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2025th Semi-annual Scientific Poster Exhibition of Undergraduate Graduation Projects

December 7 & 9, 2025

Program and Abstract Book

Graduate Studies and Scientific Research Unit
College of Science-King Saud University

Acknowledgment of Appreciation

We extend our sincere appreciation and gratitude to King Saud University, a prestigious academic institution that has long served as a beacon of knowledge, innovation, and leadership in the Kingdom of Saudi Arabia. For decades, the university has nurtured generations of scholars, researchers, and students, contributing significantly to the nation's educational and research advancement.

King Saud University continues to uphold a strong commitment to excellence, fostering scientific research, empowering innovation, and building impactful local and global partnerships aligned with the goals of Saudi Vision 2030.

We are honored to be part of the King Saud University community, its leadership, faculty members, staff, and students, and deeply value the continued support and opportunities it provides in shaping a brighter future for our society.

May King Saud University remain a symbol of progress and distinction in serving knowledge and our beloved nation.

Graduate Studies and Scientific Research Unit
College of Science-King Saud University

2025th Semi-annual Scientific Poster Exhibition of Undergraduate Graduation Projects

Letter from the Dean, College of Science

December 7 & 9, 2025

Dear Students, Colleagues, and Guests,

Welcome to the Semi-annual Scientific Poster Exhibition at the College of Science, King Saud University. Today, we proudly highlight the creativity, innovation, and dedication of our undergraduate students as they present the outcomes of their graduation research projects.

Undergraduate research is a cornerstone of scientific excellence. Through inquiry, experimentation, and discovery, our students develop essential skills that prepare them to become future leaders contributing to our nation's advancement and Saudi Vision 2030.

I extend my sincere congratulations to all students for their hard work and achievements. You have demonstrated remarkable determination and a true passion for science. I also thank our faculty mentors and organizing teams for their continued support in fostering a strong research culture across the college.

May this exhibition inspire even greater accomplishments and new opportunities for scientific impact.

Wishing you a rewarding and memorable experience.

Prof. Zeid ALOthman
Dean, College of Science
King Saud University

2025th Semi-annual Scientific Poster Exhibition of Undergraduate Graduation Projects

Letter from the Vice Dean, College of Science for Graduate Studies and Scientific Research

December 7 & 9, 2025

Dear Students, Colleagues, and Guests,

On behalf of the College of Science at King Saud University, it is my distinct pleasure to welcome you to the Undergraduate Graduation Research Poster Exhibition. We are proud to showcase the exceptional achievements of our undergraduate students across the College's diverse scientific departments, each contributing to the advancement of knowledge and innovation in our nation.

Undergraduate research plays a pivotal role in shaping the scientists and leaders of tomorrow. Through the process of inquiry, experimentation, and discovery, our students develop critical thinking, creativity, and essential research skills that prepare them for graduate studies and impactful careers. Today's exhibition is a testament to their dedication, hard work, and passion for science.

The projects presented reflect the commitment of the College of Science to fostering a vibrant research culture aligned with Saudi Vision 2030. We deeply appreciate the invaluable mentorship provided by our faculty members, who guide and inspire students to reach their highest potential. Their support ensures that research remains a central pillar of academic excellence at King Saud University.

I extend my sincere congratulations to all participating students for their accomplishments. You have taken meaningful steps toward shaping the future of science and contributing to solutions for global challenges. I am confident that what you have achieved here is only the beginning of a successful journey ahead.

Thank you to everyone who contributed to organizing this exhibition and supporting student research throughout the year. Your efforts exemplify the collaborative spirit and academic leadership that define our college.

Wishing you all a rewarding and inspiring experience today.

Dr. Saad A. Aldawood
Vice Dean, College of Science
for Graduate Studies and Scientific Research
King Saud University

2025th Semi-annual Scientific Poster Exhibition of Undergraduate Graduation Projects

Letter from the Vice Dean, College of Science for Female Student Affairs

December 7 & 9, 2025

Dear Students, Colleagues, and Guests,

It is my pleasure to welcome you to the Semi-annual Scientific Poster Exhibition for Undergraduate Graduation Projects at the College of Science, King Saud University. Today, we celebrate the remarkable achievements of our female students whose dedication, curiosity, and perseverance have brought them to this important milestone in their academic journey.

Undergraduate research embodies the spirit of discovery and scientific excellence. Through hands-on experimentation, analysis, and innovation, our students develop the confidence and capabilities necessary to become future scientists, researchers, and leaders who will shape the world with knowledge and integrity.

I would like to commend each of our outstanding students for their hard work and resilience in overcoming challenges and transforming ideas into impactful research outcomes. You are a source of pride to your department, your mentors, and your university. I encourage you to continue striving for excellence, pursuing your academic ambitions, and seizing every opportunity for growth and advancement.

We also extend our deepest appreciation to the faculty mentors and supervisors whose continuous guidance and support play a vital role in empowering our students and cultivating a strong research culture within the College of Science.

My sincere thanks go as well to the organizing committees, volunteers, and all contributors who have ensured the success of this event and fostered an inspiring environment for student innovation.

May this exhibition be the beginning of greater achievements, broader horizons, and inspiring scientific contributions for all our students.

Wishing you a fruitful and memorable experience.

Dr. Nouf Alotaibi
Vice Dean, College of Science
for Female Student Affairs
King Saud University

2025th Semi-annual Scientific Poster Exhibition of Undergraduate Graduation Projects

Letter from the Assistant Vice Dean, College of Science for Graduate Studies and Scientific Research

December 7 & 9, 2025

Dear Students, Colleagues, and Guests,

It is a great honor to welcome you to this year's Undergraduate Research Poster Exhibition, an inspiring celebration of scientific creativity and discovery within the College of Science at King Saud University. Each poster displayed here tells a story of curiosity pursued, challenges overcome, and knowledge gained.

Our undergraduate students have worked diligently, supported by their mentors, to conduct meaningful research and communicate their findings with professionalism and confidence. These experiences strengthen not only their scientific competence but also their ability to innovate and contribute to the future of our society.

We are grateful to our esteemed faculty mentors who have shared their expertise and time generously, providing students with the guidance necessary to excel. Your mentorship plays a vital role in shaping emerging scientists and reinforcing the research mission of King Saud University.

To our students: we are proud of your achievements and the enthusiasm you bring to scientific inquiry. We hope this exhibition inspires you to continue your academic and research pursuits, expand your aspirations, and embrace the opportunities that lie ahead.

Finally, I would like to thank the organizing committees, volunteers, and the broader College of Science community for ensuring the success of this event. Together, we continue to empower the next generation of scientists and innovators.

Wishing you all an enriching and memorable experience at the exhibition.

Prof. Asma A. Alothman
Assistant Vice Dean, College of Science
for Graduate Studies and Scientific Research
King Saud University

ACKNOWLEDGMENTS

On behalf of the Graduate Studies and Scientific Research Unit at the College of Science – King Saud University, it is with great pleasure and sincere appreciation that we extend our thanks to everyone who contributed to the success of the Undergraduate Research Poster Exhibition. Today, we celebrate the outstanding scientific achievements and innovative research projects presented by our talented students from all six academic departments.

The dedication of our students, guided by the expertise and mentorship of our distinguished faculty members, highlights the strong research culture we proudly promote. This exhibition not only reflects the strength of our academic programs but also supports the development of future scientists and leaders who will serve our nation and contribute to the goals of Saudi Vision 2030.

We would like to express our deepest gratitude to our faculty supervisors for their invaluable support, encouragement, and guidance throughout the research journey of their students. Your commitment plays a vital role in shaping a promising generation of researchers and innovators.

We also extend our thanks to the participating academic departments for their collaboration and continued efforts in enhancing research excellence across the College of Science.

Our sincere appreciation goes to the organizing committee and volunteers whose dedication ensured a successful and well-coordinated event. Your teamwork and professionalism made this experience enriching for all.

Finally, we thank our valued guests and attendees for their encouragement and for inspiring our students through their presence and engagement.

We look forward with great enthusiasm to the bright opportunities ahead and to continuing our mission to support impactful research and empower the next generation of scientific leaders.

With sincere gratitude,

Graduate Studies and Scientific Research Unit - College of Science - Female Students' Campus - King Saud University

Thank you for supporting us

Vice Deanship for Graduate Studies – College of Science, King Saud University

Undergraduate Research Poster Exhibition Organizing Committee

Prof. Asma A. Alothman | *Assistant to the Vice Dean of the College of Science for Graduate Studies and Scientific Research,* **Chair**.

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Ms. Hajer Altourbaq| *Graduate Studies & Research Unit,* **Secretariat**.

Design and Publications

Scientific Poster Exhibition Organizing Committee at Female Students' Campus
Graduate Studies & Research Unit at Female Students' Campus

AGENDA

Poster Session: Sunday, December 7, 2025
10:00 am – 12:00 pm

10:00 – 10:10 am .....Welcome and Reception
College of Science Lobby (Building 5)
Female Students' Campus

Tour of the Scientific Poster Exhibition
Female Students' Campus

10:10 – 10:20 am .....MATH Poster Session
College of Science Lobby (Building 5)
Female Students' Campus

10:20 – 10:30 am .....STAT Poster Session
College of Science Lobby (Building 5)
Female Students' Campus

10:30 – 10:40 am .....PHYS Poster Session
College of Science Lobby (Building 5)
Female Students' Campus

10:40 – 10:50 am .....BOT Poster Session
College of Science Lobby (Building 5)
Female Students' Campus

10:50 – 11:00 am .....BCH Poster Session
College of Science Lobby (Building 5)
Female Students' Campus

11:00 – 11:10 am .....CHEM Poster Session
College of Science Lobby (Building 5)
Female Students' Campus

11:10 – 11:20 am .....Graduate Studies & Scientific Research Unit Booth
College of Science Lobby (Building 5)
Female Students' Campus

11:20 – 11:25 am .....Exhibition Highlight Video Presentation
College of Science Lobby (Building 5)
Female Students' Campus

11:20 – 11:25 am .....Competition & Prize Draw
College of Science Lobby (Building 5)
Female Students' Campus Interactive

11:25 – 12:00 pm .....Award Ceremony for Top Students from Academic Departments
College of Science Lobby (Building 5)
Female Students' Campus Interactive

AGENDA

Poster Session: Tuesday, December 9, 2025
10:00 am – 12:00 pm

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College of Science Lobby (Building 5)
Female Students' Campus

Tour of the Scientific Poster Exhibition

College of Science Lobby (Building 4)
Male Students' Campus

10:10 – 10:20 am .....MATH Poster Session
College of Science Lobby (Building 4)
Male Students' Campus

10:20 – 10:30 am .....STAT Poster Session
College of Science Lobby (Building 4)
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10:30 – 10:40 am .....PHYS Poster Session
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Male Students' Campus

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College of Science Lobby (Building 4)
Male Students' Campus

10:50 – 11:00 am .....BOT Poster Session
College of Science Lobby (Building 4)
Male Students' Campus

11:00 – 11:10 am .....BCH Poster Session
College of Science Lobby (Building 4)
Male Students' Campus

11:10 – 11:20 am .....CHEM Poster Session
College of Science Lobby (Building 4)
Male Students' Campus

11:20 – 11:30 am .....GEO Poster Session
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Male Students' Campus

11:30 – 11:25 am .....Competition & Prize Draw
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11:30 – 12:00 pm .....Dean Award Ceremony
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College of Science Lobby (Building 5)
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ABSTRACTS

Graduate Studies and Scientific Research Unit
College of Science-King Saud University

Mathematics Department

Curves, Surfaces, and Manifolds: An Exploration of Geometric Structures

Abdulmalik bin Ahmed Al-Turaydi
Prof. Nasser bin Ibrahim Al-Turki

Euclidean geometry has long been the standard for describing flat space, but our real world, from the surface of the Earth to the fabric of the universe, is characterized by a curved nature that requires more sophisticated mathematical tools. This research presents a systematic exploration of differential geometry with the aim of analyzing and measuring these curved shapes. The study begins by comparing basic geometries (Euclidean, spherical, and hyperbolic), then moves on to analyze surfaces in three-dimensional Euclidean space using fundamental forms to calculate and classify Gaussian curvature. The research then expands to generalize the concept of surface to abstract space known as manifolds. Finally, the research links theory and application by reviewing the role of curvature in understanding general relativity and its modern applications in planning brain and nerve surgeries.

Aspects of Cybersecurity in Mathematics

Tariq bin Abdulmohsen Al-Dhahyān
Dr. Fawzi bin Ahmed Al-Dhakeer

This research provides an overview of classical cryptography systems and examines their fundamental principles, methods, and historical significance. The study focuses on several well-known classical ciphers such as the Ceasar cipher, Subtitution cipher, Affine cipher, Vigenere cipher, Hill cipher, and permutation cipher, and highlighting how each system encrypts and decrypts information. In addition, the research analyzes the strengths and weaknesses of these ciphers. Also study about cryptanalysis. The research study aims to show how classical cryptography laid the foundation for modern encryption and contributed to the development of information security.

Fourier Transform and Its Applications

Durrah Mostafa Masmas
Prof. Maysa Al-Qurashi

The Fourier Transform is a fundamental mathematical tool that breaks complex signals into their basic frequency components. This process reveals hidden patterns that cannot be seen in the time domain and forms the basis of many modern technologies. Its applications go far beyond theory: it improves communication signals, enhances medical imaging, enables digital image and audio processing, and helps model physical phenomena such as heat flow and diffraction. Because of its ability to simplify and analyze complex information, the Fourier Transform is essential in mathematics, science, engineering, and technology.

Statistics & Operations Research Department

Modeling Returns and Risk Using (ARIMA-GARCH) Models: A Comparative Study of the Efficiency of Telecom Stocks (STC and Mobily) and the General Index in the Saudi Market

Abdullatif Badr Nasser Al-Fahad
Dr. Walid Sayed Imam Ismail

This research aims, using ARIMA-GARCH models and a comparative methodology between two telecom stocks (STC and Mobily) and the General Index (TASI), to evaluate the weak-form efficiency of the Saudi market and the reliability of forecasting returns and risk. Results revealed a market efficiency dichotomy; where STC and the General Index showed high efficiency and adherence to the Random Walk model, Mobily (the relatively less liquid stock) demonstrated partial inefficiency and a structure modelable in variance (risk). Despite the failure of return forecasting (ARIMA) in the long term for all assets, GARCH models successfully modeled Mobily's risk, confirming the phenomenon of Mean Reversion and the predictability of volatility in the short term, leading to the conclusion that the practical value of the analysis lies in risk modeling rather than return forecasting.

Statistics Is All You Need: Comparing Arabic BERT and TF–IDF Logistic

Abdulrahman Mohammed Al-Krishan
Dr. Aayed Al-Qahtani

This project compares Arabic BERT with TF-IDF Logistic Regression for classifying Saudi bank tweets. Using the same data split, BERT achieved better macro-F1 and handled Neutral/Positive classes more accurately, while Logistic Regression remained simple and interpretable. Overall, BERT outperformed the traditional model.

Modelling the Determinants of Air Quality Using Logistic Regression Analysis

Abdullah Al-Shuwaier
Dr. Mansour Sharahili

This study examines the determinants of air quality by integrating environmental, meteorological, and demographic factors into a comprehensive statistical framework. Air quality has become a critical global and regional concern due to rapid urbanization, industrial growth, and the resulting rise in harmful pollutants such as PM2.5, PM10, SO_2, NO_2, and CO. These pollutants are closely associated with adverse health outcomes, environmental degradation, and decreased quality of life. The research emphasizes the need for advanced modelling techniques to better understand fluctuations in air quality and develop predictive tools for effective decision-making. A review of previous literature highlights foundational global studies that established the health impacts of air pollutants and the development of standardized Air Quality Index (AQI) guidelines. Recent studies in Saudi Arabia have provided region-specific insights, particularly regarding the influence of industrial activity and human behavior on pollution levels. Despite these contributions, gaps remain in the development of integrated statistical models that combine multiple predictors to classify air quality rather than merely describe pollutant trends. To address this gap, the study investigates how particulate and gaseous pollutants, weather conditions, and spatial/demographic indicators shape AQI categories. The main objectives include assessing pollutant behavior, evaluating meteorological impacts, examining demographic influences, and constructing a logistic regression model capable of classifying air quality into Good, Moderate, Poor, and Hazardous levels. The analysis is guided by hypotheses that test the significance of each group of variables. Using a quantitative methodology, the research applies data cleaning, descriptive analysis, correlation measures, and logistic regression to evaluate the joint effects of the selected predictors. The resulting model aims to enhance understanding of air-quality dynamics and provide a reliable tool for predicting AQI levels, supporting environmental planning and public-health strategies.

Saudi Automobile Market Analysis During the Period 2010–2025

Ali Badr Al-Wahimer
Prof. Dr. Abdulhakim Al-Babtain

The study aims to analyze the evolution of car prices and quantities in the Saudi market over the period 2010–2025 and to examine the impact of selected macroeconomic variables—namely inflation rate, interest rate, and the government budget—on these developments. Official secondary data were used and analyzed with correlation and regression models implemented in R. The results show a clear upward trend in average car prices accompanied by a decline in quantities sold. In addition, the interest rate exhibits a statistically significant negative effect on car quantities, while inflation and the budget variables do not emerge as the primary determinants of prices. Overall, the findings indicate that monetary conditions, more than inflation itself, play a key role in shaping car demand in the Saudi market during the study period.

Statistical Analysis of the Impact of Saudi Vision 2030 on the Saudi Stock Market Index (TASI) Before and After the Vision Launch

Faisal Khalid bin Dughaishim

Dr. Mahmoud Ibrahim

This project aims to examine the impact of Saudi Vision 2030 on the movement of the Saudi stock market index (TASI) by analyzing time-series data for two periods: before the Vision (2011–2016) and after its launch (2016–2025). Multiple linear regression and ARIMA models were used to identify the factors influencing the closing price and to generate forecasts extending to 2027.

Modeling emergency response time using multiple statistical methods: A case study of Riyadh, Saudi Arabia

Al-Hanouf bint Hamad bin Saad Al-Muqri
A. Ruba Al-Yafi

Ambulance response time is a critical measure of emergency medical service (EMS) efficiency and a key determinant of patient outcomes. International benchmarks recommend response times of eight minutes or less for life-threatening emergencies. Yet, many regions face challenges in achieving this standard. In Saudi Arabia, the average response time is approximately 13 minutes, with Riyadh recording the highest mean response time at nearly 18 minutes. The primary aim in this study is to analyze real emergency operation data from the Saudi Red Crescent Authority, to understand what truly drives ambulance response time in Riyadh using multiple statistical methods.

The effects of urbanization in major regions in Saudi Arabia

Fahad Sami Al-Bawardi

Prof. Dr. Abdulhakim Al-Babtain

This paper provides a quantitative assessment of that change by examining population dynamics and key public service indicators in Riyadh, Makkah, and the Eastern Region over a fifteen-year period. The analysis focuses on three core statistical questions: the extent of urban growth, the trajectory of service provision over time, and the strength of the relationship between urbanization and service availability. Using descriptive statistics, simple and multiple linear regression models, Pearson correlation analysis, and cross-regional comparisons through ANOVA, the study evaluates whether population pressures are matched by improvements in education, healthcare, financial access, utilities, and social support. By integrating these methods, the paper aims to offer a clear, data-driven understanding of how Saudi Arabia's major regions are evolving and what emerging patterns of development imply for future urban planning and service delivery.

The Effect of Some Factors on Energy Consumption of Buildings

Hamza Al-Abdullatif
Dr. Mansour Sharahili

Buildings account for a large share of global energy consumption, representing nearly 40% of total energy use worldwide and about 70% of electricity consumption in the United States. This high demand drives energy costs and strains natural resources, making energy efficiency a critical priority. Understanding what drives energy consumption is essential for designing more sustainable buildings. Key determinants include building type, size, occupancy levels, number of appliances, temperature conditions, and weekday–weekend usage patterns. Residential buildings typically use most of their energy for heating and cooling, while commercial buildings rely heavily on lighting and ventilation, and industrial buildings consume energy through machinery-heavy operations. Larger buildings require more energy overall, although use per square foot varies based on how many people occupy and interact with the space. The number of appliances also plays a major role, as each device contributes to total energy demand. External factors, such as temperature fluctuations, further influence energy use, especially through HVAC systems. Energy patterns also differ between weekdays and weekends, reflecting changes in human activity.

This study examines how these interconnected factors influence energy consumption in buildings. The research focuses on evaluating whether consumption differs across building types, identifying correlations between building characteristics and energy use, and determining how multiple variables jointly predict total consumption. Seven research questions and corresponding hypotheses guide the analysis, addressing building type differences, the effects of size, occupancy, appliances, temperature, weekday–weekend patterns, and combined predictive power. A quantitative methodology is adopted, using linear regression to model continuous energy consumption data. The study incorporates key variables, including building type, square footage, occupancy, appliance count, average temperature, and day of the week. Data will be collected from public datasets, cleaned for accuracy, and standardized to improve reliability. ANOVA will be used to compare energy consumption means across the three building types, followed by Tukey's HSD for pairwise comparisons. While the analysis provides valuable insights, limitations include assumptions of linearity and the exclusion of factors such as building age and insulation quality. Expected outcomes include identifying major contributors to energy use and developing a predictive model to support efficient building design, management, and sustainability planning.

Forecasting and Analysis of Saudi Arabia's Exports and Imports

Mahasin bint Ghumaidh bin Awadh Al-Amri
Dr. Reem Al-Ghamdi

This study analyzes and forecasts Saudi Arabia's exports and imports using monthly data from 2015 to 2023, obtained from the General Authority for Statistics (GASTAT). The research aims to identify main trends, trade patterns, and the relationship between exports and imports, as well as to build predictive models for future values. In the first stage, descriptive analysis was conducted to summarize the trade performance by product categories (raw, semi-finished, and finished goods) and by type (oil and non-oil exports). In the second stage, time series models (ARIMA) were developed to forecast future trade movements. The results showed that both exports and imports experienced an upward growth trend, with exports showing greater fluctuations due to global market conditions. The ARIMA (3,2,3) model was selected for exports, and the ARIMA (2,2,1) model was selected for imports. These models provided accurate forecasts for 2024, indicating continued growth in trade performance, which is consistent with Saudi Vision 2030's goals for economic diversification.

A study of the financial performance of Aramco and stc in the Saudi financial market: a statistical analysis

Nasser bin Bandar Al-Jaryan
Dr. Mahmoud Ibrahim

The results show that the post-2016 period became more stable, with the index exhibiting an upward trend alongside improved economic performance, while the pre-Vision period was more volatile and less stable. Vision 2030 strengthened key economic drivers of the market, allowing statistical models to achieve higher accuracy and better predictive performance.

Analysis of the factors influencing the growth of digital economy in the Kingdom of Saudi Arabia compared to the leading digital economies

Rose bint Malik bin Muhammad al-Taysan al-Maliki
Dr. Arwa Al-Shanqiti

The digital transformation in the Kingdom of Saudi Arabia is witnessing remarkable progress, driven by the ambitious Vision 2030 objectives for digital leadership. Despite this advancement, a central challenge persists—what we refer to as the "Digital Conversion Gap"—where high and near-saturated levels of domestic digital adoption do not translate into commensurate growth in technology-service exports. To analyze and address this issue, the research aims to construct a quantitative model that employs LASSO regression to assess the differential impact of digital enablers in the Kingdom compared with its strategic global peers. The results confirm the presence of statistically significant disparities, illustrating what can be described as the "Mobile Paradox." Although Saudi Arabia possesses highly advanced mobile infrastructure, it is utilized predominantly for consumer-oriented purposes, which does not contribute to the expansion of digital exports—unlike leading economies where mobile capabilities are leveraged as productive assets that drive export growth. Accordingly, the core recommendation is to direct policy efforts toward stimulating export-oriented digital production to bridge this gap and support the realization of Vision 2030's digital leadership objectives.

Analysis of Car Rental Contract Data for a Riyadh Company (2023–2024)

Salman Hadi Al-Qahtani
Prof. Dr. Abdulhameed Abdullah Al-Zaid

This study analyzes car rental contract data for a company in Riyadh during 2023–2024 to examine contract characteristics and differences in revenue between branches and car types. Operational data for 60 cars (about 2,108 contracts) were analyzed using descriptive statistics, ANOVA, linear regression, and time series models. The results show significant differences for some branches and car models, and indicate that rental duration, daily distance, and daily price are the main determinants of contract income. The daily time series of active contracts can also be used to monitor operations and support short-term demand forecasting.

Factor Analysis and Their Applications

Saleh Abdullah Al-Mahmoud
Dr. Ayed Al-Qahtani

This project applies Factor Analysis to reduce high-dimensional survey data and uncover latent patterns. Two datasets were analyzed, and diagnostic tests (KMO, Bartlett, Mardia) confirmed FA suitability. Factors were extracted using ML and MinRes, with Varimax rotation improving interpretability. Results showed clear factor structures, good fit indices, and meaningful dimensionality reduction. Overall, Factor Analysis proved effective for simplifying complex data and revealing underlying behavioral and structural dimensions.

Physics Department

Third-order nonlinear susceptibility, c (3), for Rhodamine 6G (Rh6g) solution Using the Z-Scan Technique

Abdulaziz Nasser Al-Sbeet
Dr. Mishal Al-Harbi

In this work, the nonlinear optical properties of Rhodamine 6G (R6G) in ethanol were investigated using the Z-scan technique in open- and closed-aperture modes with a 532 nm DPSSL laser. The nonlinear absorption coefficient (β), nonlinear refractive index (n_2), and third-order susceptibility χ(3) were measured for concentrations from 10% to 60%. Increasing concentration led to lower transmittance and higher linear absorption in the open-aperture scans, while closed-aperture scans showed clear beam distortion used to extract n_2 and phase shift $\Delta\phi_0$. The results confirm that R6G exhibits strong, concentration-dependent third-order nonlinear optical behavior, demonstrating its suitability as an effective nonlinear optical material.

A Comparative Experimental Study of the Physical Properties of Zamzam and Regular Drinking Water

Faris Saad Al-Farzan
Dr. Saad Al-Qarni

his study investigates the physical and optical differences between Zamzam water and commercially bottled drinking water using controlled laboratory measurements. Eight samples were analyzed (four Zamzam from different sources and four commercial brands), focusing on ultraviolet–visible (UV–Vis) absorbance and fluorescence excitation–emission matrices (EEMs). Absorbance spectra revealed that Zamzam water exhibits markedly higher UV absorbance—particularly in the 200–300 nm region—indicating a higher concentration of inorganic ions and dissolved species. In contrast, commercial bottled water showed lower absorbance across the full UV range. Fluorescence analysis demonstrated the opposite trend: after removing Rayleigh and Raman scattering, Zamzam samples displayed consistently weak, tightly clustered fluorescence signals with broad emission peaks around 410–430 nm. Commercial water exhibited stronger aromatic fluorescence, especially at Ex = 250 nm, suggesting the presence of low-level organic matter commonly introduced during processing and packaging. At Ex = 270 nm, however, Zamzam samples showed fluorescence intensities comparable to some commercial brands, reflecting the dominance of weakly fluorescent, non-aromatic species. Overall, the combined optical results indicate that Zamzam water is higher in inorganic content yet lower in aromatic organic fluorescence compared to regular bottled water. The study aims to determine whether Zamzam water exhibits significant measurable physical differences compared to regular bottled water under identical laboratory conditions.

Photoelectron Dynamics in Strong Ultrafast Visible and Near Infrared Laser Fields

Abdulrahman Hassan Al-Qarni
Dr. Abdulaziz Al-Qassim

Light-matter interactions in intense laser fields induce multiphoton ionization and tunnel ionization. The ionized (free) photoelectron propagates under the influence of the linearly polarized laser field. The photoelectron gains energy from the field and may directly hit the detector located at a distance from the light-matter interaction or return to its parent ion and elastically scatter and gain extra energy from the field. In this research, the photoelectron dynamics under ultrafast strong laser fields are being investigated. The parameters of the laser and target are chosen to be similar to those in the physics department labs at King Saud University. The simulations shown in this study show clear trends in how electrons behave under strong-field laser conditions. We found that the electron displacement and kinetic energy both increase with laser wavelength, confirming the strong dependence of ponderomotive scaling on the square of wavelength. The analysis of birth times demonstrated that the release phase determines whether an electron becomes direct, scattered, or backscattered, each associated with characteristic energy limits. Calculations of the Keldysh parameter further revealed the transition between multiphoton and tunnelling regimes for different atoms and laser intensities. Overall, these results show how to control photoelectron motion in intense visible and near-infrared ultrafast laser fields and highlight the conditions under which different strong-field behaviors emerge.

Reducing Graphene Oxide by using a High-power laser

Aryam bint Mohammed Al-Otaibi
Dr. Wafaa Majmami

The research successfully achieved the laser reduction of graphene oxide (GO) under different powers and exposure times. Identifying the best reduced sample that have an excellent electrical and Optical properties (190W-3sec) and revealing significant variations in the electrical and optical properties between rGO samples and GO.

Rayleigh-Taylor Instability in Laser-Plasma Interactions

Rana bint Abdullah Al-Maliki
Dr. Reem Al-Raddadi

Including the thickness factor f helps reduce the instability. The growth rate increases linearly with laser-induced acceleration. The Atwood number At is the most influential factor, which the large density difference between Copper and Plastic led to a significant increase in the instability growth rate. Future studies should investigate materials with similar densities (lower At) to effectively limit instability growth and preserve target efficiency.

The Effect of Anharmonicity on Phonon Transport

Ruba bint Mohammed bin Huwaimil
Dr. Jawaher Al-Otaibi

Anharmonicity is a critical feature in lattice dynamics. Although the harmonic approximation accurately models the specific heat and the phonon dispersion, the incorporation of anharmonic interactions enables an accurate prediction of finite thermal conductivity and thermal expansion. In this respect, the Grüneisen parameter serves as a useful measure to characterize the strength of the anharmonic interactions.

Fabrication and characterization of dye sensitized solar cell using natural dyes

Hala bint Hani Al-Hamdan
Dr. Narjes Bano

A solar cell converts light into electricity through the photovoltaic effect. Dyesensitized solar cells implement this principle by combining a dye-sensitized TiO_2 network with a suitable redox electrolyte, enabling efficient charge separation and collection without a conventional p–n junction. Natural dyes—such as anthocyanins, betalains, chlorophylls, carotenoids, and tannins—are practical sensitizers for student-level DSSC fabrication. Using controlled extraction procedures, careful dye adsorption onto TiO_2 films, and simple assembly with FTO substrates and graphite or platinum counter electrodes, it is straightforward to build working cells that demonstrate the full sequence of processes: photon absorption, electron injection, transport, and regeneration. The blackberry-juice-sensitized cell illustrates that even everyday plant materials can be used to produce measurable photovoltages. The combination of low cost, relatively safe reagents, and visible device operation makes natural-dye DSSCs powerful educational tool and an accessible introduction to solar-cell research.

Neural-Network Quantum States Variational Monte Carlo for the Ground-State Energy of the Quartic Anharmonic Oscillator

Rowaid Al-Najran
Dr. Ibrahim Al-Namlah

This report investigates the use of Neural-Network Quantum States within a Variational Monte Carlo framework (NNQS–VMC) to approximate the ground-state energy of the one-dimensional quartic anharmonic oscillator. Exact diagonalization is first employed to generate high-accuracy reference energies and to illustrate the severe scaling limitations that arise as the basis size grows. The NNQS–VMC method addresses these limitations by representing the logarithm of the wavefunction with a parametrized neural network and evaluating the variational energy through Metropolis sampling. Automatic differentiation provides stable access to the derivatives required for the local-energy estimator, enabling efficient optimization of the network parameters. Numerical results show that the NNQS ansatz reproduces the exact-diagonalization energies with high accuracy across a wide range of coupling strengths, including extremely large values of λ where the wavefunction becomes sharply localized. The method exhibits an initial transient regime followed by rapid convergence toward the groundstate energy, with flexibility arising from the expressive capacity of the neural-network representation. These findings demonstrate that NNQS–VMC provides a scalable and robust alternative to traditional basis-expansion methods and establishes a foundation for extending neural-network-based variational approaches to higher-dimensional and strongly correlated quantum systems.

Crystal Structure Simulation of $SrTiO3$ sample doped with Mn (7%)

Najd bint Saleh Al-Harbi
Dr. Zainab Bouq

The structural analysis of the SMTO sample confirmed the high crystallinity calculated 98% evidenced by sharp XRD peaks, a consistently constant FWHM value of 0.2 and an average elastic strain $\varepsilon strain$ of 7.58 × 10−4. Structural calculations yielded an average crystallite size (D) of 46.47nm or 464Å while from the simulation program 238Å3 because there are two phases this agreement with [3]. Rietveld refinement carried out using Profex 5.6, found the phase transition from the ideal cubic structure to a distorted tetragonal structure (Pbnm) [2,3], because $Mn2+$ ions substituted $Sr2+$ position, the smaller ionic radius of $Mn2+$ (1.34 Å) compared to $Sr2+$ (1.44 Å) induced a lattice contraction[3], with lattice constants a=5.52217 Å, b=5.52373 Å, and c=7.81071 Å. The excellent Rietveld reliability factors $Rewp$= 2.70% Rwp = 3.52% given good fit (GoF) equals to 1.30 that mean the corresponding of simulation data on experimental data is 99.7%.

Zoology Department

Using Ornamental Palm Seeds in the Nutrition of Tenebrio Molitor Larvae

Rakan Awad Al-Enzi

Dr. Fares Al-Zahrani

In this study, the effect of ornamental palm seeds as a nutritional factor on larval growth was tested. The research aims to explore the potential use of these seeds as a natural source of nutrition and to determine their impact on the health and development of larvae under controlled experimental conditions.

Cytotoxicity Evaluation Of Copper Oxide Nanoparticles Against Human Breast Cancer Cells

Nawaf Abdulrahman Al-Furaih

Prof. Dr. Abdulaziz Al-Khudairi

This research addresses the problem of cancer as a complex disease resulting from abnormal cell growth. Specifically, breast cancer is considered the most common type of cancer among women worldwide, including in the Kingdom of Saudi Arabia. Although many conventional treatments are available, their high costs and significant side effects make them unsuitable for a wide range of patients. In recent years, nanotechnology has emerged as a modern therapeutic option that provides more cost-effective and efficient solutions, with copper oxide nanoparticles being one of its prominent applications.

These nanoparticles are characterized by their small size, ranging from 1 to 100 nanometers, which facilitates their entry into cells and efficient interaction with them. Moreover, their production methods are simple and low-cost compared to other nanomaterial fabrication techniques. Nanoparticles can perform several important biological functions, such as drug delivery, antibacterial activity, contribution to phototherapies, and anti-cancer effects. Their anticancer activity is attributed to their ability to penetrate mitochondria and nuclei, elevate oxidative stress levels, increase the formation of reactive species, induce DNA damage, and trigger cell death.

The present study aimed to synthesize copper oxide nanoparticles using a simple, low-cost method at a low temperature and then evaluate their effects on cancer cells. To achieve this, a lysosomal cytotoxicity assay and a cellular bioactivity assay were employed to assess the impact of the nanoparticles on targeted cells. The results demonstrated that copper oxide nanoparticles possess a clear ability to induce cytotoxicity in cancer cells even at low concentrations, suggesting that they may represent a promising option for more effective and affordable cancer treatment.

Botany & Microbiology Department

Isolation and Identification of some food Fungi

Abdulaziz khalid alhamed
Prof Abdullah Msaad Al-Falih

This project aimed to investigate the fungi that grows on fruits, vegetables ,and bread by isolating and identifying them in three different culture media (PDA, MEA, and Czapek Dox). Samples of banana, tomato, strawberry , cucumber, apple and bread were collected from Riyadh region and cultured on prepared and sterilized media. After incubation for one week at temperature 37°C, diverse fungal growth was observed, and three main genera were identified: Aspergillus, Penicillium, and Fusarium.The results showed that Aspergillus was the most widespread, Penicillium was prominent in bread samples, and Fusarium appeared in the strawberry sample. These findings highlight the importance of studying foodborne fungi and determining optimal growth conditions to reduce spoilage and improve food safety.

Screening of novel antibacterial activity of actinomycetes from KSU garden soil sample

Abdullah Ahmed Bin Madaihish
Prof. Arunachalam Chinnathambi

This study aimed to isolate and identify actinomycetes from garden soil collected at King Saud University and to evaluate their antibacterial activity. Soil samples were cultured on selective media, and filamentous colonies were examined microscopically to confirm actinomycete characteristics. In additional confirmation was achieved through growth on Starch Agar. The isolates were cultured in a fermentation medium to produce crude extracts and extract was extracted using ethanol which were then tested against Staphylococcus aureus, Bacillus subtilis, Escherichia coli, Salmonella typhi, and using the agar well diffusion method. The extract demonstrated visible inhibition zones against Escherichia coli (15.00 mm) indicating antibacterial activity. These findings suggested that garden soil actinomycetes may serve as potential sources of antibacterial compounds.

Antibacterial Activity of Green synthesized Nanoparticles from Alkanna tinctoria

Abdulaziz Mohammed Al-Rubiya
Prof. Abdullah Alarfaj

Antibiotic resistance remains a major global health challenge, driving the search for effective alternatives. This study evaluated the antibacterial activity of Alkanna tinctoria root extract alone and in combination with silver nanoparticles against six bacterial strains, including E. faecalis, E. coli, and S. aureus. The extract was prepared as a 10% w/v methanolic solution and combined with 1 mM silver nanoparticles, and antimicrobial activity was assessed using the disc diffusion method on Mueller-Hinton agar. Results showed that E. faecalis and E. coli were inhibited with zones of 0.8 cm for the extract–silver nanoparticle combination and 0.9 cm for silver nanoparticles alone, with no activity from ampicillin. Staphylococcus aureus exhibited inhibition zones of 0.7 cm with the combination and 1 cm with both silver nanoparticles alone and ampicillin. Bacillus subtilis showed moderate inhibition, with 0.6 cm for the combination and 0.7 cm for silver nanoparticles alone, while ampicillin was ineffective. Salmonella typhi had zones of 0.7 cm with the combination and 0.8 cm with silver nanoparticles alone, with no effect from ampicillin. Pseudomonas aeruginosa demonstrated inhibition zones of 0.7 cm with the combination and 0.9 cm with silver nanoparticles alone, while ampicillin showed no activity. Overall, the Alkanna tinctoria extract–silver nanoparticle combination exhibited antibacterial activity across all tested strains, often slightly lower or comparable to silver nanoparticles alone, suggesting a supportive or synergistic effect. These findings highlight the potential of Alkanna tinctoria root extract in combination with silver nanoparticles as a natural antimicrobial agent for future therapeutic applications.

Isolation and Identification of Date Fungal Contaminants and Assessment of the Antifungal Activity of Clove Essential Oil

Abdulaziz Sultan Alsuhibani
Dr. Tarad Abdulaziz Abalkhail

Dates (Phoenix dactylifera) represent a culturally and economically significant crop in Saudi Arabia; however, fungal contamination during processing and storage poses serious food safety concerns due to potential mycotoxin production. The increasing consumer demand for natural preservatives has prompted investigation into plant-derived alternatives to synthetic antimicrobial agents. This study aimed to isolate and identify fungal contaminants from date fruits collected in Riyadh and to evaluate the antifungal activity of clove essential oil as a natural bio-preservative. Samples were obtained from two contrasting environments—well maintained palm trees in private farms and homes, and neglected palm trees in public gardens. Fungal isolation was carried out using Potato Dextrose Agar (PDA) medium. The antifungal efficacy of clove oil extract was assessed using the disk diffusion method on both PDA and Mueller-Hinton Agar (MHA) at incubation temperatures of 25°C and 37°C, with minimum inhibitory concentration (MIC) determination conducted for selected isolates. Multiple fungal species were successfully isolated and identified, including Aspergillus sp., Rhodotorula yeast ,white mold, and white yeast colonies. Clove oil extract demonstrated significant antifungal activity against all tested isolates, with inhibition zones ranging from 8.6 mm to 32.6 mm depending on the fungal species, growth medium, and incubation conditions. Statistical analysis revealed a significant difference between growth media, with PDA showing substantially higher mean inhibition zones (18.38 mm) compared to MHA (9.30 mm) ($p = 0.0142$). Temperature significantly influenced antifungal efficacy, with enhanced activity consistently observed at 25°C compared to 37°C across all tested isolates. A clear concentration-dependent relationship was established, confirming the dose-response nature of the antifungal effect. The minimum inhibitory concentration (MIC) against Rhodotorula yeast was determined to be 25%, producing a 12 mm inhibition zone. Aspergillus sp. exhibited consistent moderate sensitivity across different experimental conditions. These findings demonstrate that clove essential oil possesses substantial antifungal properties against common fungal contaminants of dates and strongly support its potential application as a natural , sustainable preservative in the date industry, contributing to improved food safety, extended shelf life, and meeting growing consumer demand for natural food additives.

Functionalization of Silver Nanoparticles with Azole Antifungals :Differential Biological Responses of Fluconazole- and Ketoconazole Coated Nanoconjugates

Abdullah Saad Suliman Aldayl
Prof. Jamal M. Khaled

Background: The rise of multidrug-resistant fungal pathogens, particularly Candida auris and Candida albicans, has created an urgent need for novel antifungal strategies. Conventional azole antifungals such as ketoconazole and fluconazole are often limited by poor solubility, reduced bioavailability, and emerging resistance. Nanotechnology-based drug delivery systems offer a promising solution by enhancing drug stability, targeted delivery, and surface interaction with microbial cells. However, there is limited evidence regarding the effectiveness of azole-coated metallic nanoparticles against clinically significant yeasts.

Objectives: This study aimed to evaluate the antifungal performance of ketoconazole-coated silver nanoparticles (AgNPs) and to confirm the successful formation of a nanoscale drug coating layer using physicochemical characterization techniques.

Methodology: Standard 100-nm commercial AgNPs (Sigma-Aldrich) were coated with ketoconazole using a controlled adsorption and sonication protocol, followed by repeated centrifugation and washing to remove unbound drug molecules. Coating was confirmed through ultraviolet-visible spectroscopy, which demonstrated a detectable shift in the localized surface plasmon resonance peak, and transmission electron microscopy, which revealed a thin organic shell surrounding the metallic core. Antifungal activity was assessed using the disk diffusion method against C. auris and C. albicans .

Result: Uncoated AgNPs showed no observable inhibition zones, indicating a lack of intrinsic antifungal activity under the tested conditions. In contrast, ketoconazole-coated AgNPs produced clear and measurable inhibition zones against both yeast species, demonstrating enhanced antifungal performance compared with uncoated nanoparticles. These findings confirm that nanoscale coating improves drug delivery efficiency and preserves the biological activity of ketoconazole at potentially lower effective doses.

Conclusion: In conclusion, ketoconazole-coated AgNPs significantly improved antifungal activity against C. auris and C. albicans, highlighting their potential as a promising nanocarrier-based therapeutic platform. Further studies are warranted to explore dose optimization, stability, and in vivo performance.

Assessment of anti/proinflammatory response following Staphylococcal infection

Abdullah Mohammed Al-shayaa
Dr. Ayman Salem Mubarak

Introduction. Staphylococcus aureus strains, both methicillin-sensitive (Sau) and methicillinresistant (MRSA), represent major clinical pathogens with distinct pathogenic and immunomodulatory profiles.

Aims. This study aimed to investigate the functional divergence in cytokine responses induced by bacterial cell components from Sau and MRSA in human leukocytes and to associate immune patterns with the metabolic burden of methicillin resistance.

Methods. ELISA was used to quantify interleukin-10 (IL-10), an immunosuppressive cytokine ,and interferon-gamma (IFN-γ), a Th1-related cytokine, in leukocyte cultures treated with bacterial cell supernatants (CCS). Interleukin-18 (IL-18) was applied to assess Th1 activation potential.

Results and Discussions. Results demonstrated that MRSA-CCS strongly induced IL-10 production (1197 pg/mL) compared to Sau-CCS (242.6 pg/mL), suggesting an efficient immune evasion mechanism. Conversely, Sau-CCS exhibited enhanced Th1 activation, with IFN-γ levels increasing under IL-18 co-stimulation (2203 pg/mL vs. 1056 pg/mL for MRSA-CCS). These findings indicate two contrasting immune strategies: MRSA promotes immunoregulatory suppression to support chronic colonization, while Sau retains acute Th1-driven inflammatory

potential. Conclusion. Targeting the IL-10 pathway may therefore represent a promising adjunctive approach to restore host immune competence during MRSA infections.

Synthesis and Characterization of Carbon Nanoparticles Derived from Palm Leaf Waste for Energy Applications

Adel Ali Alsimrani
Prof. Ali H. Bahkali

This study explores the synthesis and characterization of carbon nanoparticles derived from palm leaf waste using a simple thermal treatment process. Palm leaves were selected as a sustainable and low-cost biomass precursor for producing carbon-rich nanomaterials with potential energy applications. The resulting carbon was characterized using TGA, SEM–EDX, TEM, and UV–Vis, which collectively confirmed successful carbonization, strong thermal stability, nanoscale particle formation, and optical features consistent with graphitic carbon. These findings demonstrate that palm leaf waste can be effectively converted into functional carbon nanoparticles suitable for further investigation in energy storage and conversion technologies.

Human Adenovirus Detection in Wastewater from KSU wastewater Treatment Plant

Abdulrahman Ibrahim
Dr. Atif Hanif

Human Adenoviruses (HAdVs) are non-enveloped, double-stranded DNA viruses that cause a range of illnesses, including gastroenteritis, respiratory infections, and conjunctivitis. Their strong environmental stability and resistance to physical and chemical stressors make them highly persistent in water systems ,including wastewater, rivers, groundwater, and irrigation water (Farkas et al., 2018). Because HAdVs are shed in feces at high concentrations, they frequently enter wastewater networks and can contaminate downstream watersources. Due to their durability and high detection frequency, HAdVs are widely used as reliable viral indicators of fecal contamination and water quality. In Riyadh, Saudi Arabia, studies have repeatedly detected HAdVs—especially serotype F-41—in irrigation water and other environmental sources, indicating continuous viral circulation and potential public health concerns (Alkathiri et al., 2023; Nour et al., 2021). Wastewater-based epidemiology has emerged as an important tool for monitoring enteric viruses in communities. Understanding the prevalence, distribution, and genotype of HAdVs in wastewater helps evaluate contamination sources, track viral circulation, and assess risks associated with wastewater reuse.

Evaluation of Antibacterial, Antifungal, and Antibiofilm Activities of Pyocyanin Produced by Clinical and Environmental Pseudomonas Isolates

Ghala Alhazzani
Dr. Dalia Al Sarar

Multidrug-resistant pathogens pose an increasing public health threat, necessitating the search for alternative antimicrobials. Pyocyanin, a phenazine pigment generated by Pseudomonas spp., has already displayed antibacterial, antifungal, and antibiofilm properties. In this study, Pseudomonas isolates were obtained from clinical and environmental sources and identified using the Vitek 2 and MicroScan systems, along with the bacterial strains tested. The antimicrobial activity of pyocyanin was examined against Gram-positive bacteria (MRSA, Bacillus), Gram-negative bacteria (E. coli), and fungi (Aspergillus, Penicillium, Fusarium, and Alternaria) by growth inhibition zone and biofilm methods. MRSA showed the highest susceptibility in antibacterial assays, while Bacillus demonstrated the most significant reduction in biofilm formation. The fungi Aspergillus and Penicillium both showed significant inhibition against growth. These results support pyocyanin's broad antimicrobial and antibiofilm properties, thereby providing additional evidence towards Pyocyanin as a natural control agent against multidrug-resistant bacterial and fungal pathogens.

Effect of Salinity Stress on the Germination of Barley (*Hordeum vulgare*) Seeds

Joud Fahd Al-Malki
Dr. Hanan Al-Harbi and Dr. Asma Al-Huqail

This study aimed to evaluate the effect of salinity stress on the germination of barley (Hordeum vulgare) seeds and the growth of its seedlings. Two barley cultivars were used and exposed to different concentrations of sodium chloride (0, 100, 150, and 200 mM). The results showed that increasing salt concentration caused a significant reduction in germination percentage, root length, and shoot biomass in both cultivars, with the most pronounced effect observed at the highest concentration (200 mM).It was observed that the first cultivar exhibited higher salt tolerance compared to the second cultivar, indicating a genetic variation in the response of cultivars to salinity stress. The negative effect of salinity is attributed to osmotic stress, which limits water uptake, and ion toxicity resulting from the accumulation of sodium and chloride ions, disrupting essential physiological and enzymatic functions required for growth. These results emphasize the need for selecting and improving genetically salt-tolerant cultivars and open the door for further studies to understand the precise molecular and physiological mechanisms underlying salinity tolerance in barley, thereby contributing to enhanced productivity in salinity-affected areas.

PLANT RESPONE UNDER GROUNDWATER IRRIGATION

Jana Sulaiman Al-rufaiei
Dr. Alanoud Alfagham

Groundwater salinity poses a major threat to agricultural sustainability in arid environments such as the Al-Qassim region of Saudi Arabia, where hydrochemical analyses indicate water is often characterized by hazardous sodium-chloride-sulfate ion dominance. This research investigated the physiological and growth responses of the salt-sensitive crop cucumber (Cucumis sativus L.) when irrigated with locally sourced groundwater. Cucumber seedlings were exposed for 14 days to three distinct water regimes: Control (C,EC= 0.5 dS/m), Moderately Saline (MS, EC= 1.32 dS/m), and Highly Saline (HS, EC= 3.32 dS/m) water, and stress was assessed by quantifying the compatible osmolyte, free proline (Claussen, 2005), and measuring key growth parameters. The Highly Saline treatment triggered a robust metabolic defense, evidenced by a substantial 94.6% increase in mean proline content in the shoot tissue compared to the Control group. This accumulation of proline serves as a quantitative biomarker of the severe osmotic and ionic strain imposed by the brackish water. However, this high metabolic investment was insufficient to sustain structural growth, resulting in a catastrophic 73.2% reduction in mean fresh weight biomass. While high biological variability under severe stress led to a non-significant statistical outcome (P=0.332), the magnitude of the biomass loss confirms that the EC= 3.32 dS/m stress level exceeded the plant's capacity for effective metabolic adjustment. The results underscore that the specific ionic toxicity prevalent in Al-Qassim groundwater imposes an unsustainable metabolic and yield cost on sensitive crops. Future research must focus on high-replication trials to validate these trends and prioritize agronomic strategies, such as grafting onto ion-excluding rootstocks, to enhance resilience against the region's complex groundwater chemistry.

Bioactivity of Green-Synthesized Silver Nanoparticles using Ferula asafoetida against some pathogenic bacteria

Khalid alsubaie
Dr. Abdurahman Hajinur

The rapid emergence of antibiotic-resistant bacteria has necessitated the search for novel, ecofriendly antimicrobial agents. This study is to assess the antibacterial activity of green synthesed silver nanoparticles (AgNPs) using the extract of Ferula assa-foetida (Asafoetida). The synthesis process was optimized by varying the volume ratios of the plant extract and 1 mM silver nitrate (AgNO_3) solution. The results indicated that a 7:3 ratio (AgNO3: Extract) was the optimum condition for synthesis, evidenced by a distinct color change and verified by UV-Visible spectroscopy. The antibacterial efficacy of the synthesized AgNPs was evaluated against six pathogenic bacterial strains using the disc diffusion method and compared with standard antibiotics. Remarkably, the AgNPs exhibited superior inhibitory activity compared to the antibiotic against Pseudomonas aeruginosa, Escherichia coli, and Enterococcus faecalis .Competitive activity was observed against Staphylococcus aureus, while Salmonella typhi and Bacillus subtilis showed resistance to both agents. These findings suggest that Asafoetidamediated AgNPs possess potent antibacterial properties, making them a promising candidate for future biomedical applications.

Assessment of Airborne Fungi in Selected Primary Schools in Riyadh City

Mohammed Al-Nasrallah
Prof. Dr. Fuad Ameen

This study aims to assess airborne fungal contamination in four schools located in different areas of Riyadh city. Air samples were collected from three classrooms and one indoor yard per school using an SAS H-VAC air sampler calibrated to 50 L per plate. Potato Dextrose Agar (PDA) was used as the sole culture medium. Plates were incubated at 25 ± 2 °C for 1–7 days, depending on the growth rate of each colony. Fungal growth was observed on all plates, while no notable bacterial colonies developed. Morphological examination identified several fungal genera, including Aspergillus niger, Penicillium, Rhizopus, Alternaria, Curvularia, and Neurospora. Yeast isolates were also recovered and identified as non-Candida albicans species and pigmented Rhodotorula, based on germ tube testing, cornmeal agar morphology, urease activity, and colony characteristics. Notably, to the best of our knowledge, this study is the first to report the presence of Curvularia and Rhodotorula in the indoor air of Riyadh schools. Some molds exhibited rapid growth and overcolonization, limiting quantitative assessment. Overall, the findings demonstrate significant fungal diversity in indoor school environments and highlight the need for regular monitoring to reduce potential health and environmental risks.

Date seed extract as a natural source for silver nanoparticles synthesis

Mohammed Alduayj
Dr. Asad Saghir Syed

Nanomaterials derived from plant-based routes are gaining great attention due to their simple mode of action and the abundant availability of bioactive molecules. The present study demonstrates the biosynthesis of silver nanoparticles using date seed aqueous extract. Silver nanoparticles were produced by the action of date seed extracts on silver nitrate (AgNO3) without the addition of any external reducing or capping molecules. UVvisible spectroscopy, TEM, SEM, and EDAX analyses were carried out to further probe the optical, morphological (size and shape) and purity of the silver nanoparticles. These nanoparticles were spherical in nature with size dimensions in the range of 5-30 nm. These biosynthesized nanoparticles were effective as antibacterial agents against Gram-positive and Gram-negative bacteria. This procedure shows a developmental progress towards the eco-friendly generation of silver nanoparticles and opens up new avenues for the production of a variety of other materials.

MICROPROPAGATION OF POTATO AND IN VITRO EFFECT OF CYTOKININS ON QUATATIVE CHARACTERS

Mohammed Zaid Al-Abd Al-Wahid
Dr. Fahd Hamad Al-Quraini

The development of an efficient, cultivar-specific micropropagation protocol is essential for the rapid production of disease-free planting material in potato (Solanum tuberosum L.). This study aimed to evaluate and compare the efficacy of two cytokinins, 6-Benzylaminopurine (BAP) and Kinetin (KN), at concentrations ranging from 1.0 to 10 µM, on the in vitro morphogenesis of the commercially important potato cultivar 'Kufri Ganga'. Results demonstrated a pronounced differential response to the two hormones. BAP was highly effective, showing a positive correlation between concentration and both shoot proliferation and root development, with the highest concentration (T4) yielding the maximum number of shoots and roots. In contrast, Kinetin proved markedly inferior, resulting in minimal shoot multiplication, a suppression of shoot elongation, and a near-complete inhibition of root initiation and elongation across all treatments. The findings conclusively identify BAP as the superior cytokinin for the micropropagation of 'Kufri Ganga', underscoring the critical importance of cytokinin selection in optimizing tissue culture protocols for specific potato genotypes.

Detection of antibacterial effect of some plant extracts against some pathogenic bacteria

Mohammed Emad Alyahya
Dr. Mohammed A. EL-Tayeb

The rapid emergence of antimicrobial resistance (AMR) in clinically important bacteria has renewed interest in plant-derived antimicrobials as complementary or alternative agents to conventional antibiotics. This study evaluated the antibacterial activity of ethanolic and aqueous extracts prepared from five traditional medicinal plants—Punica granatum (pomegranate peel) ,Saussurea costus (Indian costus), Boswellia sacra (frankincense), Commiphora myrrha (myrrh) ,and Ferula assa-foetida (asafoetida)—against six pathogenic bacteria: three Gram-positive strains (Staphylococcus epidermidis, Staphylococcus aureus, Bacillus subtilis) and three Gram-negative strains (Escherichia coli, Salmonella typhimurium, Pseudomonas aeruginosa). Crude extracts were obtained by maceration of 5 g plant material in either water or ethanol ,followed by filtration, evaporation of ethanol at room temperature, re-solubilisation of the dried residues, and clarification by centrifugation. Antibacterial activity was assessed by the agar welldiffusion method on nutrient agar using 100 µL of each extract per well. Ceftazidime (CAZ30) discs served as a positive control. Ethanolic pomegranate peel extract showed the strongest and broadest activity, with inhibition zones of 31, 30 and 26 mm against S. epidermidis, S. aureus and B. subtilis, respectively, and 26 mm against *P. aeruginosa*. Aqueous pomegranate extract produced moderate inhibition against S . epidermidis, S. aureus, B. subtilis and P. aeruginosa (15–22 mm). Ethanolic costus extract exhibited smaller but consistent activity (10–14 mm) against the three Gram-positive species .Ethanolic myrrh extract showed weak inhibition (9–11 mm) of some Gram-positive strains, while asafoetida and frankincense extracts were largely inactive at the tested conditions. E. coli and S .typhimurium were inhibited only by ceftazidime. Minimum inhibitory concentrations (MICs) of ethanolic pomegranate peel extract were determined for S. aureus and P. aeruginosa using a series of two-fold dilutions applied in agar wells. The MIC for P. aeruginosa was 0.312 g/mL, and for S. aureus 0.0097 g/mL. Overall, the findings support pomegranate peel, and to a lesser extent costus and myrrh, as promising sources of antibacterial agents, particularly against Gram-positive pathogens and P. aeruginosa, and justify further purification and mechanistic studies.

Antibacterial Effects of Lactic Acid Bacteria Isolated from Kefir Milk Against Methicillin-Resistant Staphylococcus aureus (MRSA) and Pseudomonas aeruginosa

Norah Abdullah Alhuomaizi
Dr. Hissah Alodaini

The rise of antibiotic-resistant bacteria has prompted a growing interest in natural alternatives. In this study, we isolated lactic acid bacteria (LAB) from kefir milk and evaluated their antibacterial activity against methicillin-resistant Staphylococcus aureus (MRSA) and Pseudomonas aeruginosa. We prepared cell-free supernatants (CFS) of Lactococcus lactis in four different forms: acidic (A), neutralized (N), heat-treated acidic (H-A), and heat-treated neutralized (H-N), in order to investigate their antimicrobial mechanisms. We assessed antibacterial activity using the agar well diffusion method. Our results showed that both acidic and neutralized CFS produced moderate inhibition zones against MRSA, while more pronounced effects were observed against P. aeruginosa, with inhibition zones ranging from 10–11 mm. The complete loss of activity in the heat-treated neutralized samples indicated the involvement of pH-sensitive and heat-labile compounds such as organic acids or bacteriocins. We further examined the biofilm prevention and disruption capabilities using the crystal violet assay. While we observed limited biofilm inhibition (5–7%) against *P. aeruginosa* and negligible effects against MRSA, the CFS treatments were more effective in disrupting established biofilms, achieving up to 35% reduction in *P. aeruginosa* and 30% in MRSA. Overall, our findings suggest that postbiotic compounds derived from Lactococcus lactis isolated from kefir possess moderate antibacterial and anti-biofilm activities. These properties support their potential use as natural biocontrol agents in clinical or food-related applications.

Enhanced Antibacterial Effect of Green-Synthesized Zinc Oxide and Copper Oxide Nanoparticles from Ziziphus spina-christi Extract Under UVB Radiation

Norah Turki Altalhah
Dr. Maha Ahmed Alshiekheid

The growing resistance of bacteria to conventional antibiotics has created an urgent need for eco-friendly and effective antimicrobial alternatives. This study aimed to green synthesize ZnO NPs and CuO NPs using Ziziphus spina-christi aqueous extract, and to evaluate their antibacterial activity before and after exposure to ultraviolet type B radiation (UVB). The synthesized nanoparticles were characterized using ultraviolet–visible spectroscopy (UV–Vis), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), and energy-dispersive X-ray analysis (EDX), all of which confirmed the successful formation of nanoparticles and their interaction with plant-based compounds. The UV–Vis spectra showed characteristic absorption peaks at 350 nm for ZnO NPs and 412 nm for CuO NPs. SEM images revealed that ZnO NPs were rod-shaped with particle sizes ranging from 44.7 to 97.6 nm, while CuO NPs were spherical with sizes ranging from 62.6 to 97.0 nm. The antibacterial activity was tested against Staphylococcus aureus, Bacillus subtilis, Pseudomonas aeruginosa, and Escherichia coli using the agar well diffusion method. The results demonstrated a notable enhancement in antibacterial efficiency of the nanoparticles following UVB exposure, with Staphylococcus aureus being the most sensitive and Escherichia coli the most resistant. Overall, the findings suggest that the combination of green synthesis metal oxide nanoparticles with UVB irradiation may represent a promising approach to combating microbial resistance.

Ajwa Date (Phoenix dactylifera) Seed Extract-Mediated Green Synthesis of Silver Nanoparticles and Antibacterial Activity Evaluation.

Reema Sulaiman Alfafi
Dr. Amal Abdullah Sabour

Silver nanoparticles (AgNPs) are widely recognized for their potent antimicrobial properties and broad biomedical applications. The green synthesis of silver nanoparticles (AgNPs) using plant extracts offers an eco-friendly and cost-effective alternative to conventional chemical methods. This study aimed to synthesize silver nanoparticles from Phoenix dactylifera seed aqueous extract using sunlight-mediated reduction and to evaluate their antibacterial activity against selected Gram-positive bacterial strains (B*acillus subtilis*. *and Staphylococcus aureus*), and Gram-negative bacterial strains (*Escherichia coli and Pseudomonas aeruginosa*). The formation of Date Seed Extract-silver nanoparticles (SDE-AgNPs) was confirmed by a color change from light to dark brown. SDE-AgNPs were characterized by ultraviolet-visible spectroscopy (UV-vis) and scanning electron microscopy (SEM). UV–Vis absorption peak at 437.78 nm, while SEM analysis revealed spherical nanoparticles ranging from 28 42–nm in size. The antibacterial activity was assessed using an agar diffusion assay against *Bacillus subtilis, Staphylococcus aureus, Escherichia coli and Pseudomonas aeruginosa*. The synthesized SDE-AgNPs exhibited strong antibacterial activity, showing inhibition zones of 17.2 ± 0.19 mm against *Bacillus* subtilis, 14.3 ± 0.14 mm against *Staphylococcus aureus*, 15.8 ± 0.13 mm against *Escherichia coli*, and 17.5± 0.14 mm against Pseudomonas aeruginosa. The superior antibacterial activity of AgNPs compared to the crude date seed extract is attributed to the synergistic effects between the bioactive phytochemicals in P. dactylifera (such as flavonoids, saponins, and polyphenols) and the metallic silver core. These findings highlight the reliability of sunlight-assisted green synthesis for producing stable, bioactive nanoparticles with promising applications in antimicrobial and biomedical fields.

Allelopathic chemical effect of Nerium oleander and Prosopis juliflora on the germination and growth of wheat (Triticum aestivum)

Reema Ayed Al-Otaibi
Dr. Jawaher Al-Qahtani

The phenomenon of allelopathic chemical interference is one of the important biological phenomena that directly affect plant interactions within agricultural ecosystems. Some plants secrete chemical compounds capable of inhibiting or promoting the growth of neighboring plants. In light of the widespread distribution of invasive plants in various environments, there is an increasing need to understand their potential effects on crop plants, especially economically important crops such as wheat (Triticum aestivum), which is a key element in food security.This study aimed to investigate the allelopathic chemical effect of extracts from Nerium oleander flowers and Prosopis juliflora leaves on the germination and growth of wheat seedlings, and to compare the degree of inhibitory effect between the two extracts. In this study, alcoholic extracts were prepared from Nerium oleander flowers and Prosopis juliflora leaves at different concentrations (2%, 4%, 6%, and 10%) and applied to wheat seeds and seedlings in Petri dishes and pots, with distilled water used as the control treatment. The biological and physiological measurements included germination percentage, average shoot length, root and stem length, fresh and dry biomass, and the content of photosynthetic pigments (chlorophyll a, chlorophyll b, and carotenoids). The results showed a clear and gradual decline in wheat seed germination and seedling growth with increasing extract concentrations from both plants, confirming a significant allelopathic inhibitory effect. The control treatment exhibited the highest values in all parameters, while the highest concentrations (especially 10%) caused the greatest negative effects, including reduced germination percentage, shorter root and shoot lengths, and markedly lower biomass. Measurements of photosynthetic pigments indicated the sensitivity of chloroplasts to secondary metabolites in the extracts, as evidenced by decreased chlorophyll and carotenoid contents, reflecting a direct impact on photosynthetic efficiency. Moreover, the Prosopis extract demonstrated a stronger allelopathic effect than the Nerium extract in most parameters, suggesting the presence of more potent inhibitory compounds such as tannins, alkaloids, and phenolics. Although the Nerium extract was less intense than Prosopis, it still caused significant negative effects at high concentrations, highlighting the potential risk of these plants growing near agricultural fields.The study concluded that both Nerium oleander and Prosopis juliflora have strong allelopathic effects that can limit wheat germination and growth, and their presence in agricultural environments may pose a threat to crop productivity. The study also recommends monitoring the spread of these invasive plants and utilizing their allelopathic properties to develop natural alternatives to chemical pesticides within sustainable biological control programs.

Balloon Type Biogas Production Enhance By Biochar As Precursors To The Anaerobic Digestion As A Sustainable System For Managing Organic Waste

Renad Mohammed Alshehri
Dr. Amal Almousa, Dr. Khaloud Alarjani

Biogas plants are a sustainable and environmentally friendly way of generating energy from organic waste materials, This study investigates the use of date seed derived biochar to enhance anaerobic digestion and biogas production. The experiment was conducted under mesophilic conditions at 37 °C using biogas method: the balloon gas collection method. Three treatments were prepared: (inoculum only), (inoculum + substrate), and (inoculum + substrate + biochar). Biochar was produced through pyrolysis after washing, drying, and grinding the date seeds. Ballon biogas measurement techniques successfully demonstrated biogas formation more consistent results. The study highlights that adding biochar improved reactor stability and biogas generation compared to controls. Future improvements should include biochar characterization, gas composition analysis, and multi-replicate trials to enhance the reliability and precision of results.

Evaluating The Antimicrobial Activity Of Arabic Gum (Acacia) Against Some Pathogenic Bacteria And Yeasts With Insights On Biofilm Inhibition

Ruaa Alfarsy
Dr. Mashail Alsayed

Gum Arabic (Acacia senegal and Acacia seyal) is a natural plant exudate rich in bioactive compounds that have gained increasing attention in pharmaceutical and microbiological applications, particularly for its antimicrobial and anti-biofilm properties. This study aimed to evaluate the antimicrobial activity of Gum Arabic extracts—raw and powdered, using both aqueous and methanolic extraction—against Candida albicans, Candida parapsilosis, Staphylococcus aureus, and Escherichia coli, in addition to assessing its ability to inhibit yeast biofilm formation. Bacterial and yeast isolates were obtained from King Khalid University Hospital in Riyadh, Saudi Arabia. Aqueous and methanolic extracts were tested using the agar well-diffusion method, followed by subculturing swabs from inhibition zones onto SDA to determine fungistatic or fungicidal activity of Candida species against Arabic gum extracts. The extracts showed no antibacterial effect against S. aureus or E. coli. In the other hand, the methanolic extracts—particularly the powdered form—exhibited the strongest antifungal activity, producing clear inhibition zones, especially against C. parapsilosis. Subculture results confirmed fungicidal activity at certain concentrations, while aqueous extracts showed mainly fungistatic effects. Biofilm assays demonstrated that the milled methanolic extract significantly reduced biofilm formation in both Candida species, recording the lowest OD450 values, whereas aqueous extracts had minimal impact. Overall, the findings indicate that Gum Arabic has promising antifungal and anti-biofilm potential when methanol-extracted and used in milled form, while its antibacterial activity was absent under the tested conditions.

Isolation and characterization of oral microorganisms resistant to commercial toothpaste and enhancement of its antimicrobial activity using methanolic plant extracts

Saleh Brrak Al-Brrak
Prof. Dr Naiyf S Alharbi

Background: The widespread use of antimicrobial agents in oral hygiene products, such as toothpaste, has raised concerns about the potential emergence of resistant microorganisms within the human oral microbiota .Although toothpaste formulations often claim to eliminate up to 99.9% of oral pathogens, sublethal exposure to antimicrobial components can select for tolerant or resistant bacterial strains. Understanding the microbial diversity and resistance patterns associated with these consumer products is crucial to ensuring their safety and long-term effectiveness.

Objectives: This study aimed to isolate and characterize bacterial species resistant to a commercially available toothpaste from healthy adult volunteers and to evaluate the potential enhancement of toothpaste antimicrobial activity using natural plant extracts .

Methodology: Oral samples were collected aseptically from five healthy adult donors using sterile brushes
moistened with physiological saline. The samples were cultured on nutrient agar supplemented with graded concentrations of the selected toothpaste. Resistant colonies were purified, morphologically examined, and identified using the VITEK® 2 Compact biochemical system and VITEK® MS (MALDI-TOF) for proteomic confirmation. To enhance the toothpaste's antimicrobial potential, methanolic extracts of Salvadora persica (Miswak) and Syzygium aromaticum (Clove) were prepared from dried powdered plant material (1 g/100 mL methanol, 200 rpm, 25°C, 28 h) and incorporated into the toothpaste at a 1:1 ratio.

Result: The biochemical profile generated (BioNumber 05000102000001) identified the isolate as Kocuria rhizophila with 98–99.9% confidence. Microscopic and cultural observations revealed that the isolate was a non–spore-forming, Gram-positive coccus producing smooth, yellow-pigmented colonies. Biochemical testing showed a limited capacity for carbohydrate fermentation but strong oxidative enzyme activity , suggesting a metabolism adapted for chemical stress tolerance. Antibiotic susceptibility testing indicated that the isolate remained susceptible to most clinical antibiotics, including β-lactams, aminoglycosides ,macrolides, and fluoroquinolones, but was resistant to cefixime and nitrofurantoin, confirming that its resistance is likely adaptive and specific to toothpaste components rather than antibiotic exposure. The antimicrobial activity of these formulations was assessed using the agar well diffusion method against the resistant K. rhizophila. The commercial toothpaste alone produced an inhibition zone of 11 mm, whereas the formulations supplemented with S. persica and S. aromaticum extracts yielded inhibition zones of 15 mm and 26 mm, respectively. The clove extract exhibited the strongest synergistic effect, likely due to its high eugenol content, which disrupts bacterial membranes and enhances permeability.

Effect of polyethylene glycol 6000 on the performance of tomato seedlings

Saleh Mohammed Al-Sulaiman
Dr.Manzar Sadeqi

This study explored how different amounts of polyethylene glycol (PEG 6000) affect the germination, growth, and physiological responses of tomato (Solanum lycopersicum L.) seedlings when facing simulated drought stress. We found that PEG6000 notably improved germination rates and germination index, especially at 20% PEG. As for physical traits like root and shoot length, along with fresh and dry weights, they steadily increased with higher PEG levels—showing that a moderate amount of osmotic stress can boost seedling vitality. Our analysis of photosynthetic pigments indicated a steady rise in chlorophyll a, chlorophyll b, and overall chlorophyll content, suggesting that PEG6000 helps support instead of hinder photosynthesis. We also saw a sharp buildup of proline with increased PEG, which points to the activation of protective mechanisms that keep cells stable during water shortages. On the other hand, malondialdehyde (MDA) levels went up with higher PEG concentrations, signaling increased oxidative stress under greater osmotic pressure. Overall, these results highlight that PEG6000 can effectively mimic drought conditions while encouraging germination, growth, and stress-response processes in tomato seedlings.

Chitosan–Nanoparticle Composite Coatings for Gauze and Catheter Materials: Enhanced Antibiofilm Activity Against MRSA and *Enterococcus faecalis*

Shahd Abdullatif Zinou
Dr. Rawan Mohammed Alshalan

Hospital-acquired infections (HAIs) remain a major global health challenge, especially those associated with invasive medical devices such as catheters and wound dressings. The rise of multidrug-resistant pathogens, including MRSA and *Enterococcus faecalis*, has increased the need for alternative antimicrobial strategies. This study evaluates the antibiofilm and antibacterial effects of biosynthesized silver nanoparticles (BS) and silver–iron nanoparticles (PSI), applied individually and in combination with chitosan (CN), on gauze and catheter materials. Nanoparticles were synthesized using Bacillus subtilis and Pseudomonas aeruginosa supernatants and applied as coatings with or without chitosan. Biofilm formation and bacterial viability were assessed using the Miles and Misra method and SEM imaging. Results showed that chitosan–nanoparticle composite coatings (CN-BS and CN-PSI) significantly inhibited MRSA biofilm formation on gauze and reduced *E. faecalis* biofilm on catheters. Composite coatings displayed superior performance compared to nanoparticles alone, indicating a synergistic effect between chitosan and the nanoparticles. These findings highlight the potential of chitosan-based nanoparticle coatings as effective antimicrobial strategies for medical devices and wound dressings. Further in-vivo and clinical studies are recommended to validate their real-world applications.

Isolation and Characterization of Endophytic Fungi from Artemisia spp.and Nephrolepis exaltata, and Evaluation of their Enzymatic Activity on Food and Marine Waste

Shahad Mohammed alshehri
Dr. Najla alshaikh

Endophytic fungi are important microbial resources with substantial ecological and biotechnological relevance due to their ability to produce diverse bioactive compounds and degradative enzymes. This study aimed to isolate and characterize endophytic fungi from two plant hosts known for their rich microbial associations, Artemisia spp. and Nephrolepis exaltata, and to evaluate their growth performance on food- and marine-derived waste substrates, as well as their capacity to produce extracellular hydrolytic enzymes. Endophytes were isolated from surface-sterilized stems and leaves and were morphologically identified as *Stemphylium* spp. and *Alternaria* spp. The isolates were cultivated on two waste-based substrates—cake residues (rich in sugars and carbon) and shrimp shells (a chitin-rich substrate)—under both solid and liquid fermentation conditions. Fungal biomass measurements revealed that Stemphylium spp. achieved the highest growth on solid cake waste (0.555 g), while its growth on cake residues in the liquid medium was lower (0.07 g). Alternaria spp. showed high growth (0.193 g) on cake residues in the solid medium, but its growth on the liquid medium was minimal (0.08 g). Growth on shrimp shells was relatively low for both fungi, regardless of whether the growth was in the solid or liquid medium. DNS-based enzymatic assays showed strong chitinase activity in both fungi when grown on shrimp shells, while cellulase activity was detected only in *Stemphylium* spp. cultivated on cake waste. No detectable enzymatic activity was observed for *Alternaria* spp. on cake substrate. Dual-culture assays showed no antagonistic effects against *Aspergillus* spp. or *Penicillium* spp. Overall, the results highlight the ability of endophytic fungi to utilize low-cost waste materials as growth substrates and to produce valuable enzymes such as chitinase and cellulase, underscoring their potential in sustainable waste valorization and environmentally friendly biotechnological applications.

Polyethylene Glycol (PEG)-Induced Modula5on of In Vitro Regenera5on and Biochemical Response in Coleus neochilus

Sultan Mohammed Al-Subaie
Dr. Mohammed Faisal Imtiaz

Coleus neochilus is an aromatic medicinal plant valued for its adaptability and numerous bioactivities. However, its propagation is hindered by low seed viability and slow vegetative growth. This study investigated the impact of polyethylene glycol (PEG)-induced osmotic stress on in vitro regeneration and biochemical responses in C. neochilus, with the aim of enhancing in vitro regeneration methods and understanding the metabolic changes associated with stress. Nodal explants cultured on MS medium with 2.5 µM BA achieved optimal shoot induction, with 98.53% regeneration and an average of 12.80 shoots per explant. When combined with PEG, mild osmotic stress (0.25%) significantly increased shoot proliferation to 21.70 shoots per explant and promoted shoot elongation. In contrast, higher PEG concentrations (≥0.5%) inhibited growth, caused hyperhydricity, and led to senescence. Most shoots rooted spontaneously, and further rooting with 0.5 µM IBA resulted in robust root development, with a 90% success rate in acclimatization vitro .Biochemical analyses showed that in vitro plants had higher total phenolics (77.30 mg GAE/g DW) compared to ex vitro plants, while flavonoid levels remained similar. PEG-induced in vitro plants demonstrated increased antioxidant activity at all tested concentrations, which was linked to higher phenolic content. GC–MS analysis revealed distinct metabolite profiles between in vitro and ex vitro plants, with variations in major compounds suggesting environmental influence on secondary metabolite pathways. In vitro plants contained 16 identified compounds, whereas ex vitro plants had 13, indicating that nutrient medium and controlled culture conditions affect phytochemical biosynthesis. Overall, the study shows that controlled PEG-induced osmotic stress enhances regeneration efficiency and triggers adaptive biochemical responses in C. neochilus, establishing a reliable micropropagation protocol and laying the groundwork for developing stress-tolerant plant.

Sequence and phylogenetic analysis of Influenza B virus lineages circulating in Riyadh, Saudi Arabia

Turki Marzoog Alharb
Prof. Fahad Almajhadi

Influenza viruses are among the most important respiratory pathogens that cause annual epidemics and a significant global health and economic burden. Although Influenza A and B viruses share structural similarities, Influenza B virus (IBV) continues to play an essential role in seasonal influenza infections worldwide. IBV is classified into two distinct genetic and antigenic lineages: B/Victoria and B/Yamagata. This study aimed to investigate the genetic diversity and phylogenetic relationships of circulating IBV strains in Riyadh, Saudi Arabia, during the epidemic seasons of 2024-25 ,and to compare them with the World Health Organization (WHO)-recommended vaccine strains. Six clinical samples that tested positive for IBV were analyzed using one-step RTPCR and sequencing of the HA1 gene. Phylogenetic analysis revealed that 7 strains IBV strains in Riyadh (2024–2025) including) B/Riyadh/33/2024, B/Riyadh/52/2024, B/Riyadh/57/2024, B/Riyadh/116/2024 , B/Riyadh/187/2025,B/Riyadh/348/2025, and B/Riyadh/362/2025) clustered within the Victoria lineage, showing 74% sequence similarity with the vaccine strain B/Austria/1359417/2021. In the context of historical isolates from Riyadh in the years 2020 ,it was observed that the four isolates belong with B/Victoria lineage, while one isolates from2010 was classified under the B/Victoria lineage. The other two strains (B-Riyadh-71-2015 and B-Riyadh-82-2015) grouped within the B/Yamagata-like lineage, sharing 73% similarity with the vaccine strain B/Massachusetts/02/2012 (Fig. 2).These findings demonstrate the co-circulation of both B lineages in Riyadh during different epidemic seasons and emphasize the importance of continuous molecular surveillance to support influenza vaccine strain selection and improve vaccination strategies in Saudi Arabia.

Effects of Chemical and Physical Treatments on Seed Dormancy and Germination of *Datura inoxia*

Turki Saud Abdullah Al-Otaibi
Prof. Dr. Ibrahim Abdullah Al-Arid

Datura inoxia is a medicinal plant with significant pharmaceutical value, but its propagation is hindered by complex seed dormancy. This study was conducted to identify the most effective pre-sowing treatment to break this dormancy. Nine experimental groups, including an untreated control, chemical soaks (GA_3 250/500 ppm, KNO_3 500 ppm), physical/chemical scarification (Sandpaper, 96% H_2SO_4 for 1 min), and heat (80°C and 90°C hot water), were evaluated in a Completely Randomized Design. A one-way ANOVA confirmed a statistically significant difference between treatments ($F(8, 18) = 3.7338$, $p = 0.0097$). Post-hoc analysis showed that the highest germination percentages were achieved by GA_3 (250 ppm) and 80°C hot water (both 80.0%), which were statistically superior to the untreated control (56.7%). Conversely, the 1-minute H_2SO_4 treatment was found to be phytotoxic, significantly reducing germination to 23.3%. The manual sandpaper method (53.3%) was proven to be highly inconsistent (SE = 21.86). The high germination of the control and distilled water (70.0%) groups, likely influenced by a preliminary viability float test, suggests the seed lot possessed a weak dual (physical and physiological) dormancy. In conclusion, 80°C hot water and 250 ppm GA_3 are the most effective, reliable, and practical methods for enhancing the germination of D. inoxia.

Biochemistry Department

Nanoparticles in Cancer Therapy with a Focus on Zinc Oxide (ZnO) Nanoparticles

Abdul Aziz bin Nawaf bin Abdul Aziz Al-Rashid

Dr. Ibrahim bin Fahad Al-Dubayan

Cancer remains a leading cause of mortality in Saudi Arabia and worldwide, and conventional chemotherapy and radiotherapy still suffer from poor tumor selectivity, systemic toxicity, and the development of resistance. Nanoparticle-based drug delivery systems have emerged as a strategy to improve drug accumulation in tumors and to introduce new mechanisms of action. In this project, we focused on zinc oxide nanoparticles (ZnO-NPs), prepared by a green synthesis approach using Nigella sativa extract, and evaluated their antiproliferative effect on A549 human lung adenocarcinoma cells. A549 cells were exposed to Nigella sativa–mediated ZnO-NPs at 5–200 µg/mL for 24 h, and cell viability was assessed using an MTT assay. After blank subtraction and normalization to untreated control, ZnO-NPs reduced cell viability to approximately 15–40% of control across all tested concentrations, indicating a strong cytotoxic effect. In parallel, structural modelling in ChimeraX was used to visualize electrostatic surfaces of p53, Bax, and Bcl-2, highlighting negatively charged patches that represent potential contact regions for positively charged ZnO-NPs. Together with published mechanistic data, these observations support a model in which ZnO-NPs do not bind p53 in a single specific pocket but instead induce oxidative stress and DNA damage that activate the p53–Bax/Bcl-2 axis and caspase-dependent apoptosis. Overall, the findings suggest that green-synthesised ZnO-NPs are promising candidates for lung cancer nanotherapy and warrant further in-depth mechanistic and in vivo evaluation.

Effect of natural (Gallic acid and vanillic acid) and synthetic Nanoparticle (AgNP) on glycation of human serum Albumin

Ahmed bin Abdul Karim Al-Otaibi

Prof. Dr. Majid bin Saleh Al-Aqeel

This study examined the inhibitory effects of silver nanoparticles (AgNPs), gallic acid, and vanillic acid on methylglyoxal (MGO)-induced glycation of human serum albumin (HSA). AgNPs were synthesized using Roselle calyces extract and confirmed by UV-Vis spectroscopy through a surface plasmon resonance peak at 400–450 nm. HSA was incubated with MGO in the presence or absence of inhibitors, and glycation was assessed by UV-Vi's spectroscopy, tryptophan fluorescence, and circular dichroism (CD). MGO induced structural alterations in HSA, evidenced by increased absorbance at 280 nm and reduced tryptophan fluorescence. AgNPs, gallic acid, and vanillic acid attenuated these changes, with AgNPs showing the strongest inhibition, followed by gallic acid and vanillic acid. Fluorescence assays indicated partial restoration of albumin structure, while CD analysis revealed that polyphenols preserved α-helical content, whereas AgNPs caused partial secondary structure loss. Thus, AgNPs exhibited superior inhibition but disrupted albumin conformation, suggesting direct protein interaction, while gallic and vanillic acids inhibited glycation while maintaining structural integrity. These findings highlight polyphenols as safer anti-glycosylation agents compared to nanoparticles, warranting further investigation into their effects on albumin stability and function.

The Effects of Curcumin on the levels of Oxygen Free Radicals generated by Riboflavin: Implication in Protein Degradation

Faisal bin Fahad Al-Ghathbar

Dr. Mansour Khalil Mohammed Ghatasha

The study examines the effects of curcumin on the levels of oxygen free radicals generated by riboflavin, specifically in relation to protein degradation. Curcumin is a naturally occurring polyphenolic compound derived from the rhizome of Curcuma longa (turmeric), a plant widely used in traditional medicine and as a dietary spice. And it exhibits poor water solubility, rapid metabolism, and limited bioavailability, which have historically restricted its therapeutic application. Curcumin is widely investigated for its ability to modulate signaling pathways, scavenge reactive oxygen species, and regulate gene expressions linked to chronic diseases such as cancer. The study found that curcumin showed a bit better result regarding ROS generated and increased photoilluminated riboflavin absorption at zero minutes, but it will not prevent the photodegradation with time. And in the BSA test we observed that photoilluminated riboflavin will cause the degradation of BSA, but in the contrary curcumin showed that it got a relatively protecting properties to the BSA bands. And the BSA test was carried out by SDS-PAGE using a densitometer following separation by electrophoresis was used to better understand the morphological changes in BSA caused by photoilluminated riboflavin. In conclusion, the study suggests that ROS generated by photoilluminated riboflavin cause protein damaging when they are carried out in the presence of rutin via direct energy transfer. The findings of this study have implications for understanding the role of curcumin in protecting against oxidative stress and protein degradation.

Evaluating the Anti-Inflammatory Effect of Bitter Melon Using a Protein Denaturation Assay

Ghaida bint Abdullah Al-Dosari

Dr. Tahani Al-Shahri

Inflammation is a natural defense mechanism, but when excessive, it contributes to chronic disease and tissue damage. Interests in plant based anti-inflammatory agent has increased due to the limitations and side effect of synthetic drugs. Bitter melon is traditionally used for various health conditions; its anti-inflammatory potential requires further significant evaluation. This study investigated the anti-inflammatory activity of bitter melon extract using the heat-induced protein denaturation assay, a standard method for assessing substance that protects proteins from structural damage. Egg white albumin was exposed to thermal stress in the presence of different extract concentrations. A blank and a control were included to ensure accuracy. The extract showed a concentration-dependent inhibitory effect with the highest concentration producing and an inhibition rate of 98.73% indicating strong protection against protein denaturation. These results suggest that bitter melon contains a bioactive compound capable of reducing protein instability, supporting its potential anti-inflammatory properties. While these findings are promising, further in vivo studies and compound isolation are necessary to confirm therapeutic relevance and clarify the mechanism of action. The study contributes to the growing evidence supporting the medical clinical value of bitter melon as a natural anti-inflammatory candidate.

Comparative Assessment of Protease Activity and Antioxidant Potential of Fresh and Commercially Available Juices from Three Tropical Fruits.

Lina bint Ali bin Abdulaziz Al-Saqr

Dr. Abeer Al-Dabbas

Background Tropical fruits like papaya, pineapple, and kiwi are rich in enzymes and antioxidants, which can be affected by processing. This study compares the biochemical profiles of fresh and commercial fruit juices to evaluate how processing impacts enzymatic and antioxidant activities.

Methods This study presents a comparative biochemical analysis of papaya, pineapple, and kiwi, alongside their corresponding commercial juices. Protease activity was measured at pH 3.0, 7.5, and 10.5 using casein as the substrate to assess differences in proteolytic capacity between fresh and commercial fruit juices. Antioxidant properties were investigated through DPPH assay, total phenolic content, and vitamin C measurement, providing a comprehensive understanding of the fruits' oxidative profiles. Crude extracts were subjected to ammonium sulfate precipitation as a preliminary purification step, followed by protein quantification using the Bradford assay and SDS-PAGE analysis to identify key protease-associated bands.

Results fresh pineapple showed the strongest protease activity, followed by kiwi, while papaya had the lowest. Antioxidant results (DPPH) indicated higher radical-scavenging activity in pineapple and kiwi, while commercial juices showed minimal activity. Total phenolic content varied, with commercial kiwi juice showing the highest values and fresh papaya the lowest. Vitamin C results confirmed kiwi as the richest source, while all commercial juices showed reduced levels due to processing. SDS-PAGE revealed clearer protease-related bands in kiwi and papaya compared with pineapple.

Conclusion: The analysis demonstrated apparent biochemical differences among the fruits, emphasizing how processing affects their enzymatic activity and antioxidant properties.

Rutin as a Multifunctional Bioactive Compound: Potent Antioxidant, Selective Antibacterial, and Anticancer Activities

Manar bint Sultan Al-Dosari

Dr. Arej Al-Zahrani

Rutin was evaluated for its antioxidant, antibacterial, and anticancer activities using DPPH, disc diffusion, and MTT assays. The compound is a naturally occurring flavonoid known for its wide range of biological effects. In the DPPH assay, Rutin showed strong free radical–scavenging activity, demonstrating higher antioxidant potency compared to Ascorbic Acid. The significant reduction in DPPH absorbance reflects its effective electron-donating ability. The antibacterial assessment revealed weak to moderate inhibition of Escherichia coli and Staphylococcus aureus. Ampicillin produced stronger activity, as expected. The DMSO:EtOH solvent used as the negative control produced measurable inhibition due to the membrane-disruptive effect of ethanol, which emphasizes the influence of solvent components on bacterial growth. In the MTT assay, Rutin reduced the viability of MCF-7 breast cancer cells in a dose- and time-dependent manner. Microscopic images showed clear morphological changes such as cell rounding, shrinkage, and loss of adhesion, indicating apoptotic-like effects. Rutin demonstrated potent antioxidant activity, limited antibacterial action, and promising anticancer potential. Higher concentrations, additional strains and cell lines, and molecular pathway analysis are suggested to further clarify its therapeutic applications.

α-Amylase Activity in Aqueous and Ethanolic Extracts of Ceratonia siliqua L. Under Variable Conditions

Muneefa bint Faisal Al-Qahtani

Dr. Jehan Al-Ghamdi

This research aims to evaluate the α-Amylase activity in Aqueous and Ethanolic Extracts of Ceratonia siliqua L. Using the DNS assay at 540 nm under different pH, temperature, and substrate concentration condition, shaking, filtration, centrifugation and ethanol evaporation. The results showed weak and fluctuating activity in both extracts, the ethanolic extract exhibited higher absorbance due to interference from plant secondary metabolites, rather than true enzymatic activity, as supported by previous studies. The aqueous extract showed less interference but remained unstable with no clear optimum. Overall, the findings indicate the presence of low and inconsistent α-Amylase activity, but the strong influence of secondary metabolism significantly affects measurement accuracy, highlighting the need for further purification steps to obtain more reliable results.

The Therapeutic Potential of Hibiscus sabdariffa Extract Against SH-SY5Y Neuroblastoma cells: Cytotoxicity and Antioxidant Activit

Muzoon bint Abdullah Al-Najashi

Dr. Amal Al-Anad

The search for safer and more effective cancer treatments has increasingly turned toward natural products. Among these, plant-derived compounds have gained remarkable attention for their potent bioactivities. This study investigated the antioxidant and cytotoxic potential of Hibiscus sabdariffa methanolic extract against SH-SY5Y neuroblastoma cells through a series of in vitro assays. Phytochemical screening confirmed the presence of phenolic and flavonoid compounds. Antioxidant capacity was evaluated using the DPPH free radical scavenging assay, and total phenolic content (TPC = 300.8 mg GAE/g extract) and total flavonoid content (TFC = 162.6 mg QE/g extract) were determined colorimetrically. The extract exhibited strong antioxidant potential (IC_{50} = 277.5 µg/ml), supported by high TPC and TFC values. Cytotoxicity was assessed using the MTT assay, showing a concentration-dependent reduction in cell viability (IC_{50} = 767 µg/ml). Morphological observations revealed characteristic apoptotic features, including shrinkage and detachment. The scratch wound-healing assay further demonstrated significant inhibition of cell migration, suggesting potential anti-metastatic activity. Overall, these findings indicate that Hibiscus sabdariffa possesses strong antioxidant and cytotoxic properties attributed to its phenolic and flavonoid compounds, demonstrating its promise as a natural compound with therapeutic relevance in neuroblastoma therapy.

Morphological Assessment of MCF-7 Breast Cancer Cells Treated with Ashwagandha and Shilajit Extracts

Noha bint Ahmed 'Ati

Dr. Hameeda Al-Anzi

Traditional plant-based medicine has long been utilized for the treatment of various diseases, including cancer, due to its accessibility, cost-effectiveness, and low toxicity. Among medicinal plants, Withania somnifera (Ashwagandha) and natural Shilajit have gained significant attention for their potential anticancer properties. Ashwagandha contains bioactive withanolides, such as withaferin A and withanone, which selectively inhibit cancer cell proliferation and induce apoptosis, while also modulating immune responses. Shilajit exhibits direct cytotoxicity against cancer cells and enhances the efficacy of chemotherapeutic agents, such as doxorubicin, while providing protective effects for normal tissues. Breast cancer MCF-7 cells serve as a reliable in vitro model to study the cytotoxic and mechanistic effects of these plant-based compounds. Extraction of bioactive constituents via traditional maceration methods preserves key phytochemicals, allowing controlled laboratory studies on efficacy and safety. Cytotoxicity assays demonstrate dose-dependent inhibition of cancer cell growth and induction of apoptosis by both Ashwagandha and Shilajit. Morphological analyses further confirm structural changes in cancer cells consistent with apoptosis, supporting the mechanistic understanding of their anticancer effects. This study underscores the integration of traditional medicinal knowledge with modern pharmacological research, highlighting the potential of Ashwagandha and Shilajit as complementary agents in breast cancer therapy.

The deposition of fibulin-4 and latent transforming growth factor-beta binding protein-4 in dermis upon wound healing

Oroob bint Ali Al-Muzaini

Dr. Mona Shujaa Al-Harbi

Dermal wound healing is a complex, multi-stage process that relies on the precise synthesis, deposition, and organization of extracellular matrix (ECM) components, particularly elastic and collagen fibers. Disruption in elastogenesis is a major contributor to scar formation; however, the specific involvement of early elastic fiber proteins such as fibulin-4 (FBLN4) and latent transforming growth factor-β binding protein-4 (LTBP4) is not yet fully defined. This study investigated the deposition and localization of FBLN4 and LTBP4 in human scar tissue compared with matched normal skin and examined their relationship to collagen type I (COL1), tropoelastin (TE), and microfibrillar-associated protein-4 (MFAP4). Full-thickness 2-mm dermal biopsies were obtained from scar tissue and adjacent normal skin of consenting participants. Samples were formalin-fixed, paraffin-embedded, and subjected to immunofluorescence staining for FBLN4, LTBP4, COL1, TE, and MFAP4. Imaging and quantitative analyses were performed using Fiji/ImageJ to assess protein deposition levels, signal intensity, and ECM fiber organization. TE and COL1 showed comparable deposition levels in scar and normal skin; however, autofluorescence imaging revealed that elastic and collagen fibers in scar tissue were shorter, fragmented, and structurally disorganized. In contrast to TE and COL1, both FBLN4 and LTBP4 displayed significantly reduced deposition and limited incorporation into elastic and collagen fibers in scar samples, indicating disrupted early elastogenesis and collagenesis. MFAP4 levels remained unchanged, consistent with the absence of excessive fibrosis in the examined tissues. Overall, the findings demonstrate that decreased deposition of FBLN4 and LTBP4 rather than alterations in TE, COL1, or MFAP4 plays a crucial role in the abnormal ECM architecture observed in scar tissue. Reduced availability of these essential early elastogenesis proteins likely impair proper elastic and collagen fiber formation, contributing to diminished tissue elasticity and the development of scar tissue during wound healing.

Antioxidants in Saudi and V60 Coffee: Effects of Brewing and Roasting

Raghad bint Mohammed Al-Qahtani

Dr. Reem Al-Otaibi

offee's bioactive content depends on its preparation and roasting. Saudi coffee and V60 differ in brewing style, yet few studies have assessed how roasting and boiling time affect their antioxidant activity and total phenolic content (TPC). This study examined how these factors influence antioxidant potential.

Methods

Coffee beans were roasted and ground for Saudi and V60 preparation. Antioxidant activity (DPPH) and TPC (Folin–Ciocalteu) were measured across different roasting levels, brewing methods, and boiling times (5–25 min).

Results

Antioxidant activity and TPC increased with boiling time, peaking at 15 minutes. Light-roast Saudi coffee showed the highest values, while V60 yielded lower antioxidant and phenolic content. Brewing method, heat exposure, and roast level markedly affected the antioxidant profile.

Conclusion

Under the study conditions, light-roast Saudi coffee boiled for about 15 minutes provided the greatest antioxidant activity and phenolic content, highlighting the importance of roasting and brewing choices.

Evaluation of Antioxidant and Antibacterial Activities of colchicine

Raneem bint Ayed Al-Shahrani

Dr. Arej Al-Zahrani

Colchicine is an alkaloid consisting of three rings, extracted from colchicum autumnale plant, characterized by its various therapeutic uses, including the treatment of gout and familial Mediterranean fever. This study presents an evaluation of the antioxidant, antibacterial, and anticancer activities of Colchicine in the laboratory, as well as the effect of solvent and control on its effectiveness. Antioxidant activity was determined by measuring the inhibition rate using the DPPH assay, and antibacterial activity against Gram-positive *Staphylococcus aureus(S. aureus)* and Gram-negative *Escherichia coli (E.coli)* was evaluated by measuring the inhibition zone using the disk diffusion method. While anticancer activity was determined by measuring the cell viability using the MTT assay. The results of the study showed that colchicine is clearly effective in inhibiting free radicals but concentration-independent antioxidant activity, unlike ascorbic acid, which only inhibits high concentrations. Bacteria inhibition depended on the type of bacteria, showing a linear increase in inhibition zones with increasing concentrations for *Staphylococcus aureus*, but *Escherichia coli* concentrations were limited. However, the antibacterial activity was due to ethanol the solvent and negative control indicating that Colchicine did not exhibit independent antibacterial activity under the conditions tested. While the effect of colchicine toxicity on MCF-7 cells depending on concentration and duration of exposure, where cell viability was lower after 48 hours compared to 24 hours. that colchicine's cytotoxic effect is both dose- and time-dependent. These results suggest that Colchicine is therapeutic potential is mainly linked to its anticancer and microtubule-disrupting properties, rather than antioxidant mechanisms. Further studies are required using alternative solvents, and mechanistic assays to accurately determine colchicine's true antibacterial and anticancer potential.

Association of DNA Repair Gene APEX1 Asp148Glu Polymorphism with smoking status.

Reem bint Nayef bin Humaid

Dr. Tahani Al-Shahri

Asp148Glu Polymorphism in the DNA repair gene APEX1 has been shown to be a risk factor in lung cancer. This polymorphism reduces the repairing efficiency, which can result in the accumulation of the damaged DNA over time. In this study, the genotype distribution of the DNA repair gene APEX1 Asp148Glu polymorphism was investigated in healthy smokers and non-smokers to assess the association between the Asp148Glu polymorphism and smoking status. The findings of this study showed that there was no statistical significance between the two groups in the distribution of the genotype (TT, TG and GG). This result was expected because single nucleotide polymorphisms (SNPs) are inherited variations in the DNA sequence. They do not develop through lifetime.

Evaluation of the anti-diabetic potential of Cuminum cyminum extract through invertase inhibitory assay

Shaden bint Salman Al-Ghadeer

Dr. Iman Al-Shahri

Invertase is a digestive enzyme that breaks sucrose into glucose and fructose, contributing to post-meal blood sugar levels. In diabetes, this rise is more critical. Cuminum cyminum has shown anti-diabetic potential by interacting with invertase and reducing its activity, which may help slow sucrose breakdown and support blood-sugar control. This study aimed to isolate invertase, optimize its activity under different conditions, and evaluate the inhibitory and antibacterial effects of Cuminum cyminum extract, including determining its inhibition type on invertase.

Kinetic characterization of alpha amylase properties in vitex agnus-castus

Sarah bint Mohammed Al-Qahtani

Dr. Jehan Al-Ghamdi

This study investigated the inhibitory effects of Vitex agnus-castus extracts on digestive enzymes, specifically amylase and protease, and further examined the kinetic characteristics of amylase under different experimental conditions. Two types of plant extracts were prepared: an aqueous extract and an ethanolic extract. The aqueous extract was prepared using distilled water, whereas the ethanolic extract was left to evaporate for one week and subsequently re-dissolved in 5 mL of distilled water before centrifugation to obtain a clear supernatant for enzymatic assays. Both extracts were tested for their ability to inhibit amylase and protease activity. The results demonstrated that the aqueous extract exhibited moderate inhibition of amylase and strong inhibition of protease, while the ethanolic extract showed very strong inhibition of amylase and high inhibition of protease. These differences reflected the variation in bioactive compounds extracted by each solvent. Further experiments focused exclusively on amylase to characterize its kinetic behavior. The enzyme activity was assessed at different temperatures (20, 30, 37, 40, 50, 60, and 70 °C), different pH values (4–9), and different starch concentrations (0.1–0.5%). Reaction rates were determined by measuring absorbance at time 0, 1, 2, and 3 minutes, and calculating Δabsorbance/min. Additional kinetic analysis was performed in the presence and absence of the inhibitor maltose (0.2 mM), allowing comparison of Km and Vmax under inhibitory and non-inhibitory conditions.

sCD14 correlation in type 2 diabetes

Saud bin Abdullah Al-Ghamdi

Prof. Dr. Omar bin Salem Al-Atas

Type 2 Diabetes Mellitus (T2DM) is linked to chronic inflammation and soluble CD14 (sCD14) helps explain the process. The study compares sCD14 levels between pre-diabetic patients and healthy controls and explains how sCD14 relates to metabolic factors. A total of 80 participants were included, and sCD14 concentrations were measured using an ELISA assay. Results showed higher sCD14 levels in the pre-diabetic group, but the difference was not statistically significant. sCD14 did not strongly correlate with the factors within each group. However, when all participants were analyzed together, sCD14 showed a weak negative correlation with fasting blood glucose. So, sCD14 can be weak inflammatory marker for pre-diabetes but we will need other tests to confirm the disease.

Metabolic Profile and Betatrophin Variation in Adults with Type 2 Diabetes: Insights from Cross-Sectional Data

Saleh bin Khalid bin Saleh Al-Oqeili

Dr. Mohammed Farouq Al-Sadiq Badr

Abstract Background: Type 2 diabetes mellitus (T2DM) is characterized by chronic hyperglycemia, metabolic dysregulation, and increased cardiovascular risk. Betatrophin (ANGPTL8), a liver- and adipose-derived protein implicated in lipid metabolism and proposed β-cell activity, has shown inconsistent associations with glucose regulation in human studies. This study aimed to compare circulating betatrophin levels between adults with and without T2DM and to assess their relationship with key metabolic parameters. Methods: A comparative cross-sectional study was conducted involving 80 adults (34 controls, 46 with T2DM). Anthropometric measures, blood pressure, fasting blood glucose (FBS), HbA1c, lipid profile, and serum betatrophin were assessed. Betatrophin concentrations were quantified using ELISA. Group comparisons were analyzed using independent t-tests, and correlations with metabolic variables were examined using Pearson's correlation. Results: As expected, FBS and HbA1c were significantly higher in the diabetic group ($p < 0.001$), confirming marked glycemic dysregulation. Diabetic participants also exhibited significantly elevated total cholesterol, LDL-cholesterol, triglycerides, and slightly higher HDL-cholesterol ($p < 0.05$). However, betatrophin levels did not differ between diabetic and control groups (4.6 ± 3.1 vs. 5.9 ± 3.7 pg/mL, $p = 0.653$). Furthermore, betatrophin showed no significant correlations with glycemic indices, lipid parameters, anthropometric measures, or blood pressure in either group (all $p > 0.05$). Conclusion: Although traditional metabolic markers effectively distinguish diabetic from non-diabetic adults, circulating betatrophin levels were not associated with diabetic status or metabolic parameters. These findings suggest that betatrophin is unlikely to serve as a reliable biomarker for glycemic control or metabolic dysfunction in adults. Further research with standardized assays and broader metabolic profiling is needed to clarify its physiological role.

PARP-1 genetic polymorphism between smoker s and nonsmokers

Nasser bin Shihab Al-Issa

Prof. Dr. Muhammad bin Saud Al-Anzi

Cigarette smoking delivers a complex mixture of carcinogens and oxidants that impose extensive DNA damage, overwhelm repair networks, and promote mutagenesis and malignant transformation. Cells harbor a plethora of DNA repair mechanisms to counteract the mutagenic and cytotoxic effect of smoking-induced DNA damage. PARP1 is one of the most pivotal genes in DNA repair and has several roles as a first responder to single-strand breaks, a BER organizer, a chromatin remodeler, and a replication fork protector. However, the association of PARP1 polymorphisms with smoking habits is not well studied. We looked at the genotypes of two single nucleotides polymorphisms (SNPS) (rs1805404 and rs1805414) in smokers and smokers Saudi subjects. The rs1805414 variant demonstrated a clear shift toward T-allele genotypes in smokers, suggesting a potential genotype–environment interaction. Conversely, rs1805404 showed minimal variation between smokers and non-smokers, indicating limited association with smoking behavior.

Chemistry Department

Synthesis of bimetallic Supported Oxide Catalysts for Hydrogen production Via Methane Reforming

AlAnoud Mubarak Al-Otaibi

Dr. Salwa AlReshaidan, Dr. Amal AlFawaz

Hydrogen is a promising solution to the energy trouble; it is a clean fuel, and its burning results only in water vapor, making it an environmentally friendly fuel. Also, it reduces the dependence on fossil fuels and environmental pollution caused by their combustion. To produce hydrogen via Dry reforming of methane and partial oxidation of methane, a 5%Ni-5%Co/90%La2O3-ZrO2-CeO2 catalyst was prepared at two calcination temperatures (600 and 800 ℃). It was found that there was successive reaction in the dry reforming of methane while there is no reaction in the partial oxidation of methane using the prepared catalyst. In addition, the dry reforming of methane reaction produces more Hydrogen when the prepared catalyst was calcined at 600 Co.

Different Amino acids for the synthesis of Halogenated spiro-Compounds

Abdulkarim Al-Zahrani

Dr. Abdulmajeed Al-Ayaf

This project focuses on the synthesis of new halogenated spiro-oxindole derivatives using a halogenated chalcone as a key precursor and different amino acids as azomethine ylide sources in a cycloaddition reaction Spiro compounds are introduced as rigid three-dimensional scaffolds with valuable biological profiles which makes them attractive in medicinal and materials chemist.Initially a halogenated chalcone (compound 2) was prepared from 4-fluoroacetophenone and 3-chloro-2-fluorobenzaldehyde in a basic ethanol–water medium giving a good yield of about 73% Using this chalcone together with isatin derivatives and the amino acids L-methionine and L-leucine six spiro-oxindole derivatives (5a–5f) were obtained via a multicomponent [3+2] cycloaddition in methanol under reflux with moderate to good yields ranging from 47 to 88%. The synthesized products were purified and fully characterized by 1H- and 13C-NMR spectroscopy and melting point measurements confirming the proposed structures This study highlights the synthetic potential of amino-acid-based azomethine ylides and halogenated spiro-oxindole frameworks as promising building blocks for the future development of biologically active molecules.

Hydrothermal Synthesis and Characterization of Metal Tugestate MWO_4 and their Mixed Tungstate NPs for the Degradation of Methylene Blue

Alanood Waleed I Alsaeed

Dr. Hamdah Saleh Alanazi and Dr. Tahani I. Al-Muhimeed

$Fe_{0.1}Zn_{0.9}WO_4$ exhibited a remarkable 66% photocatalytic efficiency for MB degradation, outperforming pure $ZnWO_4$ at 55%, under visible light for 120 minutes, highlighting its enhanced catalytic performance under optimized conditions.

Silver nanoparticles encapsulated nanofibers containing ciprofloxacin for biomedical application

Abdullah Ayed Al-Hamdhawi

Dr. Sultan Al-Mudhaḥḥi

This study investigates the fabrication and characterization of electrospun nanofibers encapsulating silver nanoparticles (AgNPs) and ciprofloxacin (CIP) for biomedical applications. The nanofibers were prepared using the electrospinning technique, a versatile and efficient method that enables the formation of nanofibrous mats with high surface area and adjustable porosity. The incorporation of both AgNPs and ciprofloxacin into the polymeric matrix aimed to achieve a dual antibacterial and controlled drug release system. The morphology and structure of the electrospun fibers were analyzed using Scanning Electron Microscopy (SEM), TEM (Transmission Electron Microscopy), Fourier-Transform Infrared Spectroscopy (FTIR), and Thermogravimetric Analysis (TGA). The drug release behavior and antibacterial performance were evaluated under simulated physiological conditions, and the release data were fitted to various kinetic models to understand the underlying mechanism. The results indicated that the AgNPs/CIP-loaded nanofibers exhibited uniform morphology, strong antibacterial activity, and sustained drug release over time. The combination of silver nanoparticles and ciprofloxacin enhanced both the antimicrobial efficiency and the stability of the nanofibers. This work highlights the potential of AgNPs-encapsulated electrospun nanofibers as a promising platform for wound healing and other biomedical drug delivery applications.

Investigation of Zeta Potential Properties of Polymers (PVA, PMMA, PVDF) for Applications in Water Purification Membranes

Abdulmajeed Fahad Al-Sunaidi
Dr. Ahmed Al-Saleh

This study aims to evaluate the surface properties of three polymers (PVA, PMMA, PVDF) and determine their functional suitability for water purification membranes, with a focus on measuring the zeta potential as a key indicator of fouling resistance. Solubility studies confirmed that PVA is a highly hydrophilic polymer (soluble in hot water), while PVDF possesses high chemical and structural durability. Zeta potential measurements revealed relatively weak surface charges under the tested conditions but highlighted that PVA exhibited the highest negative charge among the samples. Based on these results, the study concluded that the optimal strategy for fabricating efficient membranes is to use PVDF as a robust structural framework and modify its surface with PVA as a functional additive to increase hydrophilicity and enhance the electrostatic repulsion mechanism for rejecting negatively charged contaminants in water purification applications.

Development and Validation of A Simple UV-Spectrophotometric Method for Derermination of Diclofenac Sodium

Bayan Esaam Alyahya
Prof. Dr. Nawal A. Alarfaj

This analysis aimed to obtain reliable, accurate, and reproducible results for the quantitative determination of Diclofenac Sodium concentration. A simple, precise, and cost-effective analytical method was developed using UV-Visible Spectrophotometry, following ICH (Q2) guidelines. To optimize the method, the influence of various parameters was investigated. Scanning the sample showed maximum absorbance at 275 nm, using distilled water as solvent. This wavelength was used throughout the study. The linearity range was 8–16 ppm, supported by a correlation coefficient (R = 0.985). The method also showed good precision, with a %RSD of less than 2%. Stability studies revealed that the solution remained stable for up to four hours after preparation. The method was successfully applied to the determination of the drug in voltaren ampoules.

$ZnFe_2O_4$ Spinel Nanoparticles for Tetrahydrofuran Oxidation to Gamma-butyrolactone

Alwaleed Hadhab Al-Hadhab
Dr. Saad Al-Qahtani

This project aims to develop a green and efficient method for converting tetrahydrofuran (THF) into γ-butyrolactone (GBL) using a $ZnFe_2O_4$ spinel nanocatalyst. The catalyst was synthesized via a sol–gel method using tannic acid as a natural complexing agent and characterized by XRD, FT-IR, TGA, and TEM, confirming the formation of a pure and thermally stable spinel structure with an average particle size of about 16 nm. The oxidation reaction was carried out in a stainless-steel autoclave under solvent-free conditions using molecular oxygen as a clean oxidant. Product analysis by GC and GC-MS showed that the best performance was achieved at 80 °C and 9 h, yielding 31% THF conversion and 81.26% selectivity toward GBL. Reusability tests demonstrated that the catalyst maintained high activity over three consecutive cycles with only minor loss in performance. Overall, the results show that $ZnFe_2O_4$ is a promising, sustainable, and reusable nanocatalyst for the green synthesis of GBL from renewable feedstocks.

Synthesis and Study of 3-Formyl-2-quinolone

Bodour Asubie
Dr. Shatha Alaqeel

In this study, a simple and rapid method was carried out to prepare a quinoline derivative through the condensation of 2-chloro-3-formyl quinoline with 50% HCl acid. The structural formula of the synthesized compound was confirmed using the available spectroscopic techniques: ^{1}H NMR, ^{13}C NMR, and IR.

Sustainable Bioplastic Production from Palm Waste: ACircular Economy Approach

Ghada Falah Alajmi
Dr. Seham Alterary & Dr. Hessa Altalasi

This study produces biodegradable bioplastics from palm frond waste within a circular economy framework and evaluates their mechanical, thermal, and FTIR properties. (Fig. 1) illustrates the conversion process.

Fig. 1. Circular economy concept for bioplastic production from palm waste

Synthesis and characterization of Cobalt-doped ZnMoO4

Fatimah Mubarak Alqahtani

Dr. Nouf H Alotaibi

Cobalt-doped zinc molybdate ($Zn_{1-x}Co_xMoO_4$, x = 0, 0.1, 0.3, and 0. 5) was synthesized using the hydrothermal method at an acidic medium (pH = 3). X-ray diffraction (XRD) results confirmed the formation of a monoclinic $ZnMoO_4$ phase, while Fourier-transform infrared spectroscopy (FTIR) revealed characteristic Mo–O, Zn–O, and Co–O bonds. These findings indicate that $Zn_{1-x}Co_xMoO_4$ is a promising material for inorganic pigment applications.

UV-spectrophotometric determination of the drug Mirtazapine in its pure form

Haya Abduallah Aldawas

Dr. Eman Alabdulkareem

In this study, the drug Mirtazapine in its pure form was determined using a spectrophotometric method. Hydrochloric acid (HCl) solution was used as the solvent, and the measurements were carried out at a wavelength of λ = 316 nm within a concentration range of 1–20 ppm. After plotting the standard calibration curve, it was found that the relationship between absorbance and concentration follows Beer–Lambert's law. The linear regression equation obtained was A = 0.051C + 0.0027, with a correlation coefficient (R^2 = 0.9992), indicating an excellent linear relationship and high accuracy in the spectrophotometric measurements.

Method of Recycling Expanded Polystyrene Waste: Synthesis and Characterization

Nouf Nasser Al-Arefi

Dr. Eman Aldosari

This paper reports recycling of expanded polystyrene (PS), which has a low recycling rate, by changing it chemically through the sulfonation reaction. The obtained sulfonated samples were characterized using the Fourier Transformed Infrared Spectrophotometer (FTIR) to investigate sulfonation, which showed a S-O stretch band at 1072.42 cm-1 and a S=O stretch band at 1180.44 cm-1, confirming the transformation. And Thermogravimetric Analysis (TGA) which indicated thermal stability and the start of loss of weight at around 400°C.

Adsorption of Acetic Acid from Aqueous Solutions onto Activated Carbon

Norah Mohammed Almughirah

Dr. Razan Alshgari

The adsorption of acetic acid onto activated was examined. The effects of initial concentration, contact time, and adsorbent dose were evaluated at 25°C. Adsorption capacity increased with concentration and reached equilibrium within 90 minutes, while higher adsorbent doses reduced capacity. Equilibrium data fitted the Langmuir model more accurately than the Freundlich model

Development of a ZnO Nanoparticle-Enhanced Coated Wire Selective Sensor for the Potentiometric Determination of Berberine Hydrochloride

Safaa Ahmed Mail

Dr. Adiabah Almutairi, Dr. Razan Alshgari, and Prof. Asma Alothman

A novel potentiometric coated-wire sensor was developed for the selective determination of berberine hydrochloride (BRB HCl). The sensing membrane was prepared using polyvinyl chloride (PVC) incorporating a berberine–reineckate (BRB REIN) ion-pair and zinc oxide nanoparticles (ZnO NPs) as performance enhancers. The incorporation of ZnO NPs significantly improved the membrane's conductivity, ion exchange properties, and electrochemical response. The developed sensor exhibited a near-Nernstian slope, a wide linear dynamic range, and excellent stability, sensitivity, and reproducibility, demonstrating its potential for pharmaceutical analysis.

The effect of Synthesis Parameters on the Structure and ultraviolet optical behavior of ZnO nanostructures synthesised by reflux method

Sarah Khalid Alshamiri

Dr. Raisah Ahmed AlShehri

The effect of synthesis parameters on the crystalline zinc oxide nanoparticles using the reflux method has been studied. This study examined the impact of variations in synthesising parameters, including pH, NaOH concentration as the precipitating agent, and temperature, on the final ZnO morphologies and their optical properties. UV–vis results revealed the highest absorption for 2D flakes (50°C, 1.5 M NaOH) and the lowest for flower shape consists of rods (5°C, 3 M NaOH).

Development and Validation of a Simple UV Spectrophotometric Method for Determination of Montelukast Sodium-Based on Alumina Nanoparticles Synthesized from Salvia Rosmarinus Extract

Shahad bint Ayed Al-Shaybani

Dr. Seham Alanazi

A simple, accurate, and green UV spectrophotometric method has been developed and validated for the assay of montelukast sodium based on use of alumina nanoparticles synthesized by a green route using Salvia rosmarinus (rosemary) leaf extract. The synthesized nanoparticles served as an effective adsorbent, enhancing the sensitivity and selectivity of the method. Characterization of the alumina nanoparticles was performed by some standard analytical techniques to confirm their structure and composition. Spectrophotometric analysis was conducted at a maximum absorbance wavelength (λmax 344 nm) and the validation was carried out according to ICH guidelines that provided an excellent linearity response (R^2 > 0.9909), highly precise and accurate, robust within a selected range of concentration between 5-30 µg/mL. This method provides a cost effective and sustainable alternative for routine quality control analysis of montelukast sodium in pharmaceutical formulations.

Synthesis and Characterization of Monodentate Complexes of 3-Aminoquinoline with Zn(II) and Cd(II) Ions

Talal Zaid Al-Rashoud

Dr. Rajeh Al-Otaibi

This research reports the synthesis and structural characterization of two metal complexes formed by the reaction of 3-Aminoquinoline with $ZnCl_2$ and CdI_2 in a 1:2 metal-to-ligand ratio. The ligand acts as a monodentate donor, coordinating through the quinoline nitrogen atom. The complexes were characterized using FT-IR, ^{1}H-NMR, ^{13}C-NMR, TGA, and single-crystal X-ray diffraction techniques. Spectroscopic data confirmed that the $–NH_2$ group remained intact, while the coordination through nitrogen caused noticeable downfield shifts in NMR spectra. Thermogravimetric analysis showed that both complexes are thermally stable up to around 250–260°C before gradual decomposition. X-ray diffraction revealed that the Zn(II) and Cd(II) complexes possess tetrahedral geometry, where the metal center is coordinated by two nitrogen atoms from 3-aminoquinoline and two halide ions (Cl^- or I^-).

Comparative Study on the Synthesis of Chalcone Using Conventional and Solvent-Free Methods

Shatha Abdulkreem AleatAlanazi

Dr. Hessah Albahli,, Dr. Hessah Altilasi

Chalcone is an α, β-unsaturated aromatic compound found naturally in some plants, though it can also be synthesized in the laboratory, and is represented by the molecular formula $C_{15}H_{12}O$. It has several biological and pharmacological activities, including potential antibacterial, antioxidant, anti-inflammatory, and anticancer properties. Due to its ease of synthesis and reactive structure, chalcone occupies an important place in the field of green chemistry. In this study, the chalcone derivative 3-(4-methoxyphenyl)-1-phenylprop-2-en-1-one was produced using conventional solvent-based and solvent-free (green) methods by reacting Acetophenone with 4-methoxybenzaldehyde in the presence of the catalyst Sodium hydroxide. The compounds were characterized and compared using melting point (mp), thin-layer chromatography (TLC), infrared spectroscopy (IR), and nuclear magnetic resonance (NMR) analyses.

The study of activated carbon adsorption properties for the application in water treatment

Talal Mosaad AlOsaimi

Dr. Khalid Alrashidi

This research focuses on the adsorption of heavy metals such as Pb, Cd, Ni, Cu, and Mn from aqueous solutions using carbon-based adsorbents including activated carbon and biochar. The study evaluates how pH, carbon dosage, metal concentration, and contact time influence removal efficiency. Results showed that pH 2 achieved the highest adsorption**.** The adsorption capacity (Qe) was calculated using initial and final metal concentrations after 24 hours of shaking and centrifugation. Overall, the findings demonstrate that activated carbon is an effective, affordable, and sustainable adsorbent for heavy-metal removal in water treatment applications**.**

Extraction of Essential Oil from Rosmarinus officinalis (Rosemary) Collected from Al Kharj, Central Saudi Arabia

Waleed Aayed Al-Maliki

Dr. Abdullah Al-Shuraimi

This research focused on extracting and characterizing essential oil from Rosmarinus officinalis collected in Al-Kharj, central Saudi Arabia. Hydrodistillation of fresh rosemary leaves produced a 0.4% yield of pale-yellow oil, consistent with reported values for Saudi-grown rosemary. GC–MS analysis identified 59 compounds, representing 98.5% of the oil, with oxygenated monoterpenes dominating the composition. The major constituent was 1,8-cineole (50.5%), followed by β-pinene, camphor, β-myrcene, and α-terpineol, confirming a cineole-rich chemotype. The chemical profile closely matched previous studies from regions such as Al-Jouf, Al-Qassim, Taif, and northern Riyadh, indicating strong regional similarity in rosemary composition. These findings show that the environmental conditions in Al-Kharj favor the production of cineole-rich essential oil. Overall, the study provides important baseline data for future antimicrobial, antioxidant, and natural product applications.

Geology and Geophysics Department

Detection of groundwater-bearing zones in Wadi Hanifa, Riyadh city, using Vertical Electrical Sounding technique

Abdulaziz AlQahtani

Dr. Mohammed Fnais

This study investigates the groundwater potential in Wadi Hanifah, Riyadh, utilizing the Vertical Electrical Sounding (VES) technique. Eight VES profiles were acquired using a Syscal R1 resistivity meter with a Schlumberger configuration to delineate subsurface lithology. The inverted resistivity models reveal a distinct three-layer succession: a superficial alluvial layer, a conductive water-bearing zone of saturated sandstone and fractured limestone, and a resistive bedrock. The results indicate a potential shallow aquifer system at depths ranging from 15 m to 100 m. The study confirms the effectiveness of VES in this arid setting and recommends targeted exploratory drilling in the identified low-resistivity zones.

Bayesian Joint Inversion for Earthquake Hypocenters and 1D Velocity Structure

Abdulaziz bin Jubir

Dr.Ali Attia

This study applies the Controlled-Source Audio-Frequency Magnetotellurics (CSAMT) method to investigate the subsurface structural framework of southern Jordan, within the Wadi Araba–Wadi Rum region. The main objective is to characterize the resistivity distribution of subsurface formations and to identify major structural features such as faults and basement geometry associated with the Dead Sea Transform system. CSAMT surveying was conducted along multiple east–west oriented profiles using a controlled frequency range between 1 Hz and 8192 Hz. Field results were processed through Microsoft Excel for preliminary preparation, followed by 1D inversion using IX1D software. The inversion models were then integrated to generate 2D resistivity cross-sections. The qualitative interpretation of apparent resistivity and phase curves revealed the presence of two to three main geoelectricallayers across most stations. Quantitative interpretation based on the inversion results showed significant lateral variations in basement depth, ranging from approximately 700 m in one profile to about 1200 m in another. These variations indicate the existence of graben-like structures within the study area. The results demonstrate that CSAMT is an effective and reliable geophysical tool for imaging subsurface structures in structurally complex regions such as southern Jordan. The study contributes valuable insights into fault-controlled sediment thickness, basement configuration, and regional tectonic evolution.

Seismic Refraction Study for Bedrock Depth Estimation of Dammam Urban Area

Abduaziz Alshmari

Dr.Kamal Abdelrahman

This study applies the seismic refraction method to investigate shallow subsurface conditions and estimate bedrock depth in the Dammam urban area, located on the structurally complex Dammam Dome in Eastern Saudi Arabia. Nine seismic profiles were acquired using 24 geophones at 5-meter spacing, and first arrivals were processed through Pickwin, Plotrefa, and Surfer to generate velocity and thickness models. The results reveal three distinct layers: a low-velocity near-surface layer (0.1–1.3 km/s), an intermediate compacted layer (1.2–2.2 km/s), and a high-velocity bedrock layer reaching 3.7 km/s. Thickness maps show strong lateral variation, with the deepest unconsolidated zone (>30 m) centered near P6, while the western part of the site exhibits much shallower bedrock. These patterns reflect the influence of dome-related uplift, differential compaction, and local tectonic features. The findings provide a reliable subsurface framework for engineering design, groundwater assessment, and future geophysical investigations, demonstrating the effectiveness of seismic refraction in mapping heterogeneous urban geology.

Geophysical Structural Investigations Using CSAMT in Southern Jordan

Abduallah Aldosiri

Dr.Mahmoud Elwaheidi

This study presents a Bayesian joint inversion method to simultaneously estimate earthquake hypocenters and a 1D velocity structure in areas with sparse seismic networks. The approach is applied to an event from the 2009 Harrat Lunayyir swarm, integrating interactive phase picking with machine-learning–based global optimization and accurate ray tracing. The results show excellent travel-time fits, well-constrained hypocenter estimates, and a realistic multi-layer velocity model consistent with mid-crustal magma intrusion. The method demonstrates that reliable earthquake locations and velocity structures can be achieved even with limited station coverage.

Bedrock depth estimation of Farasan Island using Seismic Refraction method

Abduallah Alabduallah

Dr. Mohammed Fnais

This study utilizes the seismic refraction method to investigate the shallow subsurface structure and estimate bedrock depth in the Farasan Islands, Southern Red Sea. Seven seismic profiles were acquired across selected sites, each 115 meters long, using 24 geophones and seven shot points per line to ensure high-resolution coverage. The seismic data were processed using SeisImager/2D software, where first-arrival times were picked using Pickwin and velocity-depth models were generated using Plotrefa via tomographic The results consistently identify a distinct two- layer subsurface model across the study area. The first layer exhibits relatively high seismic velocities ranging from 2.5 to 2.9 km/s, indicating a zone of compacted reefal sediments and weathered limestone cap rock, rather than loose soil. The second layer is characterized by high velocities ranging from 3.2 to 4.4 km/s, corresponding to the competent Pleistocene reefal limestone bedrock. The depth to this bedrock interface shows significant lateral variation, ranging from shallow outcrops at ~2 meters to deep structural depressions exceeding 30 meters, likely associated with dissolution features or paleo-channels.The study demonstrates that seismic refraction is a highly effective tool for delineating the heterogeneous subsurface of carbonate island environments. These findings provide critical geotechnical insights for engineering and development projects in the Farasan Islands, highlighting the need to account for variable bedrock topography and potential karsthazards to ensure sustainable infrastructure planning.

Earthquakes in the Gulf of Aqaba: The Role of Fault

Abduallh Altamimi

Prof. Dr. Sattam Abdulkareem Almadani

The Gulf of Aqaba, at the southern end of the Dead Sea Transform, is a transtensional basin formed by lateral motion between the African and Arabian plates at ~5–6 mm/yr. It contains numerous strike-slip faults, uplifted blocks, and a documented history of strong earthquakes, including the Mw 7.2 Nuweiba event in November 1995. To investigate how faults control seismicity, we analyzed earthquakes from 19832025–against mapped fault traces, examining hypocentrallocations, depths, and distances to nearby faults to delineate spatial patterns and clusters .Most earthquakes align with the principal strike-slip strands, and depths exhibit a bimodal distribution with peaks at ~8–10 km and ~15–25 km. A smaller but meaningful subset of events occurs off the mapped traces, implying blind or unmapped structures and complex fault interactions. These results underscore the value of integrating earthquake catalogs with geological and geodetic datasets to refine seismic hazard assessments and guide regional planning.

Interpretation and modelling for Ghwar field

Abduallh Aldhbian
Dr. Saad Almogren

The structural modeling of the Ghawar Field in eastern Saudi Arabia reveals the strong impact of tectonic deformation on its subsurface framework. A prominent anticline forms the main structural trap, generated by compressional forces that uplifted and folded the sedimentary units, creating favorable conditions for hydrocarbon accumulation. Normal and minor reverse faults further increase structural complexity, providing secondary traps and potential migration pathways that enhance reservoir connectivity. These features align with the tectonic evolution of the Arabian Plate, where regional stresses and basement movements contributed to the development of major anticlines such as Ghawar. Integration of well-log and gravity data effectively defined the subsurface geometry and confirmed strong correlations between gravity highs and uplifted structures. The constructed model, reaching a depth of about 3,850 meters and spanning nearly 40 kilometers, offers a detailed representation of the main stratigraphic units and basement configuration. Overall, the results underscore the importance of structural traps in hydrocarbon accumulation and demonstrate the value of combining geological and geophysical data to better understand complex subsurface systems.

AI-ENHANCED SEISMIC SOURCE ANALYSIS: INTEGRATING MACHINE LEARNING WITH TRADITIONAL SEISMIC PROCESSING (CASE STUDY A SMALL EARTHQUAKE IN HARRAT LUNAYYIR, SAUDI ARABIA

Abdulkarim Raed Alshmas
DR. ALI KAMEL ABDELFATTAH ATT

Intraplate earthquakes pose significant hazards due to their infrequent yet destructive nature, as exemplified by the 2009 seismic swarm in Harrat Lunayyir, western Saudi Arabia, which involved over 30,000 events and prompted the evacuation of 40,000 residents. This study develops and validates an integrated AI-enhanced seismic source analysis framework that combines machine learning (ML) techniques with traditional physics-based Markov Chain Monte Carlo (MCMC) methods to estimate earthquake source parameters—moment magnitude (Mw), seismic moment (M0), corner frequency (fc), stress drop (Δσ), and source radius (r)—for a representative small earthquake from the swarm. The framework incorporates automated trace quality assessment using signal-to-noise ratio, amplitude, and stationarity metrics; unsupervised anomaly detection via DBSCAN; rapid ML predictions with Random Forest regression trained on physics-informed synthetic data; and rigorous MCMC spectral modeling based on the Brune omega-squared model. Applied to six vertical-component broadband seismograms, all traces were classified as "Acceptable" with non-stationary characteristics noted. ML estimates yielded Mw = 2.88 ± 0.15, Δσ = 2.8 ± 0.6 MPa, M0 = 2.94 × 10^{13} ± 1.54 N·m, and r = 0.16 ± 0.03 km. MCMC ensemble averaging produced Mw = 2.69 ± 0.10, Δσ = 1.70 MPa, fc = 13.23 Hz, and r = 0.10 km, showing reasonable magnitude agreement (±0.19 units) but a larger stress drop offset (+1.10 MPa), attributed to ML training biases and spectral sensitivities. Parameter distributions confirmed expected scaling relations, characterizing the event as a small volcano-tectonic earthquake driven by shallow dike intrusion in a rift-influenced intraplate setting. The hybrid approach demonstrates ML's efficiency for real-time applications and MCMC's reliability for uncertainty quantification, overcoming limitations of traditional methods in noisy or sparse data. This work advances intelligent seismic processing for intraplate hazard assessment, with recommendations for denser networks, real-data ML training, and operational integration to enhance monitoring in volcanic provinces like the Arabian Shield.

Effects of construction waste on soil and groundwater

Abdulrahman Hisham Al-Sahaf

Dr. Saad Al-Arifi

This study focuses on assessing the geological hazards in Wadi Asfan, located northwest of Jeddah, Saudi Arabia. The main objective is to identify and evaluate the areas most vulnerable to natural hazards such as floods, erosion, and slope instability. The research integrates Remote Sensing and Geographic Information Systems (GIS) techniques with the Analytic Hierarchy Process (AHP) to generate a comprehensive hazard map of the area. Several thematic layers, including slope, elevation, drainage density, lithology, and land use, were analyzed and weighted based on their relative contribution to hazard occurrence. The final hazard map classifies Wadi Asfan into low, moderate, and high-risk zones. The results indicate that the southern and central parts of the wadi are highly susceptible to flooding, while the northern and western sectors show signs of slope instability and surface erosion. The study demonstrates that integrating GIS, Remote Sensing, and AHP is an effective approach for hazard assessment and provides essential data for land-use planning and disaster risk management in arid regions like Wadi Asfan.

Adaptation of P-wave Moment Magnitude for Early Warning: A Case Study of the Harrat Lunayyir Earthquakes, Saudi Arabi

Anas Almalki

Dr.Ali Attia

This study investigates the adaptation and practical applicability of the P-wave moment magnitude (Mwp) approach as a rapid magnitude estimation tool for early warning applications in the Harrat Lunayyir region. The 2009 seismic swarm highlighted the need for rapid, reliable seismic characterization to support early hazard mitigation. Using the Seismic Analysis Code (SAC), the study successfully adapted the Mwp method. The results demonstrated the capability to estimate earthquake magnitude using only the initial seconds of the P-wave, satisfying the speed requirements for real-time Earthquake Early Warning (EEW) systems in volcanic environments.

Mapping faults in Arabian platform using gravity data

Abdumajeed bin Faris

Prof. Chokri Jallouli

This project focuses on mapping subsurface faults within a selected area of the Arabian Platform using gravity data. The study applies Bouguer anomaly analysis, regional–residual separation, and horizontal gradient techniques to enhance the identification of structural features that correspond to density contrasts in the subsurface. After generating the Bouguer anomaly map, the regional trend was removed to produce a residual map that emphasizes shallow features. The Magnitude of the Horizontal Gradient (MHG) further enhanced fault detection by outlining high-gradient zones. The results show two main fault trends, N–S and NW–SE, reflecting major tectonic directions within the Arabian Platform. These findings indicate the influence of deep structural deformation beneath the sedimentary cover and contribute to understanding the region's tectonic framework.

Structural Assessment of the Ghawar Field Using Gravity Method

Bader Al-Salem

Dr.Saad Almogren

This research presents a comprehensive analysis of the subsurface structure of the Ghawar Field, located in Saudi Arabia's Eastern Province, using advanced gravity modeling techniques. A detailed subsurface model was constructed, providing an extensive cross-sectional representation of the geological formations, their densities, thicknesses, and structural arrangements. Central to the study is the characterization of the Ghawar anticline, which exhibits a distinctive bipolar gravity anomaly marked by high gravity values along the anticline crest and asymmetric gravity lows delineating the surrounding sedimentary basins. Detailed analysis of the surveyed transect indicates that the field reaches a maximum depth of approximately 4,600 meters and extends about 36 kilometers in width. Density variations across the study area range from 2.28 to 2.67 g/cm^3, reflecting significant lithological heterogeneity. The model clearly delineates major structural features, including the main anticline and associated fault systems, providing critical insights into the field's geometry, stratigraphy, and structural framework. These findings are essential for guiding hydrocarbon exploration and reservoir characterization.

Site Classification Using MASW Of Uraidh Of South Riyadh

Faisal Alhosain

Dr.Hassan Alzahrani

This study applies the Multichannel Analysis of Surface Waves (MASW) technique to classify the subsurface layers and evaluate the geotechnical characteristics of the Uraidharea, south of Riyadh, Saudi Arabia. The MASW method was selected due to its reliability, non-destructive nature, and efficiency in determining shear-wave velocity (Vs) distributions for near-surface site characterization. Field data were collected using a 24-channel seismic system with 1 m geophone spacing, and data processing was conducted using Pickwin and WaveEq software to generate velocity–depth models. The results reveal three Site Classification Using MASW Of Uraidh Of South Riyadh.

Assessment of Groundwater aquifer in Harrat Khyber, Al Madinah, West Saudi Arabia, using Resistivity Tomography data

Mansour Alsehani

Dr.Elkhedr Hassan

This study assesses the groundwater potential of Harrat Khaybar in Al-Madinah using Electrical Resistivity Tomography (ERT). The volcanic field is dominated by basaltic lava flows and fractured units that influence porosity and permeability. Two ERT profiles revealed three main subsurface zones: variable surface sediments, massive high-resistivity basalt, and a low-resistivity fractured basaltic layer that serves as the main aquifer. The results indicate that structural fractures significantly enhance groundwater storage and flow, highlighting Harrat Khaybar as a promising groundwater zone within an arid volcanic environment.

Exploring the Reactivation of AD DAMM Fault Zone

Khalid Abdulrahman Alharbi

Dr. Fares Abanmi

This study integrates Landsat TM imagery, SRTM DEM, and aeromagnetic data to assess potential reactivation of the Ediacaran NE-trending Ad Damm Fault Zone (AFZ) within the western Arabian Shield. The results show that the AFZ intersects the Red Sea escarpment and controls the paleo-drainage network, while aeromagnetic anomalies reveal a ~100-km-wide structural zone in the AFZ. The fault zone truncate NW-trending magnetic anomalies interpreted as Paleogene–early Neogene dike swarms associated with Red Sea rifting. These observations indicate that Red Sea–related tectonics, including marginal graben–horst systems and the onshore projection of a transform boundary, may have contributed to the late reactivation of the AFZ.

Hydro-Geophysical Study of Groundwater of Al-Dara Village, Al-Qassim Region

Meshal Fahad Alshibani

Prof. Dr. Nassir Alarifi

This study investigates the groundwater potential in Al-Dara village, Al-Qassim region, using the Vertical Electrical Sounding (VES) method. The area is characterized by a complex geological setting within the Arabian Shield. Twenty VES soundings were conducted using the Schlumberger configuration with electrode spacing (AB/2) up to 300 m to map subsurface resistivity variations. The interpretation of the data revealed four distinct geoelectrical layers: (1) a dry surface layer of quaternary alluvial deposits, (2) a highly weathered/clayey zone, (3) a fractured granite layer acting as the main aquifer with low to moderate resistivity, and (4) a massive high-resistivity fresh basement rock at the bottom. The study concluded that groundwater is confined to the deep weathered zones, and the most suitable locations for drilling were identified at stations VES-5, VES-10, and VES-12. These findings highlight the effectiveness of VES in characterizing hard-rock aquifers in arid environments.

Bedrock Depth Estimation of Riyadh Area Using Sismic

Mohammed Alnuheer
Dr. Kamal Abdelrahman

This project estimates bedrock depth in the Riyadh region using the seismic refraction method. Seven seismic profiles were acquired, each 115 meters long, using 24 geophones and five shot points per line. First-arrival times were processed with Pickwin, and velocity depth models were generated using Plotrefa. The results identify two to three subsurface layers across the site. The first layer shows low seismic velocity (≈1.3 km/s), indicating weak and unconsolidated surface materials. The second layer has moderate velocity (≈2.6km/s), representing compacted sediments or partially weathered limestone. Where present, the third layer records the highest velocities (≈2.9 km/s), corresponding to competent limestone bedrock typical of Riyadh's geological formations. Bedrock depth ranges from approximately 8 to 30 meters, reflecting natural variations in lithology and structural influence within the region. The study demonstrates that seismic refraction is an effective tool for identifying subsurface layering and estimating bedrock depth in urban environments. These findings support engineering design, construction planning, and geotechnical assessment by providing reliable subsurface information essential for safe and sustainable development in Riyadh.

Integrating Remote Sensing, GIS, and AHP model for flood susceptibility Analysis in wadi ASFAN, western Saudi Arabia.

Mohammed Khalid Alrumaihi
Dr. Fahd Al-Shehri

This study focuses on assessing the geological hazards in Wadi Asfan, located northwest of Jeddah, Saudi Arabia. The main objective is to identify and evaluate the areas most vulnerable to natural hazards such as floods, erosion, and slope instability. The research integrates Remote Sensing and Geographic Information Systems (GIS) techniques with the Analytic Hierarchy Process (AHP) to generate a comprehensive hazard map of the area. Several thematic layers, including slope, elevation, drainage density, lithology, and land use, were analyzed and weighted based on their relative contribution to hazard occurrence. The final hazard map classifies Wadi Asfan into low, moderate, and high-risk zones. The results indicate that the southern and central parts of the wadi are highly susceptible to flooding, while the northern and western sectors show signs of slope instability and surface erosion. The study demonstrates that integrating GIS, Remote Sensing, and AHP is an effective approach for hazard assessment and provides essential data for land-use planning and disaster risk management in arid regions like Wadi Asfan.

Hydrogeophysical Exploration of a Shallow Coastal Aquifer along the Gulf of Aqaba Using 2D Resistivity Method

Mohammed Alyahya
Dr.Mahmoud Elwaheidi

This study investigates the shallow coastal aquifer in the Al-Humaidah area along the Gulf of Aqaba using the 2D Electrical Resistivity Tomography (ERT) method. Four ERT profiles were collected to characterize subsurface layers, identify freshwater and saline zones, and assess the extent of seawater intrusion. The results revealed three main layers: a dry alluvial layer with high resistivity, a moderately resistive wet alluvial layer, and a low-resistivity saline zone. A bedrock uplift was also detected, influencing groundwater flow and salinity distribution. The study highlights the effectiveness of 2D ERT in evaluating coastal aquifers and understanding salinity variations in vulnerable coastal regions.

Geological Evolution and Gravity-Based Subsurface Mapping of the Al-Madinah Administrative Region

Mohammed Alturki
Dr.Hesham Elaraby

This graduation project presents a gravity-based geophysical investigation to elucidate the subsurface geological structure and tectonic framework of the Al-Madinah Administrative Region, western Saudi Arabia. Situated within the Precambrian Arabian Shield, the region's complex geology, influenced by the Red Sea rifting and ancient tectonic sutures, makes it a compelling area for subsurface mapping. The primary objective was to identify and characterize major regional trends and local structural features, particularly fault systems, that have implications for seismic hazard assessment and geological evolution.

Bedrock depth estimation in Al Madinah Al Munawwarah using seismic refraction

Nawaf Alsahli
Prof.Dr.Abdullah Alamri

This study employs the seismic refraction method to characterize the shallow subsurface conditions and estimate bedrock depth in a selected area of Al Madinah Al Munawwarah. The study area is geologically complex, influenced by the volcanic flows of Harrat Rahat and unconsolidated alluvial deposits, creating significant heterogeneity in near-surface materials. Four seismic refraction profiles were acquired using a 24-channel seismograph, followed by first-break picking and time-term inversion to construct detailed 2D velocity models. The results consistently reveal a three-layer subsurface stratigraphy: (1) a weak near-surface layer with velocities ranging from 0.3 to 0.9 km/s, representing loose alluvium; (2) an intermediate weathered or compacted layer with velocities between 1.1 and 2.6 km/s; and (3) a competent bedrock layer, exhibiting velocities up to 6.8 km/s, particularly in the northern sector. These findings were further corroborated by velocity (V1, V2, V3) and thickness (h1, h2) contour maps, which delineated zones of shallow bedrock and sediment accumulation. Overall, the integrated analysis provides a reliable geotechnical assessment of the site. The northern sector offers the most favorable foundation conditions due to the presence of shallow, high-velocity bedrock, whereas areas with thick unconsolidated deposits may require deeper foundations or ground improvement. These results demonstrate the efficacy of seismic refraction in characterizing complex geological environments for engineering purposes.

Hydro-Geophysical Study for Assessing the groundwater of Al-Hijaziyah Village, Al-Qassim Region

Sami Alsubiae
Dr.Nasser Alarifi

This study investigates groundwater potential using Vertical Electrical Sounding (VES) to characterize subsurface resistivity variations and delineate water-bearing formations. VES data were acquired in the Al-Hijaziyah area, northeast Saudi Arabia, and processed using IPI2WIN for forward modeling and 2-D inversion. Five profiles, each 300 m in length, wereinterpreted, yielding resistivity values ranging from 6 to 6985 Ω·m. The resulting true-resistivity sections reveal distinct low-resistivity zones that are indicative of groundwater presence at variable depths. These findings enhance the understanding of local hydrogeological conditions and support future groundwater assessment efforts.

Interpretation of geological structures using gravity data in Al-Madinah area

Omar Alotaibi
Professor Hesham EL-Araby

This study focuses on the geological setting, elevation, and gravity data analysis of the Al-Madinah Al-Munawarah region in Saudi Arabia. The region is characterized by a system of U-shaped valleys and dry erosional channels, such as the Qanah and Al-Aqiq valleys, which feed into the Al-Madinah basin. The geological formations in this area are part of the Arabian Shield, which underwent significant tectonic events from the Proterozoic to the Cenozoic era. The volcanic eruptions from the Tertiary to Quaternary periods contributed to the formation of large basaltic plateaus, including the Harrats, which encircle Al-Madinah. Field investigations indicate the presence of various types of basaltic rocks and suggest the potential significance of the Harrats as a groundwater aquifer. The study area is also influenced by a series of faults, folds, and other tectonic features. Gravity data and elevation mapping help provide insights into the subsurface geology and the regional distribution of these features. The results suggest that the area is rich in geological complexity, offering significant potential for further studies on groundwater resources and geological hazards.

Locating Earthquake Hypocenters Using Seismic Waveform Cross-Correlation: A Signal Processing Approach with SAC Data in Jizan are

Salam Abu sbaa
Dr. Ali Attia

Traditional location methods, which rely on absolute arrival times of P and S waves, are often limited by velocity model uncertainties and picking errors, leading to location uncertainties that can obscure fine-scale seismic structures. This paper presents a methodological framework for improving relative earthquake location using cross-correlation techniques applied to continuous seismic waveforms. The developed algorithm, implemented in Python, reads seismic data in SAC format, applies a strategic bandpass filter (1.0–4.0 Hz) to enhance the signal-to-noise ratio and waveform coherence, and computes the normalized cross-correlation function to measure precise time delays between pairs of seismic events. The lag time corresponding to the maximum correlation coefficient provides a high-precision differential time measurement, which can be integrated into double-difference location algorithms. We demonstrate the application of this method using synthetic and real waveform pairs, showing that it reliably resolves time delays with sub-sample precision. Our results indicate that this approach significantly reduces relative location errors, potentially revealing detailed features of seismogenic zones, while the discussion extends to the integration of these measurements into large-scale hypocenter relocation studies, the limitations of the method, and future directions for automated seismic processing.

Groundwater Quality in the Kingdom Of Saudi Arabia: An Integrated Literature Review and GIS Evaluation.

Talal Tariq Dowidar

Dr. Suhail Al-Hajji

This comprehensive review assesses the groundwater quality and aquifer sustainability challenges across the major hydrogeological regions of Saudi Arabia, a nation characterized by extreme aridity (rainfall <100 mm/yr) and a heavy reliance on subterranean resources for over 85% of its water supply. The review differentiates between the low-storage, fractured aquifers of the Arabian Shield (West) and the high-storage, vast sedimentary aquifers (Primary Confined Aquifers) of the Arabian Platform (Central and East), which contain the bulk of the nation's non-renewable fossil water (aged 10,000–30,000 years). Furthermore, the review includes an analysis of key hydrochemical parameters from more than 30 studies, which reveal significant regional variations and contamination issues, including widespread salinization (such as high Total Dissolved Solids, TDS), elevated nitrate concentrations in agricultural zones due to excessive fertilizer use, and localized risks from heavy metals and natural radioactivity. Our finding aligns with the main findings of these studies, underscoring the critical threat of rapid depletion, driven by an unsustainable consumption model in which agriculture accounts for approximately 88% of groundwater withdrawals (e.g., Walker, 2021). With water levels dropping at alarming rates (0.5–2\m/yr), major aquifers face potential exhaustion within the next 30 to 40 years. The review concludes by highlighting the urgent need for robust policy reforms, advanced monitoring systems, and diversified water sourcing (desalination, wastewater reuse, and managed artificial recharge) to ensure the long-term water security and public health of the Kingdom. More importantly, previous studies often lacked the application of advanced methodologies, such as isotopic analysis and geochemical tracing, to accurately identify contamination sources and recharge origins. This gap has limited the ability to distinguish between natural geogenic processes and anthropogenic impacts, leading to incomplete groundwater management strategies. Modern approaches, including stable isotope techniques such as δ18O and δ2H for tracing recharge sources, radiogenic isotopes for groundwater age determination, and geochemical fingerprinting, provide critical insights into aquifer dynamics and pollutant pathways. These methods allow researchers to identify the origin of salinity, track nitrate contamination from agricultural activities, and assess mixing processes between different water bodies. Furthermore, integrating isotopic and geochemical data with GIS-based spatial analysis and advanced statistical modeling, such as Principal Component Analysis and cluster analysis, enhances the precision of contamination source attribution. By addressing these methodological gaps, this review emphasizes the need to adopt innovative techniques to improve groundwater quality assessment, optimize resource allocation, and support evidence-based policy decisions for sustainable water management in arid regions such as Saudi Arabia.

Hydrogeological Investigation in Al-Kharj Area Using 2D Resistivity Tomography

Yazeed Ali Alghamdi

Dr.Elkhedr

Groundwater in the arid Al-Kharj area is under stress due to intensive agricultural extraction, leading to declining water tables and rising salinity. Methodology: Applied 2D Electrical Resistivity Tomography (2D-ERT) using the Dipole-Dipole electrode array. Four ERT profiles were acquired and processed using least-squares inversion.

Key Findings:

- Revealed saturated zones (main aquifer) and areas of localized saline-water intrusion at depth.
- Detected high-resistivity anomalies indicating dry karst cavities or dense limestone.
- Identified sharp lateral resistivity contrasts suggesting fault or fracture systems acting as groundwater conduits.

Contribution:

Provides an improved understanding of aquifer behavior, water quality variations, and structural controls.This project estimates bedrock depth in the Riyadh region using the seismic refraction method. Seven seismic profiles were acquired, each 115 meters long, using 24 geophones and five shot points per line. First-arrival times were processed with Pickwin, and velocity depth models were generated using Plotrefa. The results identify two to three subsurface layers across the site. The first layer shows low seismic velocity (≈1.3 km/s), indicating weak and unconsolidated surface materials. The second layer has moderate velocity (≈2.6 km/s), representing compacted sediments or partially weathered limestone. Where present, the third layer records the highest velocities (≈2.9 km/s), corresponding to competent limestone bedrock typical of Riyadh's geological formations. Bedrock depth ranges from approximately 8 to 30 meters, reflecting natural variations in lithology and structural influence within the region. The study demonstrates that seismic refraction is an effective tool for identifying subsurface layering and estimating bedrock depth in urban environments. These findings support engineering design, construction planning, andgeotechnical assessment by providing reliable subsurface information essential for safe and sustainable development in Riyadh.

Groundwater Potentiality Assessment in Jazan Region Saudi Arabia Using Remote Sensing and GIS

Yazid Nasser Al-Mutairi

Dr. Fahd Al-Shehri

This study assesses groundwater potential zones in the Jazan region, southwestern Saudi Arabia, through the integration of Remote Sensing (RS) and Geographic Information Systems (GIS). Eleven thematic layers—including rainfall, geology, soil type, land use/land cover (LULC), drainage density, lineament density, slope, NDVI, and digital elevation model (DEM)—were generated and evaluated based on their influence on groundwater occurrence. Each thematic layer was assigned a weight and ranked using the Weighted Overlay Analysis according to its hydrogeological importance. The integration of these layers resulted in a final Groundwater Potential Zone (GWPZ) map. The results indicate that groundwater potential varies considerably across the region due to differences in lithology, structural settings, land cover patterns, and topographic conditions. Areas characterized by permeable geological units, high lineament density, moderate drainage density, gentle slopes, and higher vegetation cover exhibited higher groundwater potential. The study demonstrates that the use of RS and GIS enhances the accuracy of groundwater assessment and supports sustainable groundwater management in arid regions such as Jazan.

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