



جامعة نِزْوَى
University of Nizwa

Research Annual Report - 2022

Deanship of Research



“On top of our national priority is the education sector, with all its types and levels.

It will receive full attention, and it will be provided with the supporting environment which motivates research and innovation”.

His Majesty
Sultan Haitham bin Tarik Al Said



His Majesty
Sultan Haitham bin Tarik Al Said

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Professor Dr. Ahmed Al-Harrasi
Vice Chancellor for Graduate Studies,
Research and External Relations
University of Nizwa

FOREWORD

It gives me great pleasure to present to you the Annual Research Report of the University of Nizwa (UoN) for the academic year 2022. Despite all challenges we were faced with as a result of the pandemic and the substantial decrease in funding, the University has maintained outstanding research outcomes in terms of volume, quality and impact. This has remarkably improved the university academic ranking.

Based on the scimagoir.com (world research ranking), the UoN was ranked 404 in 2022 and ranked the first in Oman by the nature index. Furthermore, in QS 2022 Arab world ranking, UoN has been ranked the second in Oman and 81-90 in the Arab world. 11 of our faculty members have been named by Stanford University's global list of top 2% Scientists in year 2021-2022. Research at UoN aims at creating an innovative research culture where capacities are developed, collaboration and networking among researchers are fostered, and where research outcomes are geared toward social economic growth. It has therefore quantified the three major research components: research infrastructure, funding and human resources to produce effective research development.

I thank everyone who made our research story a great success in spite of all challenges.

Ahmed Al Harrasi

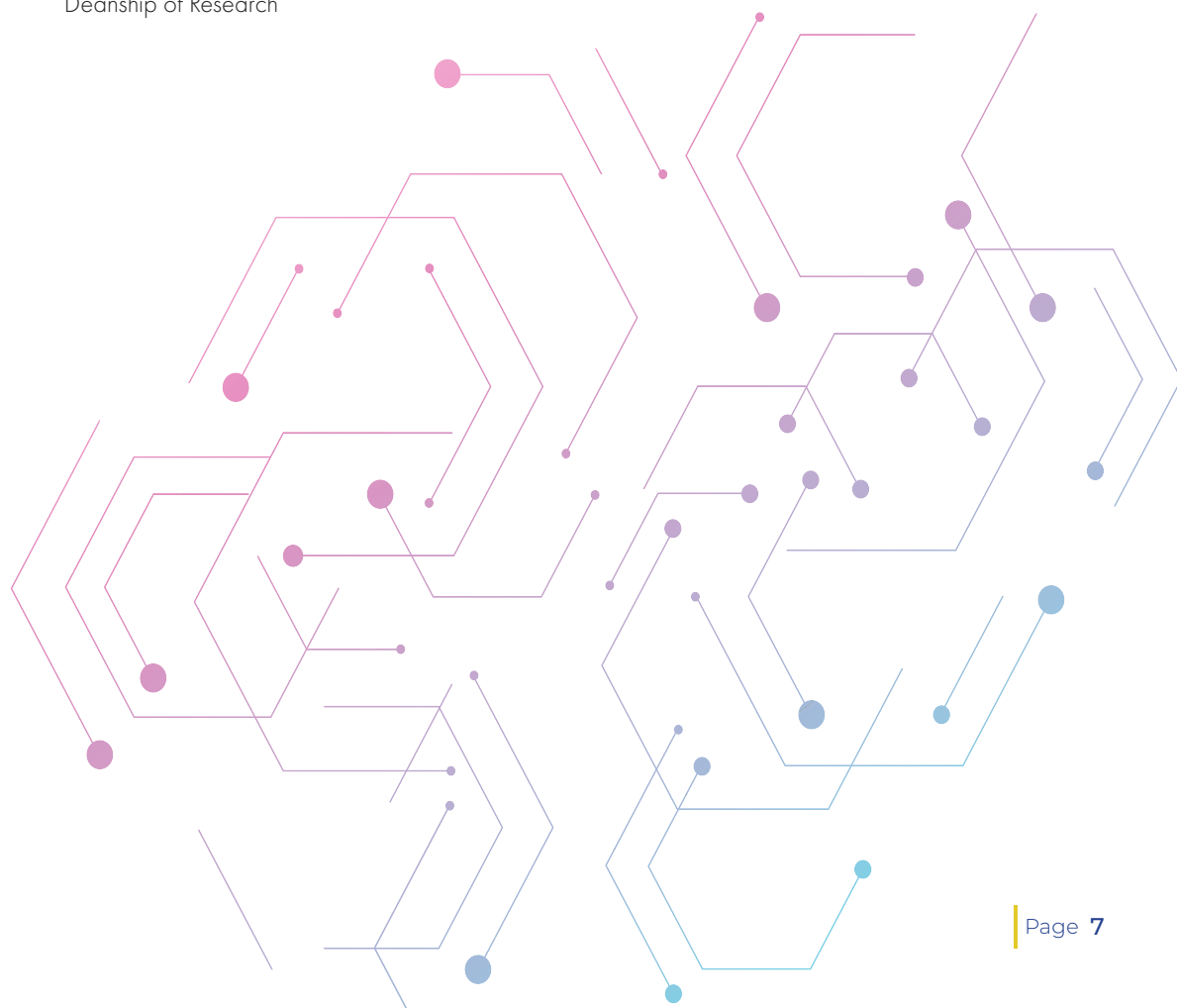
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Abbreviations

UoN	University of Nizwa
CAS-A/S	College of Arts and Sciences –Arts/Sciences
CEA	College of Engineering and Architecture
CEMIS	Collage of Economy management and information system
CPN-P/N	College of Pharmacy and Nursing- Pharmacy/Nursing
GRG	Graduates Research Grants
NCMSM	National Chair of Materials Science and Metallurgy
NMSRC	Natural and Medical Sciences Research Centre
RG	Research Grants
TRC	The Research Council
URG	Undergraduates Research Grants
UCASA	UNESCO Chair on Aflaj Studies – Archaeohydrology
DoR	Deanship of Research



University Ranking



1.1 UoN Scimago Ranking

The research ranking refers to the volume, impact and quality of the institution’s research output. As Shown in the Figure 1 below, a significant growth on research ranking from 2016-2022. The research ranking reached 404 in 2022, ranked number 2 in the Sultanate of Oman.



Figure 1: Research and Innovation ranking. Research rank 404, a significant growth from 2020 to 2022. Source: Scimago Institutions Ranking - <https://www.scimagoir.com/institution.php?idp=11518>



Figure 1.2: Innovation Ranking, Ranked 408. Significant increase from 2021. Source: Scimago Institutions Ranking - <https://www.scimagoir.com/institution.php?idp=11518>

1.2 UoN Nature Index Ranking

Table 1.1: Source: *nature index* - <https://www.natureindex.com/country-outputs/Oman>

Institution	Count	Share
1. University of Nizwa	8	4.43
2. Sultan Qaboos University (SQU)	10	1.95
3. University of Technology and Applied Sciences, Salalah	1	0.25
4. University of Technology and Applied Sciences, Muscat	1	0.25
5. Alara Resources Ltd.	2	0.10
6. Oman Ministry of Health	1	0.09
7. Oman Water Society	2	0.05
8. Middle East Desalination Research Center (MEDRC)	2	0.05

1.3 Ranked by Subject areas

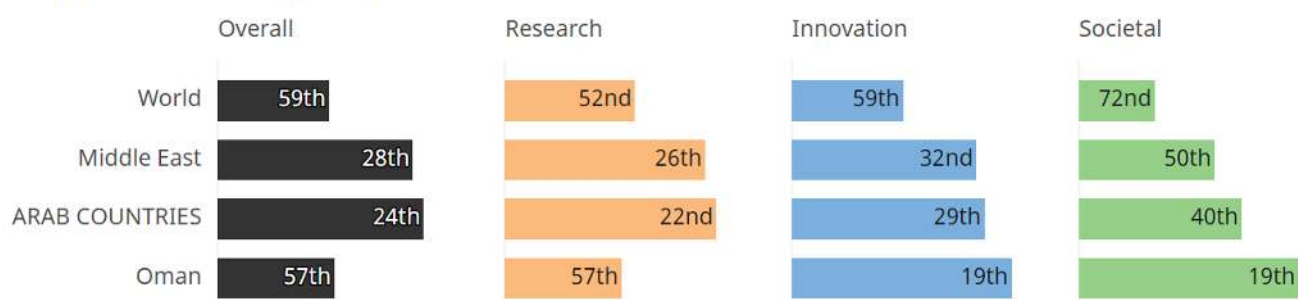
Table 2: Source: Scimago Institutions Ranking - <https://www.scimagoir.com/institution.php?idp=11518>

Area	In Oman
1. Earth and Planetary Sciences	1 st
2. Energy	1 st
3. Physics and Astronomy	1 st
4. Biochemistry, Genetics and Molecular Biology	2 nd
5. Chemistry	2 nd
6. Environmental Science	2 nd
7. Pharmacology, Toxicology and Pharmaceutics	2 nd
8. Economics, Econometrics and Finance	3 rd
9. Business, Management and Accounting	5 th
10. Social Sciences	5 th

1.4 Compared to its context

The result of the evaluation of the institution can be compared to obtain a view of the country, the region to which it belongs and the institutions of the world, placing it in their respective positions.

Compared to All sectors (percentiles)



Compared to Universities sector (percentiles)

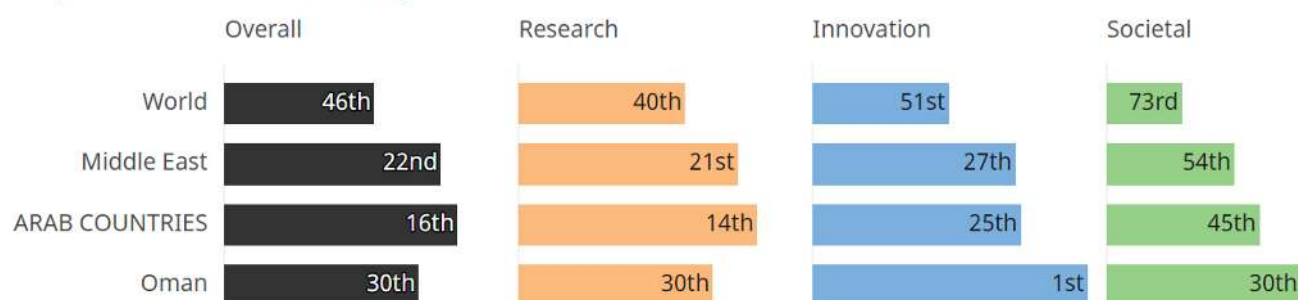


Figure 2: Source: Scimago Institutions Ranking - <https://www.scimagoir.com/institution.php?idp=11518>

Research & Innovation

2.



2. Towards a rich culture of Research and Innovation



140

Research collaborations



65

HEIs including:

University of Cambridge, University of Oxford, & Harvard University

27

State-of-the-art research labs



6

Innovation Incubators



2

Research Centers



1

Research Chairs



11

Alkhalil Journal Issued volumes



75 Million OMR

Total Research Expenditure



28

Graduate programs at the PhD, master's and higher diploma levels



5%

Research and Innovation fund allocated 5% of UoN annual revenues

2.1 UoN Research & Innovation Achievements 2009-2022

11 Patents
filed1520 Conferences
attended2430 Refereed papers published in
indexed journals with
high impact factors212 Books and
book chapters published

3.

Research Grants



3.1 Faculty/Researcher Grants

Table 3.1: Total Research Grants in 2021/2022

	External	Internal
Number of Research Grants	36	5
Amount of Research Grants	239,243	27,210

3.2 Total Research Expenditure

Expenses	Amount
Infrastructure & Equipment	742,796.73
Human Resources cost	3,821,457.00
Consultancy cost	5,875.908
External Grant cost	167,567.50
Labs running cost	321,720.00
Overhead	140,573.939
Total Expenses OMR	5,452,250.31

3.3 Internal Funding

Project Title	College/Center	Amount
Groundwater potential mapping: using geospatial models in the Nizwa watershed, Sultanate of Oman <i>Dr Khalifa Al-Kindi</i>	UNESCO Chair on Aflaj Studies-Archeo-hydrology	4,900
Targeting energy metabolism to mitigate breast cancer aggressiveness by bioactive compounds <i>Dr Shaik Rehamn</i>	Natural & Medical Sciences Research Center	15,000
Nanofluid convective flow and heat transfer controlled by some external and internal forces with a realistic approach. <i>Dhananjay yadav</i>	College of Arts and Sciences	400
Detecting and Mapping of Harmful Pesticides in the Highly Consumable Imported Fruit and Vegetables. <i>Dr Yahya Al-Rashdi</i>	College of Pharmacy & Nursing	6210
الأفلاج العمانية من خلال كتابي بيان الشرع والمصنف: دراسة في الأبعاد الحضارية ناصر الصقري	UNESCO Chair on Aflaj Studies-Archeo-hydrology	700

3.4 Government Sector Funding

3.4.1 Ministries Funding

Project Title	College/Center	Amount
LAMAD Project <i>Dr Abdullah Al-Ghafri</i>	Ministry of Agriculture, Fisheries and Water Resources	30,000
Establishment and Preservation of Microbial Culture Collection for Basic and Applied Research (Phase 2) <i>Abullah Al-Hatmi</i>	MOHRI/Mawarid	30,900



3.4.2 Research Grant

Project Title	Organization	Amount
The Issues of Chronicling Omani Literature <i>Issa Al-Howqani</i>	MOHRI	2,000.00
Design, synthesis and molecular modeling of novel 1H-1,2,3-triazole hybrid derivatives of 3-O-acetyl-11-keto- β -boswellic acid and 11-keto- β -boswellic acid: A new class of Anti-cancer/Anti-inflammatory active analogues. <i>AVULA, SATYA KUMAR</i>	MOHRI	10,200.00
Understanding Entrepreneurial Phenomena in Oman through Global Entrepreneurship Monitor <i>Dr Abdullah Al-Shukaili</i>	MOHRI	5,450.00
SCREENING ANTIBIOTIC RESIDUES IN CHICKEN MEAT IN OMAN, <i>Dr Abu Sham Ahmed</i>	MOHRI	4,725.00
Value Added Tax in Oman: An approach to practical solution. <i>Dr Sadriwala, Kaneez</i>	MOHRI	1,500.00
Plant Protein Production in The Oman: Future Perspective For Proteinaceous Nutrient Supplements <i>Dr Mohanta, Tapan</i>	MOHRI	11,800.00
Study on Compressive, Tensile and Flexural strength of Ultra High Performance Fiber Concrete (UHPCF) <i>Dr Imran Latif Qureshi</i>	MOHRI	10,700.00
Administrative performance in education directorates in the Sultanate of Oman and its relationship to the job stability and self-efficacy. <i>Dr Rubaa Al-Thehli</i>	MOHRI	3,000.00
Synergy of ground based and satellite measurements for atmospheric aerosol monitoring over middle east <i>Dr Dayanandan, Baiju</i>	MOHRI	6,083.49
Electrochemical synthesis of semiconducting transition metal dichalcogenides in deep eutectic solvents for advanced applications <i>Dr. Dunaboyina, Sri Maha</i>	MOHRI	10,000.00
Natural Products as Potential Sources for New Drug Leads: A Case study of Selected Omani Medicinal Plants <i>Dr. Najeeb Rehman</i>	MOHRI	10,500.00
In situ osteochondral interface regeneration using layer-by-layer 3D-bioprinted scaffold through host stem cell recruitment: In vivo study in the Rabbit model <i>Dr. Sulieman Al-Hashmi</i>	MOHRI	6,940.00
Investigating the functional and biochemical properties of cystic fibrosis mutations from the Middle East: concept for the establishment of a reference research laboratory <i>Dr. Majid Al Salamani</i>	MOHRI	15,000.00

3.4.3 Graduation Research Program

Project Title	Organization	Amount
The Earth's outer radiation belt response to the geomagnetic storm Expand additional information <i>ALSUTI, BADAR MOHAMMED</i>	MOHRI	2,000.00
Mitochondrial Genome Sequencing of Endemic Omani Coral Reefs Species <i>Ahmed Al- Rawahi</i>	MOHRI	3,000.00
The assessment of anti-inflammatory function of Incensole and Incensole Acetate via a microfluidic-on-a-chip platform; in vitro melanoma skin cancer metastasis model <i>ALKindi, Juhaina</i>	MOHRI	3,000.00
Design and fabrication of a 3-5KW efficient hybrid prototype solar- hydrogen generator for the enhancement of power sector in Oman. <i>Alhinai, Abdulhakim</i>	MOHRI	3,000.00
FANET-based Surveillance of Sea Turtles System (FSSTS) at Sultanate of Oman <i>SARAHAN GHASSAN AL MAYYAH, KHALFAN</i>	MOHRI	1,500.00
Relationship between leader-behavior and firm performance during crisis: A study of Small and Medium Enterprises (SMEs) in Oman during COVID-19 <i>Al Busaidi, Talal</i>	MOHRI	1,500.00
The Earth's outer radiation belt response to the geomagnetic storm Expand additional information <i>ALSUTI, BADAR MOHAMMED</i>	MOHRI	2,000.00
Burnout and Its Relation to Self-Efficacy among Mothers of Students with Disabilities at Sultanate of Oman <i>Alkalbani, Intisar</i>	MOHRI	1,600.00
Conflict of Roles and its relationship to self-efficacy among mothers of children with disabilities at the Sultanate of Oman <i>AL kindi, Amira</i>	MOHRI	1,450.00

3.4.4 Undergraduate Research Program

Project Title	Organization	Amount
Attitudes of Students of the First Cycle and their Teachers Towards distance learning during the Corona pandemic <i>Al-Aamri, Raida</i>	MOHRI	1,150.00
Prevention of abdominal adhesion bands by β -boswellic acid (BA) loaded 3D-printed scaffold <i>Albalushi, Alia</i>	MOHRI	1,500.00
The platforms electronic and its role in developing academic achievement for students in the first cycle at Sultanate of Oman <i>AL MANHI, SHAIMA</i>	MOHRI	900.00
The level of using active learning strategies among of the teachers of the first cycle and its relationship to academic achievement of students <i>Al khamisi, kawther</i>	MOHRI	820.00
Isolation Structure Elucidation Biological Activities and Quantification of the Active Constituents of Haplophyllum Tuberculatum. <i>AL SENAI, SHEIKHA</i>	MOHRI	1,500.00

E-Learning Stress and coping strategies among the Higher Education Students: Evidence from Oman <i>MUTIB WAHISH AL DUREY</i>	MOHRI	1,500.00
Influence of chemical reaction and internal heating on the double diffusive convective motion in porous enclosures soaked with non-Newtonian fluid <i>ALSIYABI, MAIMOUNA</i>	MOHRI	700.00
Investigating a mobile peer tutoring training model for foreign languages <i>Al Luwaihi, Nidhal</i>	MOHRI	930.00
Improving active and lifelong learning skills in foreign languages with mobile tablet devices <i>Al mazroui, Aisha</i>	MOHRI	930.00
Characterization of atmospheric aerosols and their direct radiative implications over Middle-East <i>Nasser Al-Abri</i>	MOHRI	1,100.00

3.5 Private Sector Funding

Project Title	Organization	Amount
Ejadd Challenge : De- Oxygenation for Produced water Project <i>Dr. Salam Kadhim Hassan Al Dawery</i>	Ejadd	41,700.00

3.6 International Funding

Project Title	Organization	Amount
Places of literature: German - Omani perspectives on literature, history, language <i>Dr Khairuddin Mohammed Abdulhamid Abdulhadi</i>	German Academic Exchange Service (DAAD)	8,464.61

3.7 Students Grants

3.7.1 Distribution of URG Projects by College and Research Center

Academic year	CAS	CEMIS	CEA	CPN	Chairs	Total
2021/2022	8	2	0	0	1	11

3.7.2 Bachelor Graduation Projects

Academic year	CAS	CEMIS	CEA	CPN	Total
2021/2022	315	106	43	77	650

3.7.3 URG Projects Fund

	2021 /2022	Total
Number of Research Grants	11	93
Total Fund in OMR	12,530	179516

4.

Research Outcome



Research outcomes are presented below in terms of the number of journal papers, journal papers per faculty, the number of papers presented in international and national conferences, the number of books/book chapters, and the quality of journals.

4.1 Papers Published

UoN Journal to academic staff per year in 2017-2022

Academic Year	Publications	Journal Papers to Academic Staff	Percentage Increase
2017/18	274	1.61	0.57
2018/19	258	1.05	-0.56
2019/20	297	1.2	0.15
2020/21	320	1.4	0.2
2021/22	494	02	0.6

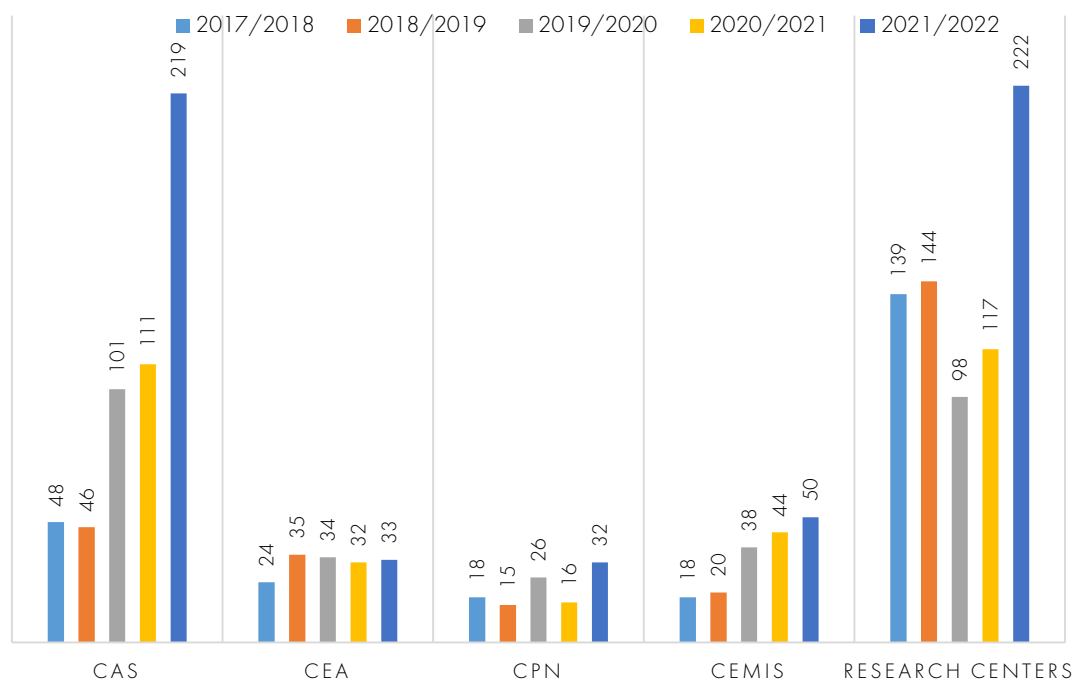


Figure 4.1.1: Source: Distribution of Journal Papers per College per year (2017/18– 2021/2022). Research centre shows the highest publications followed by CAS, CEMIS, CEA, and CPN.

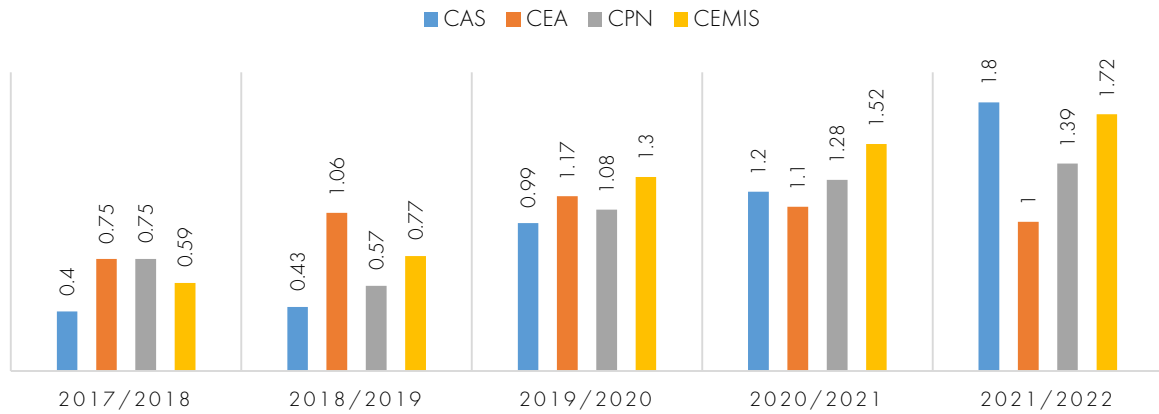


Figure 4.1.2: Journal Papers to Faculty Ratio by College per year (2017/18– 2021/2022)

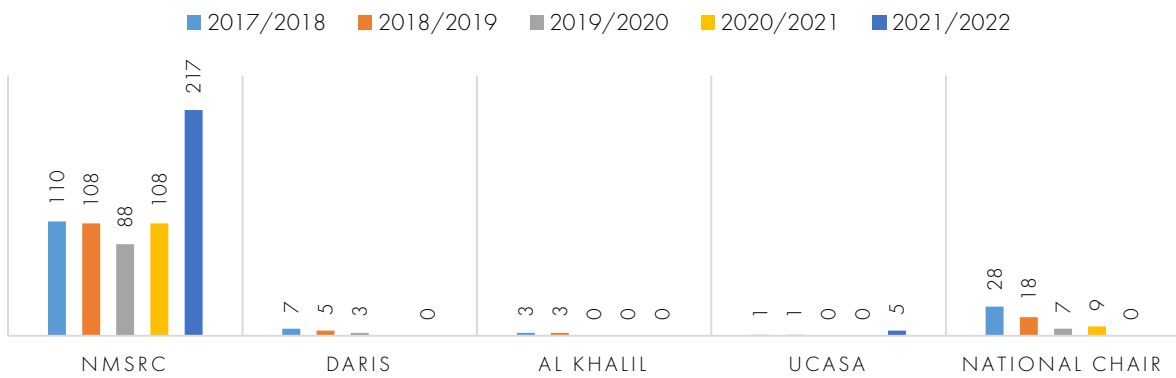


Figure 4.1.3: Distribution of Journal Papers by Research Centre and Unit per year (2017/18– 2021/2022): NMSRC is high in publication among all research centre.

- The National Chair of Materials Science and Metallurgy has been merged with the Natural and Medical Sciences Research Center.

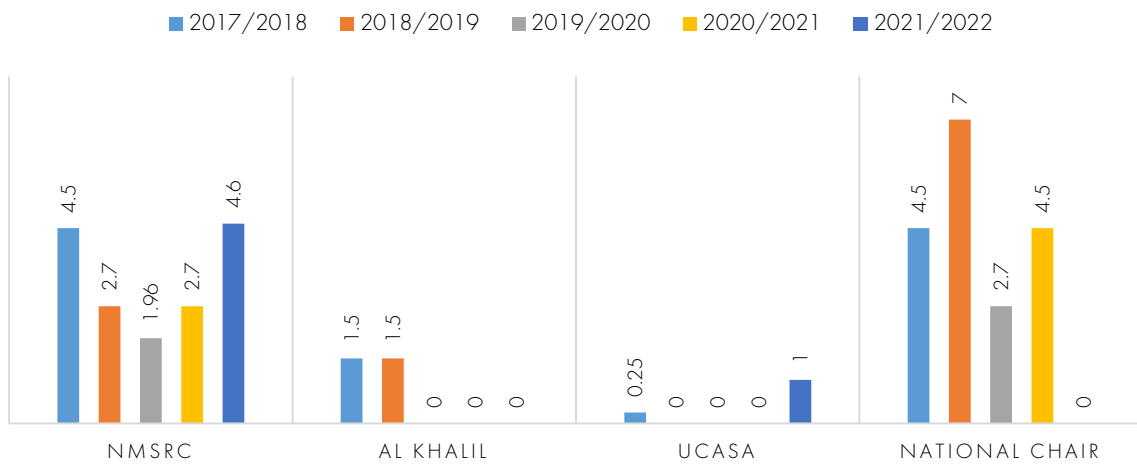


Figure 4.1.4: Journal Papers to Faculty Ratio by Research Center and Unit per year (2021/2022).

	2021/2022
Average Journal Papers to Faculty Ratio	2

4.2 Student's Publications

Table 1: Papers Published by Undergraduate Students in International Journals based on the Graduation Project 2021/2022

Year/college	CAS	CEA	CPN	CEMIS	UoN
2021/2022	7	5	11	12	35

Table 2: Papers Published by Graduate Students in International Journals 2021/2022

Year/college	CAS	CEA	CPN	CEMIS	UoN
2021/2022	27	1	0	6	34

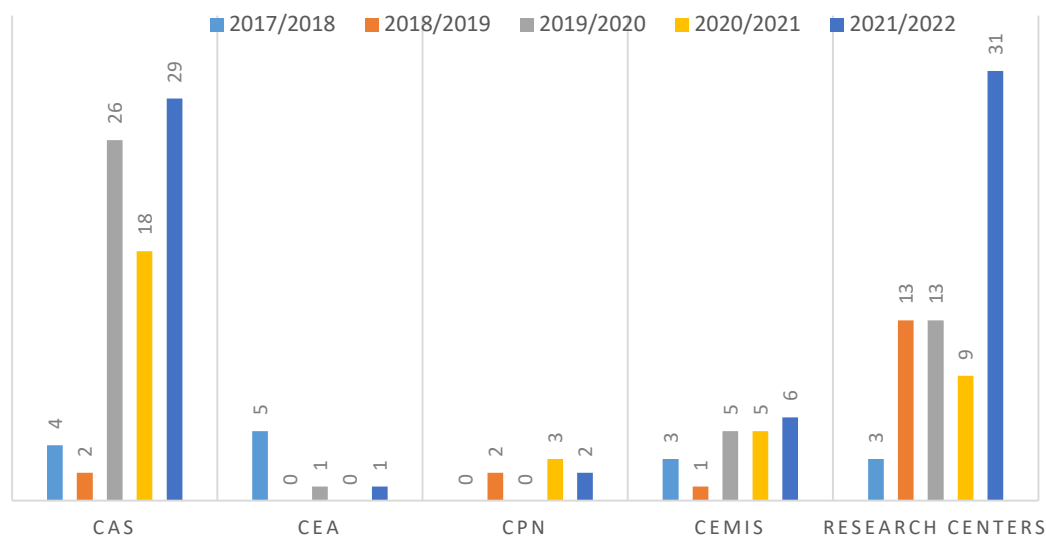


Figure 4.2.1: Number of books published per college/centre in (2017/18– 2021/2022)

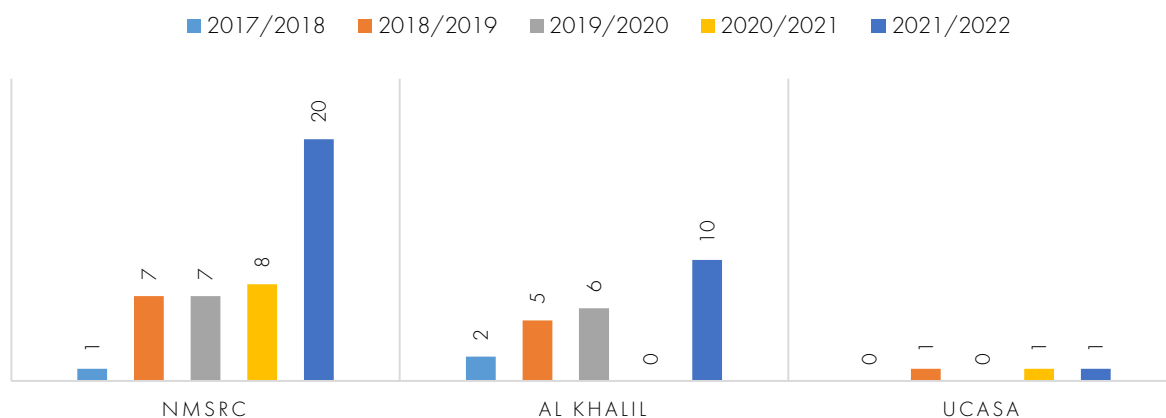


Figure 4.2.2: Number of books published per research centers (2017/18– 2021/2022)

Awards & Conferences

5.



5.1 Awards Achieved

Award Title	Awarded by	Faculty	Students	College/ Research Center
"German Patent" A push pull osmotic pump system for formulation of Lornoxicam and capsaicin.	Germany	Dr. A. Shyam Sundar.	-	CPN
National research award	Ministry of higher education, research, and innovation	Saeid Vakilian, Fatemeh jamshidi-adevani, Juhaina Al-kindj, Sulaiman Al-hashmi	Afra Al Yahmadi	NMSRC
Best Paper 2021	Ministry of higher education, research, and innovation	Dr. Najeeb Ur Rehman	-	NMRSC
Quality of Care in Acute Myocardial Infarction Patients and their Secondary Prevention treatment at Nizwa Hospital. 12/12/2021	10th Pharmaceutical Care Conference by Ministry of Health, Oman	Dr. Sabin Thomas	Samar Gamal Mohamed	CPN
German University of Bokhum for Valence Dictionary of Modern Arabic	German University of Bokhum	Dr. Khairuddin	-	CAS
The World Congress on Sciences and Applied Sciences (WCSAS 2022): Advances in Nanoscience and Nanotechnology	Qatar University	Dr. Fathima Hussain Jahir	-	CAS
Best Session Paper	University of Nizwa	Dr Qadir Bux alias Imran Latif Dr Naserallaeh Hassan	-	CEA
Best Paper Presentation	Environment and Social Welfare Society of Khajurah, India	Mustafa Malik	-	CEMIS
1 st place	Oman IoT and AI Challenge, organized by the University of Technology and Applied Sciences in Muscat	Sallam Osman Fageeri Khairy	Mohammed Juma Al Awaimri	CEMIS
Best prototype	Oman IoT and AI Challenge, organized by the University of Technology and Applied Sciences in Muscat	Sallam Osman Fageeri Khairy	Ibtisam Humaid Al Bahri	CEMIS

Literati Award Winners 2022
 Journal of Islamic Accounting and Business Research - Literati Award Winners 2022
 Mohammad Dulal Miah - CEMIS
 Emerald Publishing

5.2 National and International Conference Participations

Conferences attended 283 Papers presented 120

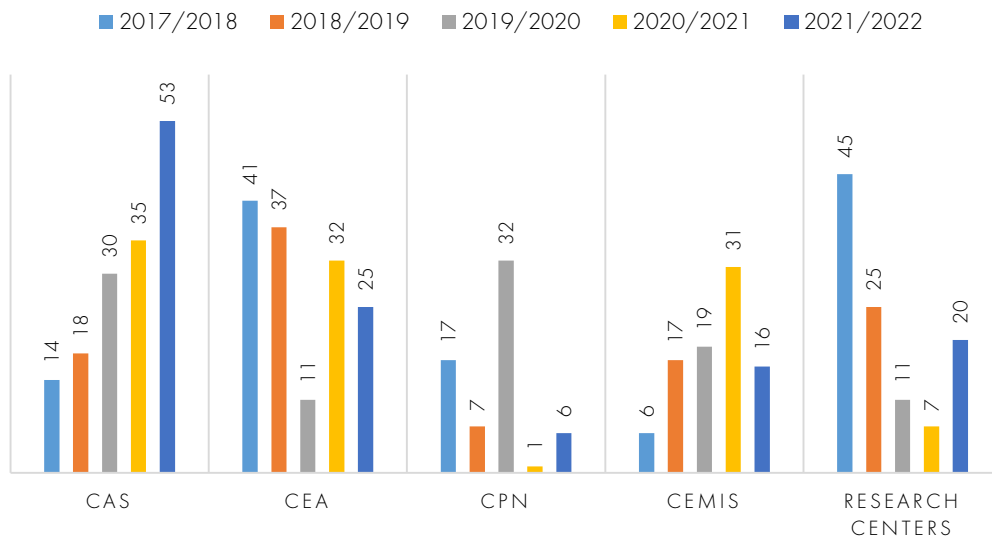


Figure 5.1: Conference papers by College/Research Centers (2017/18 – 2021/2022)

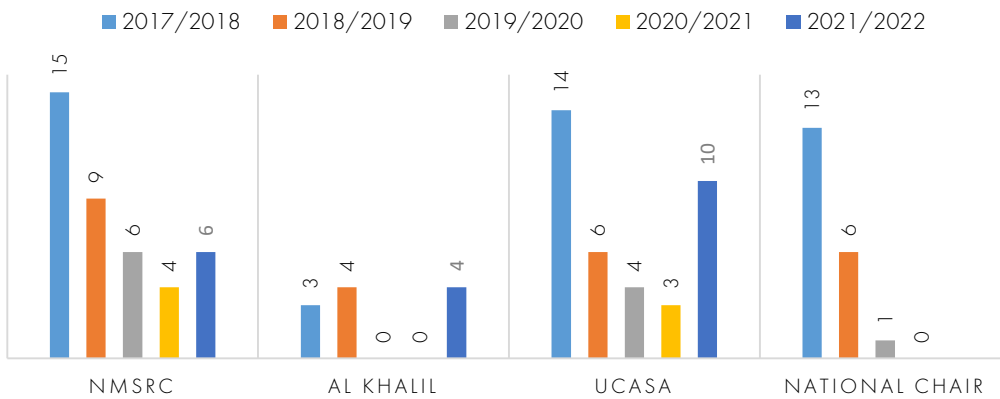


Figure 5.2: Chair/Centre Conference papers per year (2017/2018 – 2021/2022)

5.3 Seminars and Workshops

All colleges at the UoN conducted seminars and workshops. The total number of seminars and workshops during this academic year was **268**

Table 5.3: Number of Seminars and workshops by College/ Research Centres (2017/18-2021/2022)

Year/college	CAS		CEA		CPN		CEMIS		Research Centers		UoN	
	Seminars	Workshops	Seminars	Workshops	Seminars	Workshops	Seminars	Workshops	Seminars	Workshops	Seminars	Workshops
2017/18	3	1	24	2	5	14	12	6	32	22	76	45
2018/19	10	0	10	9	7	8	9	8	35	9	62	31
2019/20	10	26	26	34	32	40	8	9	13	18	89	127
2020/21	44	48	18	11	18	10	22	7	7	7	109	83
2021/22	88	46	21	15	13	3	18	9	19	36	159	109

5.4 Activities by DoR

- Series of workshops to all staff How to submit a Research Proposal to MoHERI -Almashariq auditorium. Oct 27 2021
- How to "Prepare Final year project report": For final year students
This a series of lectures for CEA, CEIMS and CAS.
- How to use RIMS to submit research proposal to Ministry of Higher Education Research and Innovation. Overview of RIMS in order to fill research proposal.
- Workshop: how to write a successful research proposal in Arabic languages (28 /12/21)
Element of successful research proposal was highlighted.
- Workshops for ethics committee 6 Jan 22, how to review ethically a research proposal involving human participants (online via google meet)
- Workshop Intellectual properties, Mr Mohana Al-Zihaimi, From ministry of higher education Research innovation on 6 Feb 22
- Workshop in Ethics of Research and publications 30 March 22

5.4.1 External lectures by DoR

- Webinar "Elements of a Successful Research Proposal. Conducted on Tuesday 25th Jan 2022 12:00-1:00 pm. UTAS Ibra
- Workshop on "Guidelines for preparing Senior/Graduation Project Report 22nd February 2022 (Tuesday) UTAS-Ibra

Research Excellence

6.



6.1 Highlights of Outstanding Achievements

Table 6.1: Stanford University of top 2% of world's scientists:

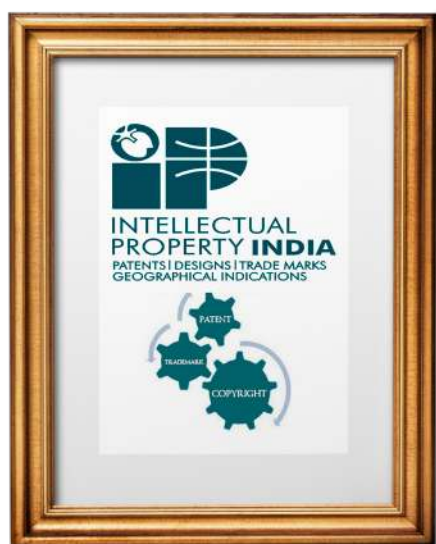
Author Name	World Rank	h-index 2020	hm-index 2020	field	subfield-1	subfield-2
Dr. Maurya, S. K.	27,271	15	9.6000	Physics & Astronomy	Nuclear & Particle Physics	Astronomy & Astrophysics
Dr. Khan, Abdul Latif	58,134	21	9.7865	Biology	Plant Biology & Botany	Microbiology
Dr. Hossain, Mohammad Amzad	89,361	11	6.6667	Clinical Medicine	Tropical Medicine	Plant Biology & Botany
Dr. Mohanta, Tapan Kumar	92,349	13	5.5401	Biology	Plant Biology & Botany	Microbiology
Dr. Das, Biswanath	95,070	42	23.9742	Chemistry	Organic Chemistry	General Chemistry
Prof. Al-Harrasi, Ahmed	131,186	15	7.9103	Chemistry	Organic Chemistry	Medicinal & Biomolecular Chemistry
Dr. Bhatia, Saurobh	137,754	6	4.8429	Chemistry	Medicinal & Biomolecular Chemistry	Pharmacology & Pharmacy
Prof. El-Karamany, Ahmed	199,829	24	15.5833	Engineering	Mechanical Engineering & Transports	General Physics
Dr. Yadav, Dhananjay	237,434	17	11.4833	Engineering	Mechanical Engineering & Transports	Chemical Engineering
Prof. Hussain, Javid	266,072	13	5.5458	Chemistry	Medicinal & Biomolecular Chemistry	Plant Biology & Botany
Dr. Abbas, Ghulam	269,808	13	4.8402	Chemistry	Medicinal & Biomolecular Chemistry	Pharmacology & Pharmacy

6.2 Patents

6.2.1 A system and method to improve the shelf life of freeze dried alkali treated *Calotropis Gigantea* milk

Prof. Ahmed Al Harrasi, Dr. Saurabh Bhatia

The present invention relates to a system and method to improve the shelf life of freeze dried alkali treated *Calotropis gigantea* milk. The method includes freeze drying of alkali treated *Calotropis gigantea* milk to improve its shelf life. The present approach improves the shelf life by using alkali pretreatment followed by the freeze drying of the sample.

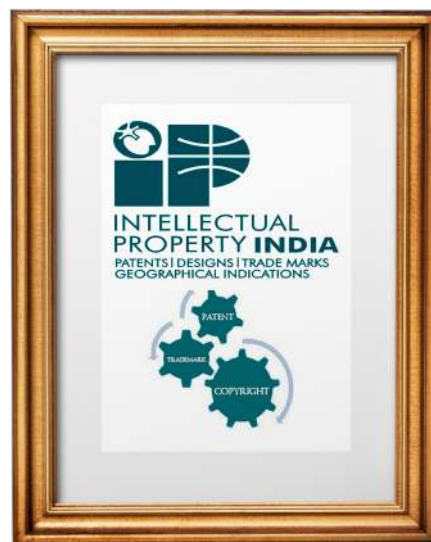


6.2.2 A nasal stick for lungs detoxification against air pollutants

Prof. Ahmed Al Harrasi, Dr. Saurabh Bhatia

The present invention relates to a cost-effective and portable nasal stick for lungs detoxification against air pollutants. The invention provides economic anti-air pollutant nasal inhaler stick to prevent the adverse effects of harmful pollutants. Stability (organoleptic such as color, solubility, refractive index, viscosity, aromatic behavior) studies for 3 months suggested that conditions proposed would be more suitable for the development of EO. Pharmacological assessment showed that optimal EOs blend significantly reduced carrageenan-induced paw oedema, reduced pro-in-

flammatory cytokines (IL-6 and TNF- α) and increased anti-inflammatory cytokines (IL-10). These findings demonstrated the considerable anti-inflammatory effects of blend.

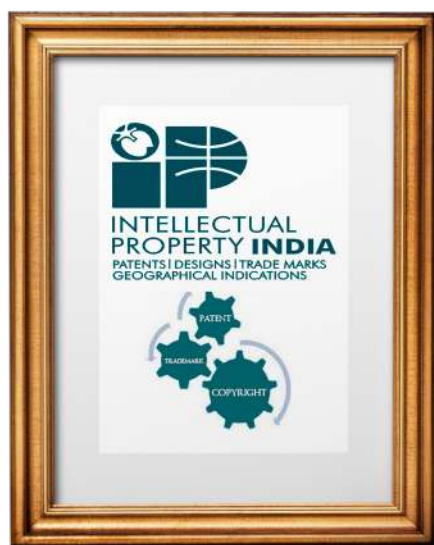


6.2.3 A Method for the Development of Maltodextrin and Gum Arabic Microencapsulated Freeze-Dried Latex from *Ficus racemosa* and Its Hepatorotective Effect

Prof. Ahmed Al Harrasi, Dr. Saurabh Bhatia

The present invention relates to the field of hepatoprotective effect of microencapsulated exudate obtained from *Ficus racemosa* (FR) by freeze drying: The present invention in particular relates to a method for maltodextrin (MD) and gum Arabic (GA) freeze dried microencapsulated exudate from FR. The present invention relates to a method for pretreated MD and GA encapsulated latex from *Ficus racemosa* and hepatoprotective effect of freeze dried MD and GA encapsulated latex from *Ficus racemosa*. The present scheme provides the hepatoprotective potential of freeze dried gummy exudate from *Ficus racemosa*. This novel method is followed by the encapsulation with MD and GA to increase the shelf life and improve its quality. Plant exudates are vulnerable against various environmental factors which can encourage the oxidation of chemical components. The present invention provides novel approach to prevent oxidation of chemical constituents by microencapsulation using lyophilization process and its further treatment. Optimized conditions which

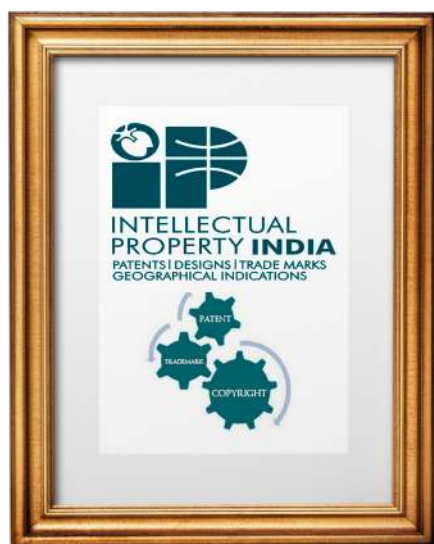
are used during microencapsulation remove the solvent at a very low temperature.



6.2.4 A sugar-free chewing gum to cure dental caries, pain and mouth ulcer

Prof. Ahmed Al Harrasi, Dr. Saurabh Bhatia

The present invention relates to a sugar-free chewing gum to cure dental caries, pain and mouth ulcer. The dental caries and mouth ulcer are treated by sugar-free chewing gum containing combination of plant extracts and essential oils. Portable sugar-free chewing gum can be utilized to treat and prevent various oral ailments and to maintain oral hygiene. This gum can also be used by diabetic patients suffering from severe periodontal disease.



6.2.5 A novel medicated plaster for the treatment of underlying skin complications

Prof. Ahmed Al Harrasi, Dr. Saurabh Bhatia

The present invention generally relates to a novel medicated plaster for the treatment of underlying skin complications. The invented POP is loaded with polystyrene microcapsules containing three drugs in combinations (neomycin, clotrimazole and sulindac) to treat the skin complications. Polystyrene is used to reduce the initial 'burst effect' of drug release from plaster of Paris implants and thus to extend the therapeutic release from one week to more than one month.



6.2.6 Australian Innovation Patent on Anthocyanin Food Color.

Dr. Tanveer Alam

The work drew attention from the Food Industry. When I was working on natural colors and found that synthetic colors used in FD&C (Food, Drugs & Cosmetics) are having more toxic effects, sometimes develop cancer and hyperactivity in children. In US and Europe, synthetic colors are totally banned for FD&C products. Keeping this thing in mind, I started my work on natural food colors for food industries. Recently I developed a new technique for the production of anthocyanin (purple-pink color) from black carrot. The main problem with anthocyanin color is its transparency and stability. The transparency of anthocyanin color depends on the purity of anthocyanin. I used macroporous polymer (Translucent beads) having high surface area and got the high purity anthocyanin. The novelty of this technology is to enhance the transparency, solubility and stability of the anthocyanin (purple-pink color). Anthocyanin are the polyphenols and having the antioxidant activities. Food products available in the markets which contain the anthocyanin (purple-pink color) are nutritious and good for health.



6.2.7 Patent on A Push Pull Osmotic Pump System for Formulation of Lornoxicam and Capsaicin.

Dr. Shyam Sundar Arputhanantham

The present invention generally relates to a push-pull osmotic pump system for formulation of lornoxicam and capsaicin comprises a push layer comprises at least one micro-unit containing capsaicin to provide an immediate release and protect gastric mucosa by invaders of the gut mainly against H-Pylori infections; a pull layer containing Lornoxicam to release for an extended period which reduces dose frequency for arthritis; and a protecting film configured to coat the push layer with cellulose acetate, wherein the cellulose acetate film-forming agents and Polyethylene glycol (PEG) in differing concentrations to produce an elegant formulation with identification of push and pull formulation with colors. The initial commercialization talks with the industrial experts opens up an avenue of translating the patent for key anti-cancer drugs.



6.3 Book Author

6.3.1 Recent Advances in Natural Products Science

Prof. Ahmed Al Harrasi, Dr. Saurabh Bhatia

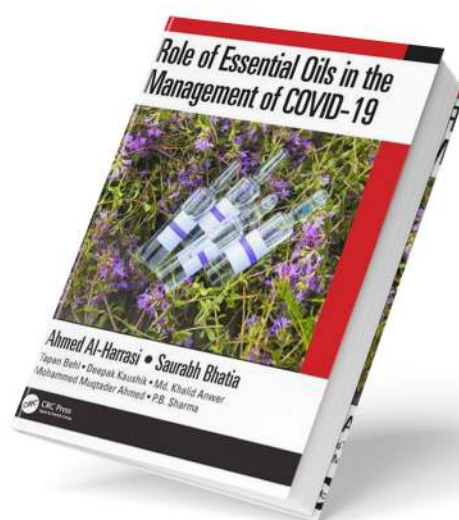
This book provides a summarized information related to the global herbal drug market and its regulations, ethnopharmacology of traditional crude drugs, isolation of phytopharmaceuticals, phytochemistry, standardization, and quality assessment of crude drugs. Natural products science has constantly been developing with comprehensive data contemplating different parts of natural drugs, such as global trade, quality control and regulatory concerns, traditional medicine systems, production and utilization of drugs, and utilization of medicinal and aromatic plants. This broad information about crude drugs gives rise to a subject that is now recognized as advance natural products science. By contemplating all of this thorough knowledge of the areas, this book is intended to provide considerably to the natural products science. The area of natural products science involves a broad range of topics, such as the pharmacognostical, phytochemical, and ethno-pharmacological aspects of crude drugs. Each chapter gives a sufficient understanding to academicians and researchers in the respective topic. This book includes 40 illustrations and descriptions of roughly 80 medicinal plants used for herbal medicine. The book is an imperative source for all researchers, academicians, students, and those interested in natural products science.



6.3.2 Role of Essential Oils in the Management of COVID-19

Prof. Ahmed Al Harrasi, Dr. Saurabh Bhatia

Coronavirus disease 2019 (COVID-19) has emerged as a global health threat. Unfortunately, there are very limited approved therapeutics available with established efficacy and safety profiles against SARS-CoV-2. COVID-19 vaccines aim to actively induce systemic immunization; however, the possibility or fear of side effects decreases or discourages their use. Alternative therapy via natural products, especially essential oils, could be considered safe and effective to improve health, cure ailments, and soothe your body and mind. Essential oils, which have been known for their anti-inflammatory, immunomodulatory, bronchodilatory, and antiviral properties, could possibly be useful for the symptomatic management of COVID-19. This book is vital in respect of designing approaches to protect humanity from further losses and harm due to SARS-CoV-2 infection.



6.3.3 Atlas of clinical fungi

Dr. Abdullah Al Hatmi co-authored Atlas of clinical fungi.

With 1600 densely filled pages in full colour on more than 700 fungi, the book provides a wealth of information on medical mycology. The two volumes are organized in analogy of the Fungal Kingdom, and because it includes numerous opportunists it is also useful for workers outside the medical area. Complementary to the search tools of the website, the book provides an overview of the rich data collected over 30 years of medical mycology, covering diagnostics, taxonomy, phylogeny, nomenclature, antifungals, and histopathology, validated by almost 8000 references. The layout is pleasant to read, and the photo plates are stunning, often showing unique features of the fungi.

The Atlas was first published as a book in 2000. And now, 20 years later, the book will be printed again, and in full color. It contains about 1600 pages in 2 volumes, with more than 700 photo plates in full color, chapters on diagnostic methods, antifungals, recommended therapy, phylogeny, and explanatory chapters on major fungal groups. With over 8000 references, the book follows the current literature until today, covering all 700 species that have been proven to be able to cause infection in humans and other vertebrates since the beginning of medical mycology in 1840. All fungal names used in medical publications can be found. The book is a must for every diagnostic laboratory. The printed version of the book is the best teaching material to find your way through the fungal Kingdom.



Research Collaboration

7



7.1 Research Collaboration

Table 7.1: UoN International Research Collaboration in 2021/2022

No.	Research Chair/ Center	No. of International Collaborators	No. of International HEIs of affiliation	Sample of Research Areas being Investigated
1	NMSRC	40	13	Fungal strains Computational Chemistry-University of Pittsburgh-USA Obesity and Cancer Lymph tissue engineering Drug delivery using microvesicles Tissue engineering Diabetes Inorganic Chemistry Data analyses of associations of immune checkpoints and disease free survival in colorectal cancer patients. Medicinal Chemistry, biochemistry, bio/chem-informatics, enzymology Synthesis, isolation and biological activities
2	UCASA	7	7	The Water Resources Management Water Energy and Environment Engineering Socio-hydrology Socio-hydrology Culture Humanities and Basic Sciences Aflaj Studies History and Cultural Heriatge
3	Al Khalil bin Ahmed Al Farahidi Center	1	1	Manuscripts
4	College of Arts and Sciences	87	40	Linguistics Diabetes Inorganic Chemistry Education Language and Literature Psychology ARTS Microbiology/Medical mycology
5	College of Pharmacy and Nursing	3	2	Effectiveness of antibiotic stewardship- Systematic Review Assessment of Mental Wellbeing, Grit and its Associated Factors: An International Survey of Undergraduate Pharmacy Students from 14 Countries
6	College of Economics and Information System	2	2	Comparative Studies on Sustainable Tourism: Oman and Italy Entrepreneurship activity

7.2 Co-Supervisors

Table 7.2: UoN Co-supervisors of International PhD Students: 28

Supervisor Name	No of Students	Country	Area of Study
Dr.Salem Said Al Touby	1	Sweden	Human resources management and job satisfaction among medical laboratory Technologists
Dr.Salem Said Al Touby	1	Malaysia	Disaster Management
Dr. Arockiasamy Soosaimanickam	1	Karunya University, India	Automatic Personalized User Preference Based Information Retrieval in Semantic Web Search
Dr. Abdullah M.S. Al-Hatmi	3	The Netherlands	Medical Mycology
Dr. Sulaiman Al-Hashmi	2	Iran	Lymph tissue engineering
Dr. Fatemeh Jamshidi-adevani	2	Iran	Lymph tissue engineering and cancer therapy
Saeid Vakilian	1	Iran	Lymph tissue engineering
Dr. Ajmal Khan, Dr. Sobia Ahsan Halim	2	Pakistan	Enzyme inhibition and medicinal chemistry
Prof. Manzoor Ahmed	1	Pakistan	Chemistry
Prof. Waheed Murad	1	Pakistan	Chemistry
Dr. Amjad Khan	1	Pakistan	Chemistry
Dr. Mohammed Abdul-Hakin Alsaadi	2	UM, Malaysia	Nanotechnology applications in environment
Dr. Shaikh Mizanoor Rahman	2	Pakistan	Obesity and Cancer Biology
Dr. Oscar M. Turingan (Dissertation Panel)	1	Philippines	PhD Nursing Science
Dr.Sabin Thomas	1	Malaysia	Social Pharmacy
Dr.Abdullah Al Ghafri	1	UK	Aflaj Studies (Sociohyrlogoy)
Dr.Majid Labbaf	1	Iran	Sociology
Dr. Sunil Kumar Maurya	1	India	Mathematical Physics (Modeling of Astrophysical Compact objects in General Relativity and Modified Gravity Theory)
Dr. Khizar Hayat	1	Pakistan	Computer Science (DIP)
Dr.Khalil Al Ruqeishi	1	Malaysia	Computer science (Image processing)
Javid Hussain	1	Pakistan	Natural Product Chemistry

7.3 Al khalil -University of Nizwa Journal for Literary and Linguistic Studies

The University issued **11** volumes of this international journal in 2021/2022

7.4 UoN Scholar Professional Involvements

College/ Research Center:

- Number of scholars acting as international journal reviewers: **245**
- Number of scholars serving on International journal editorial boards: **54**

7.5 Ongoing Research Projects Examples

- Aflaj Groundwater potential mapping: using geospatial models in the Nizwa watershed, Sultanate of Oman, Dr Khalifa Al Alkindi , Funded by University of Nizwa:

The aflaj (sing. falaj) are the primary traditional irrigation systems in Oman, which have been used for millennia. The goal of this research is to develop groundwater to the aflaj (canal) potential maps in the Nizwa watershed, Al-Dakhiliyah Governorate, Sultanate of Oman (Oman), utilizing remote sensing (RS) and spatial information techniques (SIT). Aflaj locations map will be prepared for the study area based on a topographical map at 1:10,000-scale and extensive field surveys. 250 aflaj locations will be detected in the field surveys. 75 % (200 locations) of the aflaj locations will be used for potential groundwater mapping, and 25 % (50 locations) will be used for validation. Fourteen practical factors will be considered in this investigation, such as land use and land cover (LULC), altitude slope, slope degree, aspect, slope length (LS), topographic wetness index (TWI), stream power index (SPI), profile curvature, plan curvature, distance to wadis (dry rivers), distance to faults, lithology, drainage density, and fault density. A groundwater aflaj potential map will be generated using the above conditioning factors, implementing frequency ratio (FR) and Shannon's entropy (SE) models, and the results will be plotted in ArcGIS Pro. The area will be determined the predictive capability of FR and SE models under the relative operating characteristic curve. Planners and engineers can utilize the GAPM to help with groundwater development plans and land use planning.

- Whole Genome Sequencing and Conservation of Arabian Gazelle population of Oman, Mr. Ahmed Al Rawahi, Funded by Office for Conservation of the Environment at Diwan of Royal Court

The Arabian tahr (*Arabitragus jayakari*) is endemic to northern Oman and the United Arab Emirates mountains. However, the species is faced with significant threats to its population. Because of its small and dwindling population, it is listed as Endangered. Here, we sequenced and assembled the mitochondrial (mt) genome of *A. jayakari* into 16,485 bp with 39.6% GC content. It also contains 13 protein-coding genes, 22 tRNA genes, and two rRNA genes. Phylogenetic analysis of *A. jayakari* with related 12 species mt genomes showed that *A. jayakari* forms a monophyletic clade with *Hemitragus jayakari*. In the current context of a changing environment, evolutionary analysis based on the mitochondrial genome will aid in identifying evolutionary changes among different species and analyzing shared gene pools to counteract threats.

- Lamad Project, Dr Abdullah Al-Ghafri, Funded By AGRICULTURE & FISHERIES DEVELOPMENT FUND - Ministry of Agriculture, Fisheries and Water Resources

Lamad project is aimed to incorporate the modern technologies into the aflaj traditional water management, by using the capacity of internet and smart cellphones in aflaj irrigation timing. The project is supposed to be carried out for a falaj as a pilot project, and then more aflaj will be involved based on the pilot results. The farmers will be able to keep track of their turn on the irrigation cycle (dawran) and the situation of their water shares at any time. This project can also contribute to tourism sector, since the visitors can see the names and order of water shares on a digital screen at the exit point of falaj, which will give them a handle on how the falaj water division system works.

Lamad system is one of the digital systems or innovative websites, which pertains to the management of the timing of Omani aflaj irrigation, and hinges on creating a system through which irrigation is automated according to the same rules and principles as that of aflaj. Lamad application allows the owners of Omani farms to keep track of their shares on the irrigation cycle. This system has been named after "al-Lamad", referred to as a special Omani sundial that was used to calculate the irrigation time by means of sunlight in the rural regions. This project is aimed to introduce new technologies and sciences to the aflaj communities in the light of Oman's general approach towards industrialization.

This project serves to preserve the historical and cultural values of water supply systems, which are a crucial part of Omani civilization. It also helps to archive the information of aflaj water management, which would otherwise sink into oblivion due to the aflaj elderly practitioners passing away. Lamad project consists of three main components as follows: the website, digital system, a smart application (LMD) for cellphones.

