD); the African Development Bank (AfDB); the International Fund for Agricultural Development (IFAD); the Government of Burkina Faso; The Government of Kenya; and the Alliance for the Green Revolution in Africa.

In addition to his membership to The World Academy of Science (TWAS) since 1985, Dr. Toure is also Founding member of SNAS, and AAS. From 2010 to 2016, he was the Vice President of the SNAS and Chair of the Agricultural Sciences Section. He recently served as the chairman of an AAS Independent Committee on governance issues.

Dr. Toure has been appointed Senior Fellow at the World Agro-forestry Center. As a researcher, Dr. Toure has worked in fields of Natural sciences, Agronomy, Soil Chemistry, Desertification and Land Management and Science Management. He has greatly contributed towards Science, academics and research institutions and programs in various capacities throughout his career. These include:

- Member of Science and Technology Committee for International Cooperation of European Economic Commission (1982-1985);
- Member and Vice Chairman of Scientific Advisory Committee under the Observatory for the Sahara and the Sahel (2006-2010);
- Member of UN inter-Agency Facilitation Committee under Global Mechanism of the United Nations Convention to Combat Desertification (UNCCD) (2001-2006);
- Member of the Executive Committee under Forum for Agricultural Research in Africa (FARA) (2000-2004);
- Member of the Advisory Committee for the Soil Health Program of the Alliance for Green Revolution in Africa (AGRA) (2011 to 2016);
- Member of Scientific Advisory Committee, then first Chairman of the West African Rice Research and Development Association (WARDA) (1976-1986);
- Member of Board of Trustees and member of Executive Committee of International Board for Plant Genetic Resources (IBPGR) (1986-1992);
- Member of Board of Trustees of International Center for Research on Agro-Forestry (ICRAF) (1987-1993);
- Member of Board of Trustees of International Center for Insect Physiology and Ecology (ICIPE) and Vice Chairman of the Board (1985-1991);
- Member of Board of Trustees of International Board for Soil Research and Management (IBSRAM), served as Chairperson of the nomination committee and member of the Executive Committee from (1989-1995);
- Member and Chairman of the Board of Directors of Africa Harvest Biotech Foundation International (2010 to 2016).

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COMSATS' BRIEF AND ANNOUNCEMENTS

Selected Forthcoming Scientific Events in COMSATS' Countries

26 - 27 April 2017	2nd International Conference on Agriculture, Food Security, and Biotechnology, Islamabad, Pakistan ***(www.comsats.org)***
20 - 24 May 2017	Modern Trends in Mathematical Crystallography – 2nd Manila International Workshop on Mathematical Crystallography, Manila, Philippines ***(www.crystallography.fr/mathcryst/manila2017.php)***
24 - 26 May 2017	AFRICACRYPT 2017 — 9th International Conference on Cryptology and Information Security, Dakar, Senegal ***(https://sites.google.com/site/africacrypt2017/)***
11 -14 July 2017	Geo4Africa Summit 2017, Kampala, Uganda ***(http://geo4africa.com)***

20th Meeting of COMSATS Coordinating Council Cairo, Egypt, 14-15 May 2017

COMSATS is pleased to announce the convening of the 20th meeting of its Coordinating Council, in Cairo, Egypt, on 14-15 May 2017, to be hosted by COMSATS' Centre of Excellence, the National Research Centre (NRC), Egypt. The Council would review the activities of COMSATS' Network since its last meeting, follow up on the decisions and recommendations made in the previous meeting, and outline the future course of action.

For more information on the Council meeting, the members or their representatives may contact Mr. Tajammul Hussain, Advisor (Programmes) COMSATS, over his email (tajammul@comsats.org).

Scholarships offered by COMSATS' Centres of Excellence for Member States

COMSATS Institute of Information Technology (CIIT), Pakistan, offers 100 scholarships for students/researchers for postgraduate studies in all disciplines offered by the university at its 7 campuses, as well as five post-doctoral fellowships.

The Iranian Research Organization for Science and Technology (IROST), Iran, offers 7 Ph.D scholarships [4 fully paid and 3 partially paid (50%)] and five-post-doctoral fellowships in disciplines offered by the Organization.

The International Center for Chemical and Biological Science (ICCBS), Pakistan, offers scholarships for MS and Ph.D studies in disciplines offered by the Center.

For more details, please write to Mr. Tajammul Hussain, Advisor (Programmes), COMSATS Secretariat at tajammul@comsats.org.

Science Vision - Call for Papers

COMSATS invites scholarly contribution for Volume 22 of its bi-annual journal, Science Vision, which aims at highlighting the important scientific and technological developments having a bearing on socio-economic conditions of the people.

For more information, please visit the journal's website: **www.sciencevision.org.pk**.

A BRIEF ON COMSATS

The Commission on Science and Technology for Sustainable Development in the South (COMSATS) is an intergovernmental organization, with its Secretariat located in Islamabad, Pakistan.

COMSATS, currently, has 24 developing countries as its members, spread across three continents, i.e., Latin America, Africa and Asia. A network, of 20 International S&T Centres of Excellence, is also affiliated with COMSATS to contribute to scientific development of its Member States. The mission of COMSATS is to help create a world where all nations are at peace with one another and capable of providing good quality of life to their populations in a sustainable way using modern S&T resources. For detailed information, please visit COMSATS' website: www.comsats.org.

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