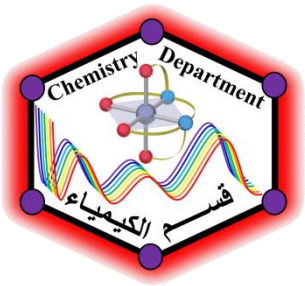
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كلية العلوم - جامعة سوهاج
بحث - ابتكار - تميز

# Chemistry

CO01

# Advances in Chitosan Chemistry: Functionalization Strategies and Modern Applications

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## ABSTRACT

Chitosan is a versatile amino-polysaccharide obtained via the partial deacetylation of chitin, primarily composed of β-(1→4)-linked D-glucosamine and N-acetyl-D-glucosamine units. Owing to its biodegradability, biocompatibility, and inherent biological activities, chitosan has emerged as a promising sustainable biopolymer for advanced functional applications. In addition to conventional sources such as crustacean shells, recent research has explored alternative and eco-friendly sources, including insects and fungal biomass, to support circular bioeconomy approaches. Recent advances in chitosan chemistry have focused on tailored functionalization strategies to overcome its limited solubility and enhance its performance. These include carboxymethylation, graft copolymerization, quaternization, and the formation of Schiff bases through condensation reactions with aldehydes and ketones. Such modifications significantly improve physicochemical properties, enabling the design of smart materials with tunable characteristics. Modern applications of chitosan-based materials extend across multiple fields, including drug delivery systems, tissue engineering, water purification, food preservation, and antimicrobial coatings. Notably, chitosan derivatives have been widely investigated for controlled drug release, heavy metal adsorption, and as green catalysts in sustainable chemistry. Furthermore, nanostructured chitosan systems, such as nanoparticles and hydrogels, have opened new frontiers in biomedical and environmental applications. This review highlights recent developments in chitosan sources, chemical modifications, and emerging applications, emphasizing its role as a key material in sustainable development and green chemistry innovations.

**Keywords**: Chitosan; Chitin; Biopolymer; Chemical modification; Carboxymethylation; Schiff base; Graft copolymerization; Nanotechnology; Drug delivery; Antimicrobial activity; Water treatment; Green chemistry; Sustainable materials

CO02

# Azo Complexes as a Dye-Sensitized Solar Cell

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## ABSTRACT

This study investigates the development of azo-based dyes as cost-effective sensitizers for Dye-Sensitized Solar Cells (DSSCs). By combining laboratory synthesis with computer-based modeling, the research explores how changing a dye's molecular structure can improve its ability to convert sunlight into electricity. The findings highlight that the anchoring position of how the dye attaches to the solar cell is the most critical factor for performance. Specifically, para-positioned dyes show high efficiency, while ortho-positioned dyes fail because they form internal hydrogen bonds that "lock" the molecule and block it from attaching to the cell surface. Additionally, the study demonstrates that incorporating copper (II) complexes and heterocyclic designs can effectively tune energy levels to ensure better electron flow. Overall, these results provide a clear design protocol for creating more efficient and affordable organic solar energy systems.

**Keywords:**

Dye-Sensitized Solar Cells (DSSCs); Azo dyes; Molecular design; Anchoring position; Copper(II) complexes

CO03

# Alzheimer's Disease

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## ABSTRACT

Aluminium chloride ($AlCl_3$) is a prevalent environmental pollutant found in food and drinking water. Epidemiological studies suggest a strong link between $AlCl_3$ exposure and neurodegenerative disorders, especially Alzheimer's disease (AD). $AlCl_3$ disrupts normal brain function, potentially leading to oxidative stress, inflammatory responses, and cognitive decline, all of which are implicated in AD pathology. The focus was specifically on the neurotoxic effects of $AlCl_3$, drawing insights into its impact on brain structure, function, and behaviour. Findings from the reviewed studies reveal that $AlCl_3$ exposure leads to increased aluminium accumulation in brain tissues, resulting in structural damage and neurotoxic effects. This accumulation affects cognitive functions and behaviour, with histological analyses showing signs of neurodegeneration. Behavioural changes and impaired cognitive abilities observed in animal and cellular models suggest that $AlCl_3$ disrupts neural pathways critical to learning and memory. The evidence indicates a significant association between $AlCl_3$ exposure and neurodegenerative damage, especially in the context of AD. This review emphasizes the need for further research into $AlCl_3$'s neurotoxic mechanisms to clarify its role in AD and other neurodegenerative diseases. Enhanced understanding may help develop preventive measures and regulations to mitigate the health risks posed by aluminium exposure in daily life.

**Keywords**: Aluminium chloride, Alzheimer's disease, Neurotoxicity, Oxidative stress, Cognitive impairment.

CO04

# Sodium-Ion Batteries as a Sustainable Energy Storage Technology

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## ABSTRACT

The increasing global demand for sustainable and cost-effective energy storage systems has driven significant interest in alternatives to lithium-ion batteries (LIBs). Among these, sodium-ion batteries (SIBs) have emerged as a promising technology due to the natural abundance, low cost, and environmental advantages of sodium resources. This study provides a comprehensive overview of sodium-ion batteries, focusing on their fundamental electrochemical principles, key components, and recent advancements in material design. Particular emphasis is placed on the development of high-performance electrode materials, including layered transition metal oxides, Prussian blue analogues, and hard carbon anodes. The work also highlights the role of advanced characterization techniques such as SEM, XRD, and TEM in understanding material structure and performance. Recent research developments are critically reviewed, including innovations in interfacial chemistry, electrolyte optimization, and biomass-derived materials for sustainable battery production. Special attention is given to recent breakthroughs in cathode design, such as novel phosphate-based materials that exhibit high energy density and excellent cycling stability. Despite these advancements, several challenges remain, including the larger ionic radius of sodium, lower energy density compared to lithium systems, cathode structural instability, dendrite formation, and the need for optimized electrolytes. This study concludes that, while sodium-ion batteries may not fully replace lithium-ion batteries in all applications, they offer a highly viable and scalable solution for grid storage and large-scale energy systems. Continued research into advanced materials and cell design is essential to unlock their full potential as next-generation sustainable energy storage technologies.

**Keywords:**
Sodium-ion batteries; Sustainable energy storage; Hard carbon anode; Prussian blue analogues; Cathode materials

# CO05

## Green Hydrogen Production from Seawater and Wastewater: Performance Study of Chloride-Resistant Electrodes

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**ABSTRACT**

Green hydrogen production has emerged as a key technology for sustainable energy systems, particularly through water electrolysis using abundant natural resources such as seawater and treated wastewater. However, the presence of chloride ions in these media poses a major challenge due to severe electrode corrosion and competing side reactions such as chlorine evolution. This study focuses on the performance evaluation of chloride-resistant electrodes for efficient green hydrogen production from seawater and wastewater. The work investigates the electrochemical behavior, stability, and catalytic activity of advanced electrode materials designed to operate under harsh chloride-containing environments. The study emphasizes the development of corrosion-resistant electrode surfaces that maintain high catalytic efficiency for the hydrogen evolution reaction (HER) while suppressing chlorine evolution and material degradation. Electrochemical techniques such as polarization measurements and impedance spectroscopy are used to assess performance and durability. The results highlight that surface modification, alloying strategies, and protective coatings significantly enhance electrode stability and hydrogen production efficiency. This work demonstrates the feasibility of using seawater and wastewater as sustainable feedstocks for green hydrogen generation, provided that electrode materials are carefully engineered to resist chloride-induced corrosion. The findings contribute to the advancement of cost-effective and durable electrolyzer systems for large-scale hydrogen production, supporting the global transition toward clean and renewable energy.

**Keywords:**
Green hydrogen; Seawater electrolysis; Wastewater treatment; Chloride-resistant electrodes; Hydrogen evolution reaction

CO06

# Extraction of Cellulose from Sugarcane Bagasse and Its Conversion to Glucose

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## ABSTRACT

Sugarcane (Saccharum officinarum) bagasse (SCB) is an abundant agricultural waste generated during sugar processing and represents a promising renewable biomass resource. Due to its high lignocellulosic content, SCB has attracted significant attention for the production of valuable bio-based products, particularly glucose. However, efficient utilization of SCB requires appropriate pre-treatment to overcome the recalcitrant nature of lignin, which acts as a protective barrier around cellulose. Various pre-treatment methods, including alkaline and combined alkali–acid processes, have been investigated to enhance cellulose accessibility and improve hydrolysis efficiency. These pre-treatments have been shown to significantly increase glucose yield by facilitating the breakdown of lignocellulosic structure. Both acid and enzymatic hydrolysis methods were evaluated, with studies reporting glucose yields exceeding 80% under optimized conditions. This research focuses on the conversion of sugarcane bagasse into cellulose, followed by its hydrolysis into glucose. Additionally, spectroscopic techniques such as FTIR, NMR, and mass spectrometry are employed to confirm the chemical structure of the produced glucose. The findings highlight the potential of SCB as a sustainable feedstock for glucose production, contributing to waste valorization and the development of eco-friendly biochemical processes.

**Keywords**: Sugarcane bagasse, Saccharum officinarum, lignocellulosic biomass, pre-treatment, enzymatic hydrolysis, glucose yield, spectroscopic analysis, waste valorization

CO07

# Green Synthesis of Carbon Quantum Dots from Organic Waste

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## ABSTRACT

The growing demand for sustainable nanomaterials has driven increasing interest in the green synthesis of carbon quantum dots (CQDs) using organic waste as a low-cost and eco-friendly precursor. This study explores the preparation of CQDs from various organic waste sources through environmentally benign methods such as hydrothermal or pyrolytic processes, eliminating the need for toxic chemicals and reducing environmental impact. The synthesized CQDs exhibit unique optical properties, including strong photoluminescence, high water solubility, and tunable emission behavior, making them suitable for a wide range of applications. Comprehensive characterization techniques, such as UV–Vis spectroscopy, fluorescence spectroscopy, FTIR, and TEM, are employed to investigate the structural, chemical, and optical properties of the prepared CQDs. The results demonstrate that the physicochemical properties of CQDs are strongly influenced by the nature of the precursor material and synthesis conditions. Furthermore, the study highlights potential applications of these green-synthesized CQDs in bioimaging, sensing, drug delivery, and environmental monitoring. Overall, this work provides a sustainable and cost-effective approach for converting organic waste into high-value nanomaterials, contributing to waste management strategies and advancing green nanotechnology for environmental and biomedical applications.

**Keywords:**

Carbon quantum dots; Green synthesis; Organic waste; Photoluminescence; Nanomaterials

CP01

# Anti-Inflammatory Potential of Curcumin Nanoparticles via Inhibition of Nitric Oxide Production

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Biochemistry Program, Department of Chemistry, Faculty of Science, Sohag University

## ABSTRACT

Curcumin, a polyphenolic compound derived from Curcuma longa, possesses well-documented anti-inflammatory and antioxidant properties, yet its clinical translation is hampered by poor aqueous solubility and low bioavailability. Nanoencapsulation strategies have emerged as a promising approach to overcome these limitations. This paper reviews and synthesizes current evidence on the anti-inflammatory potential of curcumin nanoparticles (CUR-NPs), with a particular focus on the inhibition of nitric oxide (NO) production as a key mechanistic pathway. Reactive nitrogen species, primarily generated by inducible nitric oxide synthase (iNOS) in activated macrophages, play a central role in sustaining inflammatory cascades. Multiple in vitro and in vivo studies demonstrate that CUR-NPs significantly suppress NO release in LPS-stimulated RAW 264.7 macrophages and reduce inflammatory markers in animal models of acute and chronic inflammation, outperforming free curcumin. Nanoencapsulated curcumin has shown up to 12-fold higher plasma bioavailability compared to native curcumin and enhanced paw edema reduction in carrageenan-induced inflammation models. These findings position CUR-NPs as a viable candidate for the management of inflammatory disorders through targeted NO suppression.

**Keywords:** curcumin , nanoparticles , PLGA nanoparticles, anti-inflammatory

CP02

# Antidiabetic Potential of Berberine via Improvement of Insulin Sensitivity

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## ABSTRACT

Berberine is a plant-derived isoquinoline alkaloid with significant antidiabetic effects, particularly in improving insulin sensitivity in type 2 diabetes mellitus (T2DM). In a 12-week randomized, double-blind, placebo-controlled trial, patients receiving 500 mg berberine twice daily showed a marked reduction in insulin resistance (HOMA-IR), with a significantly greater improvement compared to placebo ($p < 0.001$). In addition to enhancing insulin sensitivity, berberine significantly lowered fasting plasma glucose and HbA1c levels, indicating improved glycemic control. It also produced beneficial effects on lipid metabolism, including reductions in total cholesterol, LDL cholesterol, and triglycerides, along with a decrease in the inflammatory marker hs-CRP. Mechanistically, these effects are largely attributed to activation of AMP-activated protein kinase (AMPK), improved insulin receptor signaling, modulation of inflammatory cytokines, and regulation of lipid metabolism. Berberine also influences gut microbiota composition and enhances pancreatic β-cell function and insulin secretion. Although berberine has low oral bioavailability, its active metabolites contribute substantially to its therapeutic efficacy. The treatment was generally well tolerated, with mild gastrointestinal side effects being the most common. Overall, berberine acts as a multi-target agent and represents a promising adjunct therapy for improving metabolic control in T2DM, though further large-scale studies are needed to confirm long-term outcomes.

**Keywords:** Berberine, Type 2 DM, Insulin Resistance, AMPK, HOMA-IR

CP03

# Gold Nanoparticles for Targeted Cancer Therapy

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## ABSTRACT

Gold nanoparticles (AuNPs) have attracted significant attention in cancer therapy due to their unique physicochemical and optical properties. Their high surface area and ease of functionalization allow efficient conjugation with targeting ligands, drugs, and biomolecules, enabling selective delivery to tumor sites. Notably, AuNPs exhibit strong surface plasmon resonance, which can be exploited in photothermal therapy to convert light into localized heat for precise tumor ablation with minimal damage to surrounding tissues. In addition, they can enhance cellular uptake and improve therapeutic efficacy through multifunctional platforms combining imaging and treatment. Despite these advantages, challenges related to long-term toxicity, biodistribution, and clinical translation still need to be addressed. Overall, AuNPs represent a promising strategy for next-generation targeted cancer therapies.

**Keywords:** Gold nanoparticles (AuNPs); Targeted drug delivery; Photothermal therapy; Surface plasmon resonance; Cancer nanomedicine

CP04

# Luciferin-Based Bioluminescence for Cancer Detection and Therapy

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## ABSTRACT

Bioluminescence is a natural phenomenon in which living organisms produce light through a chemical reaction between a luciferin substrate and a luciferase enzyme. This reaction converts chemical energy directly into visible light without external excitation, resulting in extremely low background signals and high detection sensitivity. Luciferin is naturally found in organisms such as fireflies and can be extracted through homogenization followed by solvent-based purification, although synthetic analogues are widely used for research and biomedical applications. In cancer research, luciferin–luciferase systems are widely used for non-invasive imaging and detection due to their high sensitivity and real-time reporting capability. They enable monitoring of tumor growth, metastasis, and treatment response with a high signal-to-noise ratio. In addition to diagnostic use, bioluminescence-based systems are being explored for therapeutic applications, including light-activated drug release and bioluminescence-driven photodynamic therapy, allowing localized and controlled cancer treatment. Overall, luciferin-based bioluminescence offers a powerful platform for sensitive cancer detection and emerging therapeutic strategies.

**Keywords:** Bioluminescence; Luciferin–luciferase system; Cancer imaging; Photodynamic therapy; Non-invasive detection

CP05

# 1,2,4-Triazole Derivatives as Promising Anticancer Agents: Recent Advances in Design, Synthesis, and Biological Evaluation

**Hager Elsayed Younes[1], Bahgat R .M. Hussein[1*]**

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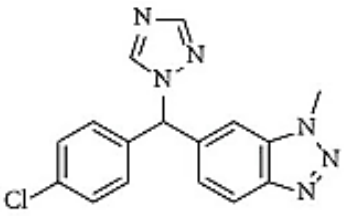
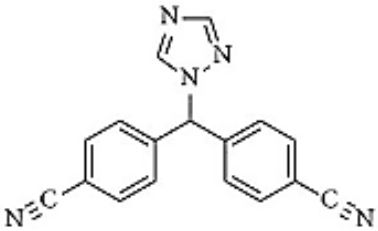
## ABSTRACT

1,2,4-Triazole derivatives represent an important class of nitrogen-containing heterocycles widely explored in medicinal chemistry. Their unique structural features enable strong interactions with biological targets, making them promising scaffolds in anticancer drug development. Notably, several clinically approved drugs containing the triazole moiety, such as letrozole, anastrozole, and vorozole, have demonstrated significant efficacy, particularly in hormone-dependent breast cancer therapy through aromatase inhibition. In addition to these established agents, numerous novel triazole-based compounds have been recently designed and synthesized, exhibiting potent cytotoxic activity against various cancer cell lines. This work highlights recent advances in the design, synthesis, and biological evaluation of triazole-based compounds, focusing on their anticancer activity, structure–activity relationships (SAR), and mechanisms of action.

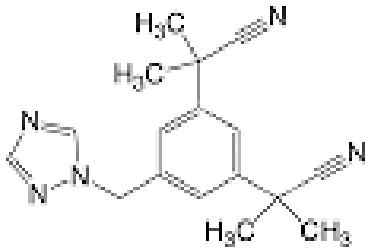


Vorozole



Letrozole

Anastrozole



**Keywords**: Nitrogen-containing heterocycles; 1,2,4-triazole; anticancer; biological activity

CP06

# Synthetic Pathways of Essential Terpenoids: From Natural Sources to Industrial Production

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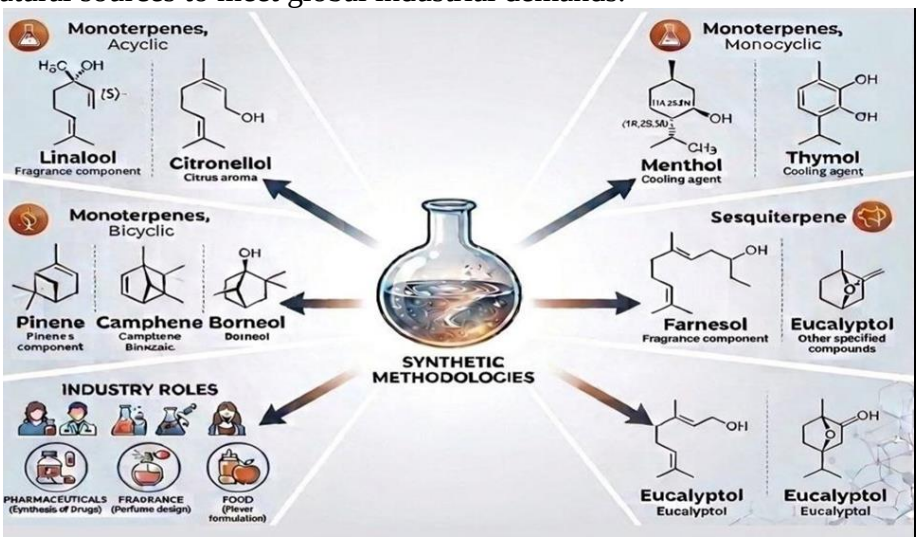
## ABSTRACT

This research explores the synthetic pathways and chemical transformations of key natural terpenoids, including Geraniol, Menthol, Thymol, Eucalyptol, Farnesol, Pinene, Camphene, Citronellol, Linalool, and Borneol. The study focuses on the transition from traditional botanical extraction to advanced synthetic methodologies such as catalytic hydrogenation, cyclization, and isomerization. By analyzing how these compounds are synthesized from abundant precursors, the paper highlights their critical role in the pharmaceutical, fragrance, and food industries. Ultimately, this review emphasizes the importance of efficient chemical synthesis in providing sustainable, high-purity alternatives to natural sources to meet global industrial demands.




**Keywords**: Natural products; Terpenoids; Food industries; Natural sources.

CP07

# Bioethanol Production from Sugarcane: A Comparative Review of Molasses and Bagasse Feedstocks

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## ABSTRACT

The depletion of fossil fuels and growing environmental concerns have increased interest in sustainable energy alternatives such as bioethanol. This study evaluates the production of bioethanol from sugarcane using both first-generation (1G) and second-generation (2G) feedstocks, namely molasses and bagasse. While molasses, a sugar-rich by-product, can be directly fermented, bagasse requires pretreatment and enzymatic hydrolysis to release fermentable sugars. Fermentation is carried out using Saccharomyces cerevisiae under optimized conditions, with different fermentation modes (batch, fed-batch, and continuous) assessed for their impact on ethanol yield. The study also investigates pretreatment strategies to enhance biomass conversion efficiency, addressing challenges such as inhibitor formation and limited pentose utilization. Results indicate that molasses is a cost-effective and efficient feedstock, whereas bagasse offers greater long-term sustainability despite existing technical and economic challenges. Integrating bioethanol production within a circular economy framework is essential to improve resource efficiency and reduce environmental impact.

**Keywords**: Bioethanol, Sugarcane molasses, Sugarcane bagasse, First-generation biofuel (1G), Second-generation biofuel (2G), Lignocellulosic biomass, Fermentation, Saccharomyces cerevisiae, Pretreatment, Enzymatic hydrolysis, Renewable energy, Circular economy

CP08

# Physicochemical Properties and Biological Applications of Cobalt: A Comprehensive Review

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## ABSTRACT

Cobalt (Co) is a transition metal of significant importance due to its unique physicochemical properties and its essential role in biological systems. This research explores the dual nature of cobalt, focusing on its fundamental chemical characteristics and its diverse applications in the medical and biological fields. The study first details the physicochemical aspects of cobalt, including its electronic configuration, variable oxidation states $Co^{2+}$ and $Co^{3+}$, and its ability to form stable coordination complexes. These properties are the foundation of its high magnetic susceptibility and catalytic activity. In the biological context, the research highlights cobalt as a core component of Vitamin B12 (cobalamin), which is vital for DNA synthesis and red blood cell formation. Furthermore, the paper discusses the emerging applications of cobalt-based complexes in therapeutic areas, such as Antimicrobial and Antifungal activities, where cobalt complexes show enhanced efficacy compared to free ligands. Cancer Therapy: Investigating cobalt as a carrier for targeted drug delivery or as a center for anti-tumor agents. Bio-imaging: Utilizing its magnetic properties in diagnostic techniques. The findings emphasize that while cobalt is an essential micronutrient, its concentration must be precisely regulated to avoid cytotoxicity. This review concludes that the tailored design of cobalt coordination compounds continues to hold great promise for developing next-generation bio-materials and therapeutic interventions.

**Keywords:** Cobalt chemistry; Coordination complexes; Vitamin B12 (cobalamin); Anticancer applications; Bio-imaging

CP09

# Copper: Physicochemical Properties and Biological Applications

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## ABSTRACT

Copper (Cu) is a versatile transition metal characterized by exceptional electrical and thermal conductivity, variable oxidation states $Cu^{+}$ and $Cu^{2+}$, and a unique ability to form stable coordination complexes. These physicochemical properties make copper indispensable not only in industrial catalysis but also as a fundamental trace element in biological systems. This research provides a comprehensive overview of copper's chemical nature, emphasizing its role in "Redox" chemistry. In biological environments, copper serves as a critical cofactor for numerous enzymes, known as cuproenzymes, including Cytochrome c oxidase (essential for cellular respiration) and Superoxide dismutase (involved in antioxidant defense). The study further explores the diverse biological applications of copper-based compounds, such as: Antimicrobial Properties: The use of copper surfaces and nanoparticles in hospital settings to combat multi-drug resistant pathogens. Therapeutic Potential: The development of copper complexes as anti-inflammatory agents and their emerging role in cancer therapy through selective cytotoxicity. Bio-sensing: Utilizing copper-based electrodes for the detection of glucose and other biomolecules due to their high catalytic efficiency. The findings highlight the sophisticated regulatory mechanisms (homeostasis) that organisms use to manage copper levels, balancing its essentiality with its potential toxicity. This review underscores the potential of copper coordination chemistry in designing novel biomaterials and pharmaceuticals for future medical challenges.

**Keywords:** Copper chemistry; Redox activity; Cuproenzymes; Antimicrobial properties; Biosensing

CP10

# A Comprehensive Review on the Physicochemical Properties and Biological Applications of Nickel

**Dr. Shaimaa Mahdy and Yusra Younis Mohammed**
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## ABSTRACT

Nickel (Ni) is a transition metal of profound significance, characterized by its high corrosion resistance, ferromagnetic properties, and versatile coordination chemistry. This review provides a systematic exploration of the physicochemical nature of nickel and its increasingly recognized importance in biological systems and medical technologies. From a chemical perspective, the study examines the stability of nickel in its $Ni^{2+}$ oxidation state and its ability to form diverse geometries, such as octahedral and square planar complexes, which are essential for its catalytic functions. Nickel's role as a potent catalyst is highlighted, particularly in hydrogenation reactions and energy-related processes. In the biological domain, the research emphasizes nickel as an essential cofactor for several microbial and plant enzymes. Key examples include: Urease, which plays a vital role in nitrogen metabolism. [NiFe]-hydrogenases: Crucial for hydrogen activation and energy conversion in microorganisms. Furthermore, the paper investigates the biomedical applications of nickel-based materials, including: Anticancer Potential: Recent studies on nickel coordination complexes as potential therapeutic agents that target DNA or specific protein structures. Diagnostic Tools: The application of nickel nanoparticles in protein purification and biosensing. This review underscores the future potential of nickel compounds in bridging the gap between inorganic chemistry and clinical applications.

**Keywords:** Nickel chemistry; Coordination complexes; Catalysis; Metalloenzymes; Biomedical applications

CP11

# The electrochemical Study of Some Organic Corrosion Inhibitors on Metal Surfaces

**Prof. Abdel-Rahman El-Sayed، Mostaf Adel, Aya Attay Al-Sadiq Mohammed, and Aya Abd Elraheem Elwardany**

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## ABSTRACT

Corrosion is a major challenge in industrial systems, especially in the oil and gas sector, where aggressive conditions accelerate metal degradation and demand effective protection strategies. This study focuses on the role of organic compounds as corrosion inhibitors, emphasizing that their efficiency is closely linked to molecular structure and adsorption behavior on metal surfaces. Organic inhibitors are particularly effective due to the presence of heteroatoms and functional groups that promote strong interaction with metals, forming protective films that suppress both anodic and cathodic reactions. Special attention is given to nitrogen-containing compounds such as imidazolines, phosphonates, and urotropine derivatives, which show high inhibition efficiency in harsh environments, including acidic media and systems containing corrosive gases like $H_2S$ and $CO_2$. These compounds form stable, often hydrophobic surface layers that significantly reduce corrosion rates and enhance material durability. Other classes, including azoles, Schiff bases, and heterocyclic compounds, are also effective, particularly in chloride-rich environments.

**Keywords:** Corrosion inhibition; Organic inhibitors; Adsorption mechanism; Nitrogen-containing compounds; Protective films

CP12

# Zinc-Air Battery Stability Behavior Using Potassium Ferrocyanide as a Corrosion Inhibitor

**Prof. Abdel-Rahman El-Sayed, Mostaf Adel, Sara RezkAlla Gabriel Fakhry, and Rosette Elyas Zaher Awad**

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## ABSTRACT

This review presents a comprehensive overview of inorganic corrosion inhibitors, covering their classifications (such as metal-based, metal oxides, phosphates, and silicates), mechanisms of action, and industrial applications. These inhibitors primarily function through adsorption on metal surfaces, formation of protective films, and modification of anodic and cathodic reactions. The paper also discusses their advantages and limitations across sectors like oil and gas, chemical processing, and construction. Recent developments, including nanotechnology-based inhibitors, environmentally friendly alternatives, and computational design, highlight ongoing efforts to improve efficiency and sustainability. The study further investigates the use of potassium ferrocyanide as an inorganic corrosion inhibitor for zinc electrodes in zinc–air batteries using 5 M KOH electrolyte. The addition of ferrocyanide significantly reduced corrosion current density and improved inhibition efficiency, which increased further in the presence of $CO_2$ due to a strong synergistic effect. Electrochemical analyses (EIS and Tafel) and surface characterization (SEM, EDS, XRD) confirmed the formation of a stable protective layer on the electrode surface. Overall, the combined use of ferrocyanide and $CO_2$ enhances corrosion resistance, electrochemical stability, and discharge performance, offering a promising approach to improving the durability and efficiency of alkaline zinc-air batteries.

**Keywords:** Inorganic corrosion inhibitors; Potassium ferrocyanide; Zinc–air batteries; Electrochemical impedance spectroscopy; Synergistic effect

CP13

# Corrosion Inhibition of Cu Alloys by Using Aminotriazole in NaCl Solution

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## ABSTRACT

Corrosion of copper alloys in chloride-containing environments is a significant problem in many industrial and marine applications. Sodium chloride (NaCl) solutions accelerate corrosion due to the aggressive action of chloride ions. The use of organic inhibitors is considered one of the most effective methods to reduce metal corrosion. Aminotriazole has been reported as an effective corrosion inhibitor for copper and its alloys because of its ability to adsorb on the metal surface and form a protective film. Electrochemical techniques such as Tafel polarization and electrochemical impedance spectroscopy (EIS) are commonly used to evaluate the inhibition efficiency. Many studies show that Aminotriazole can significantly reduce the corrosion rate of copper alloys in NaCl solutions by forming a protective layer on the metal surface. This protective film reduces both anodic and cathodic reactions, improving the corrosion resistance of copper alloys in saline environments.

**Keywords:** Copper corrosion; Aminotriazole; Chloride ions; Corrosion inhibition; Electrochemical impedance spectroscopy

CP14

# Corrosion Inhibition of Copper by Using Green Inhibitors in an Acidic Medium

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## ABSTRACT

This study discusses the effectiveness of Moringa oleifera extract as a green corrosion inhibitor for copper in an acidic medium (HCl). The corrosion behavior was evaluated using weight loss measurements, Tafel polarization, and Electrochemical Impedance Spectroscopy (EIS). The results revealed that the corrosion rate of copper decreases significantly with increasing concentration of the extract, while the inhibition efficiency (IE%) reached up to 88% at the highest concentration. Electrochemical analysis confirmed that the extract acts as a mixed-type inhibitor, affecting both anodic and cathodic reactions. Adsorption studies suggested that the inhibition mechanism follows Langmuir-type isotherms, involving both physical and chemical adsorption. Although higher temperatures slightly reduced the inhibition efficiency, the protective layer remained stable, indicating the extract's effectiveness under elevated temperature conditions. Overall, Moringa oleifera extract represents a sustainable and eco-friendly alternative to conventional chemical inhibitors for copper corrosion in acidic environments.

**Keywords:** Moringa oleifera extract; Green corrosion inhibitor; Copper corrosion; Langmuir adsorption isotherm; Electrochemical impedance spectroscopy

CP15

# Sustainable Corrosion Inhibition of Aluminum Anodes in Alkaline Media for High-Performance Battery Applications

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## ABSTRACT

With the global shift toward sustainable energy storage, aluminum-air batteries have emerged as a frontrunner due to aluminum's high theoretical energy density, low cost, and recyclability. However, the practical application of these systems is severely hindered by the rapid corrosion of aluminum in alkaline electrolytes, which leads to significant capacity loss and the hazardous evolution of hydrogen gas. This research investigates the effectiveness of Hibiscus Sabdariffa (Karkade) as a high-performance corrosion inhibitor for aluminum in KOH solution. Using a combination of potentiodynamic polarization and electrochemical impedance spectroscopy (EIS), we evaluated the inhibition efficiency across various concentrations and temperatures. Our results demonstrate that the inhibitor significantly suppresses both anodic and cathodic reactions, achieving a maximum inhibition efficiency. Surface analysis via Scanning Electron Microscopy (SEM) further confirmed that the inhibitor molecules form a protective adsorbed film on the aluminum surface, effectively blocking active corrosion sites. These findings provide a cost-effective and scalable strategy to enhance the shelf-life and discharge performance of aluminum-based alkaline batteries. By mitigating parasitic hydrogen evolution and maintaining anode integrity, this study contributes to the development of more durable and efficient energy storage technologies for next-generation power applications.

**Keywords:** Aluminum–air batteries; Corrosion inhibition; Hibiscus sabdariffa extract; Alkaline electrolyte (KOH); Hydrogen evolution suppression

CP16

# Adsorptive removal of tetracycline (TC) from aqueous systems using activated carbon synthesized from grape residue: physicochemical characterization and mechanistic insights

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## ABSTRACT

In this study, activated carbon was prepared from grape residue and applied for the removal of tetracycline (TC) from wastewater. The precursor material was subjected to pyrolysis at 300, 500, and 700 °C to investigate the influence of temperature on the properties of the resulting activated carbons. The physicochemical and surface characteristics were comprehensively analyzed using SEM, FTIR, XRD, elemental analysis, $N_2$ adsorption–desorption isotherms, thermogravimetric (TG) and derivative thermogravimetric (DTG) analyses, as well as BET surface area measurements. The BET surface areas increased with increasing pyrolysis temperature, reaching 4.25 $m^2/g$ at 300 °C and 44.23 $m^2/g$ at both 500 and 700 °C. Likewise, the pore volumes increased from 0.0037 $cm^3/g$ to 0.023 $cm^3/g$ and 0.305 $cm^3/g$ for samples prepared at 300, 500, and 700 °C, respectively, while the average pore diameters were 8.02, 9.45, and 10.29 nm. Adsorption studies revealed that the equilibrium data were best described by the Langmuir isotherm model, indicating monolayer adsorption. The maximum adsorption capacities were determined to be 6.98 mg/g for AC300, 15.25 mg/g for AC500, and 17.38 mg/g for AC700. Kinetic analysis showed that the adsorption process followed a pseudo-second-order model, suggesting that chemisorption plays a dominant role. Enhanced adsorption at higher pyrolysis temperatures is attributed to improved pore structure and reduced oxygen-containing groups. Despite its relatively low surface area, the grape-derived activated carbon exhibited high efficiency in tetracycline removal due to its large pore volume and active surface sites.

**Keywords:** Activated carbon; Grape residue; Tetracycline removal; Langmuir isotherm; Pseudo-second-order kinetics

CP17

# Metal-Organic Frameworks (MOFs) from Waste Plastic PET Bottles for Environmental Applications

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## ABSTRACT

The escalating environmental crisis driven by plastic pollution and water scarcity necessitates innovative circular economy solutions. This study explores a "waste-to-wealth" strategy by utilizing waste polyethylene terephthalate (PET) bottles as a sustainable source of 1,4-benzenedicarboxylic acid (BDC) for the synthesis of Metal-Organic Frameworks (MOFs). Through a controlled chemical upcycling process, the PET waste is depolymerized and coordinated with various metal centers to produce high-porosity, crystalline MOF structures. Their efficacy as advanced adsorbents and photocatalysts was evaluated in wastewater treatment applications, specifically targeting the removal of hazardous pollutants, including heavy metals, organic dyes, and emerging pharmaceutical contaminants. Results indicate that PET-derived MOFs exhibit comparable, and in some cases superior, adsorption capacities to those synthesized from commercial precursors, owing to their tailored pore architectures and high surface-to-volume ratios. This research demonstrates a dual-action environmental benefit: mitigating the accumulation of plastic waste and providing a cost-effective, high-performance material for the remediation of contaminated water resources.

**Keywords:** Plastic Upcycling; Metal-Organic Frameworks (MOFs); Polyethylene Terephthalate (PET); Wastewater Remediation; Adsorption

CP18

# Progress in Sustainable Water Purification: From Conventional Methods to Advanced Functional Materials

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## ABSTRACT

Water treatment is a critical process for ensuring the availability of safe and clean water for domestic, industrial, and environmental applications. Increasing contamination from heavy metals, organic pollutants, and pathogenic microorganisms has intensified the need for efficient and sustainable purification technologies. Conventional methods such as coagulation, filtration, and chlorination remain widely used; however, they often suffer from limitations, including incomplete removal of trace contaminants and the formation of harmful by-products. In recent years, advanced treatment strategies—such as membrane filtration, adsorption using nanostructured materials, advanced oxidation processes, and electrochemical techniques—have gained significant attention due to their high efficiency, selectivity, and adaptability. Among these, nanomaterial-based adsorbents and electrochemical sensors have shown remarkable performance in detecting and removing toxic ions like $Pb^{2+}$, $Cd^{2+}$, and $Hg^{2+}$ at very low concentrations. Despite these advancements, challenges related to cost, scalability, and environmental impact persist. Therefore, ongoing research is focused on developing low-cost, eco-friendly, and highly selective materials to enhance water treatment performance. This study highlights recent progress in water purification technologies and emphasizes the integration of novel functional materials for improved water quality and environmental sustainability.

**Keywords:** Water treatment; Advanced purification technologies; Nanomaterial adsorbents; Heavy metal removal; Electrochemical methods

CP19

# Advanced Strategies for the Detection of Water Pollutants: From Conventional Methods to Smart Sensing Technologies

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## ABSTRACT

The detection of pollutants in water has become a major focus of environmental monitoring due to the increasing presence of toxic contaminants such as heavy metal ions, organic compounds, and emerging pollutants. Rapid industrialization and agricultural activities have led to the release of hazardous substances, including $Pb^{2+}$, $Cd^{2+}$, $Hg^{2+}$, pesticides, and pharmaceutical residues into aquatic systems, posing serious risks to human health and ecosystems. Conventional analytical techniques, such as atomic absorption spectroscopy (AAS) and chromatography, offer high sensitivity and accuracy but are often limited by high cost, complex operation, and the need for sophisticated instrumentation. In recent years, significant progress has been made in the development of rapid, cost-effective, and highly sensitive detection methods. Among these, electrochemical sensors, optical sensing platforms, and nanomaterial-based approaches have attracted considerable attention due to their excellent selectivity, low detection limits, and potential for on-site monitoring. Functional materials such as carbon nanostructures, metal–organic frameworks, and calixarene derivatives have been widely employed to enhance sensing performance through improved adsorption and signal amplification. Despite these advances, challenges remain in achieving real-time detection, multi-analyte sensing, and long-term stability under complex environmental conditions. Therefore, ongoing research is directed toward designing innovative, portable, and environmentally friendly sensing systems for efficient water quality assessment. This work highlights recent developments in water pollution detection technologies and underscores the importance of integrating advanced materials with smart sensing platforms to ensure sustainable water management.

**Keywords:** Water pollution detection; Electrochemical sensors; Nanomaterials; Heavy metal ions; Environmental monitoring

CP20

# CQDs and their applications in water treatment

**Ahmed M. Soliman[1*], Mahmoud A A El-Remaily[1], Bassam G. Mohamed[1], Mohamed Osama[1], Samia Mohammed[1], Sarah Yasser[1], Abraam Philip[1], and Omar M. Elhady[1]**

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## ABSTRACT

We explored the potential of carbon quantum dots (CQDs) as novel materials for wastewater treatment and their role towards environmental sustainability. The advantages of CQDs over other carbon-based materials, when synthesized using the same precursor material and for the same contaminant, are discussed, enabling future researchers to choose the appropriate material. CQDs have demonstrated exceptional adaptability in various wastewater treatment applications, acting as efficient adsorbents for contaminants, exhibiting excellent photocatalytic properties for the degradation of organic pollutants, and functioning as highly sensitive sensors for water quality monitoring. We found that the bottom-up approach has better control over particle size (resulting CQDs: 1–4 nm), whereas the top-down synthesis approach (resulting CQDs: 2–10 nm) has more potential for large-scale applications and tunability. Transmission electron microscopy (TEM) remains the most expensive characterization technique, which provides the best resolution of the CQD's surface. The study emphasizes the environmental impact and safety considerations pertaining to CQDs by emphasizing the need for thorough toxicity evaluation and necessary environmental precautions. The study also identifies the lacunae pertaining to critical challenges in the practical implementation of CQDs, such as scalability, competition of co-existing contaminants, and stability. Finally, future research directions are proposed, advocating green synthesis approaches, tailored surface functionalization, and lowering the overall cost for analysis, synthesis, and application of CQDs.

**Keywords**: CQDs, water treatment, nanochemistry, green synthesis, sustainability.

CP21

# Green Hydrogen and Sustainable Development

**Bassant Saad Mohamed[(1)], Lobna Abdel-Mohsen Ebaid Nassr[(2)]**

[(1)] 4th year student – Chemistry Program - Chemistry Department – Faculty of Science – Sohag University

[(2)] Vice-Dean for Higher Studies and Research Affairs - Faculty of Science – Sohag University

## ABSTRACT

Producing and using green hydrogen as a source of energy supports the implementation of sustainable development goals: clean energy (SDG 7), industry innovation (SDG 9), and climate action (SDG 13). Hydrogen is classified into different color shades: blue, gray, brown, black, and green, respectively, according to their hydrogen production technology, energy source, and environmental impact. Green hydrogen is produced from renewable water and electricity by the electrolysis process. In this process, water is split into hydrogen ($H_2$) and oxygen ($O_2$) under the influence of electricity, with zero carbon emissions. Different electrolysis techniques are used to produce green hydrogen, such as alkaline water electrolysis, anion exchange membrane (AEM) water electrolysis, proton exchange membrane (PEM) water electrolysis, and solid oxide water electrolysis. The reaction conditions have a great effect on the production rate of the obtained green hydrogen.

**Keywords:**

Green hydrogen; Water electrolysis; Renewable energy; Sustainable development goals (SDGs); Hydrogen production technologies

CP22

# Classification of antidiabetic drugs

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## ABSTRACT

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. It represents a major global health challenge due to its increasing prevalence and associated complications. Antidiabetic drugs play a crucial role in the management of diabetes by controlling blood glucose levels and preventing long-term complications. Antidiabetic medications are broadly classified based on their mechanism of action. In Type 1 diabetes, which results from autoimmune destruction of pancreatic β-cells, insulin therapy remains the primary treatment. In contrast, Type 2 diabetes is characterized by insulin resistance and relative insulin deficiency, and it is managed using a variety of oral and injectable agents. These include insulin sensitizers, insulin secretagogues, inhibitors of glucose absorption, and incretin-based therapies. Recent advancements in antidiabetic drug development focus on improving efficacy, reducing side effects, and providing additional benefits such as weight control and cardiovascular protection. Understanding the classification and mechanisms of these drugs is essential for optimizing therapeutic strategies and improving patient outcomes in diabetes management.

**Keywords:** Diabetes mellitus; Antidiabetic drugs; Insulin therapy; Type 1 diabetes; Type 2 diabetes

CP23

# Synthesis, Characterization, and Reactivity of 1,2,4-Triazole Derivatives for Medicinal Applications

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## ABSTRACT

This research focuses on the synthesis and chemical reactions of 1,2,4-triazoles and their derivatives, which are known for their significant biological and pharmacological activities. The target compounds were synthesized through efficient synthetic routes using various starting materials and reagents. The structures of the prepared 1,2,4-triazole derivatives were characterized and confirmed using physical and analytical methods. Furthermore, the chemical reactivity of the triazole ring was investigated through several reactions to produce new heterocyclic systems. The study highlights the versatility of 1,2,4-triazoles as key building blocks in organic synthesis and medicinal chemistry.

**Keywords:** 1,2,4-Triazoles; Heterocyclic compounds; Organic synthesis; Chemical reactivity; Medicinal chemistry

# Chemistry Department Experiments

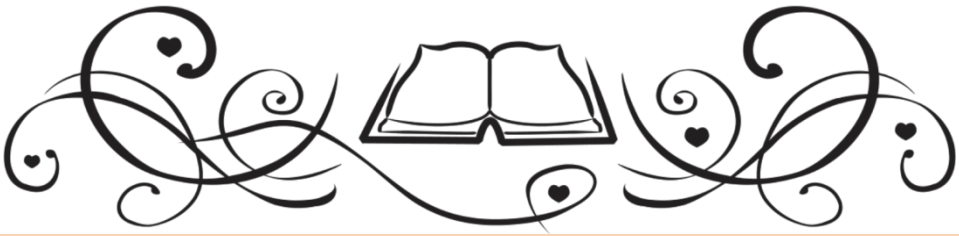
| No. | Name of Experiment | Category | Students | Supervisor |
|---|---|---|---|---|
| **CE01** | Elimination of Certain Hazardous Contaminants from Wastewater | Environmental | 1- Mostafa Mohammad Awud Abdul Moneim | Bassam Mokhtar |
| **CE02** | Green Hydrogen from Aluminum Cans waste | Fuel cells | 1- Shrouk Mohamed Nour Eldeen.<br>2- Alaa Ahmed Abd Elghani | Mohamed Abdel-Hameed |
| **CE03** | Water Quality Analysis | Water quality | 1- Asmaa Badawe Ahmed<br>2- Donia El - Meshwady Okasha | Aya Adel Ahmed |
| **CE04** | From plastic waste to clean water | Environmental | 1- Malak Mohamed Ahmed<br>2- Manar Adel Fawzy | Amira Gelany |
| **CE05** | Ensuring Nutritional Integrity: A Quantitative Assay of Iodate in Table Salt | Quality control | 1- Mohamed Hussein Tawfic<br>2- Mohammed Yasser Makhlouf | Mostafa Adel Abdel-Hamid |
| **CE06** | Green synthesis of CuO NPs | Water treatment | 1- Gebril Mohamed Gebril Mohamed<br>2- Abdallah Gamal Ahmed Mohamed<br>3- Hoda Mohamed Abdel-Hady | Yathreb Ahmed |
| **CE07** | Determination of | Quality | 1. Bassma Abo | Eman Ragab |

| | | | | |
|---|---|---|---|---|
| | phosphoric acid in Coca-Cola and Max Cola by conductometric, pH-metric, and gravimetric methods | control | EL-Yazed Mohamed Mohamed<br>2. Amany El-Sayed Mohamed | |
| **CE08** | Analysis of commercial Aspirin tablets pH-metrically, Conductometrically and assessment of the purity of tablets | Quality control | 1. Ziad Ahmed Ahmed Abdel Hafez<br>2. Ahmed Abu Al-Hamd Khalaf Allah Rashwan | Semon Wageh |
| **CE09** | Determining the Concentration of Hypochlorite ($OCl^-$) in Detergents | Quality control | 1- Mariam Mahmoud Mohamed Mosalam<br>2- Asmaa Essam Labib Abdelhamed | Abdel-Baset Mohamed Ahmed |
| **CE10** | The magic of chemistry IN the chameleon reaction | Magic chemistry | 1-Basmala Ahmed Mahmoud<br>2- Nada Ahmed Hebeshy | Ahmed Mahmoud |
| **CE11** | Eco-friendly synthesis of nanohydroxyapatite from eggshell | Green nanomaterials | 1-Reem Khaled Ali<br>2-Shahd Mahmoud Abdellah<br>3-Reham Sayed<br>4-Balqees Gaber Ali | Aya Mansour |
| **CE12** | Recycling plastic waste | Organic | 1. Abdulrahman Wael Mostafa<br>2. Malak Mohamed Metawaa Ahmad | 1. Alaa Elaraby Mahmoud<br>2. Abraam Philip |
| **CE13** | Aspirin synthesis | Organic | 1. Ahmed Abdel Hamid Makhlouf<br>2. Abdullah Yasser | 1. Sham Mahrous Mohamed |

| | | | | |
|---|---|---|---|---|
| | | | Ali | 2. Bassam Abogabal Mohamed |
| **CE14** | Extracting essential oils from basil (Ocimum basilicum) | Organic | 1. Omar Hussein Badawy Mohamed<br>2. Khaled Mohamed Mohamed Abdelaziz | 1. Asmaa Abdelbaset<br>2. Ali Mohamed Ali |
| **CE15** | Wool dyeing | Organic | 1. Ola Abdel Nasser El-Qatt<br>2. Nada Nasser Khalifa<br>3. Malak Hatem Abdel Aleem<br>4. Mariam El-Badry Hanafy<br>5. Alaa Ahmed Fouad<br>6. Sarah Yasser | 1. Hend Mahmoud<br>2. Dalia Mahfouz |
| **CE16** | Bioplastic from starch | Organic | 1. Rahma Mahmoud Kamel<br>2. Bassant Saad | 1. Mariam Abderaheam<br>2. Eman Mahmoud |
| **CE17** | Evaluation of Kidney Function via Serum Creatinine Estimation | Biochemistry | 1. Marcel Barakat Nassif<br>2. Malak Ali Muhammad<br>3. Azza Ahmed Abdel-Alim<br>4. Nesma Mahmoud Hussein<br>5. Basmala Ahmed Abdel-Rashid | 1. Ahmed Gamal<br>2. Radwan Abdelal |

| | | | | |
|---|---|---|---|---|
| **CE18** | Spectrophotometric Analysis of Bilirubin Levels in Blood Samples | Biochemistry | 1. Rania Ahmed Hussein<br>2. Ruqaya Mahmoud Ragab<br>3. Rahma Khaled Ahmed<br>4. Menna Allah Mohsen Ali<br>5. Ola Mahmoud Abdel-Aziz | 1. Ahmed Gamal<br>2. Samah Semary |





# Botany & Microbiology

BO01

# Bioactive compounds from microalgae as promising source for medical and industrial applications

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## ABSTRACT

The increasing demand for functional foods, nutraceuticals, and sustainable industrial resources has intensified interest in microalgae as a promising source of natural bioactive compounds. Microalgae are rich in both primary and secondary metabolites, including proteins, lipids, pigments, and polysaccharides, which exhibit diverse biological activities such as antioxidant, anti-inflammatory, antimicrobial, anticancer, and neuroprotective effects. These multifunctional properties make microalgae valuable for applications in food, pharmaceutical, and nutraceutical industries, with growing evidence from human studies supporting their role in disease prevention and overall health promotion.

In addition to their health-related benefits, microalgae have gained attention for industrial applications due to their high biomass productivity and short cultivation cycles, offering a sustainable alternative to conventional resources. However, large-scale utilization faces significant challenges, particularly high production costs and economic limitations. To address these issues, the co-production of primary and secondary metabolites has emerged as a key strategy to improve process efficiency and economic feasibility. Various approaches, including the optimization of cultivation conditions and the induction of stress factors, have been explored to enhance metabolite biosynthesis.

This review highlights recent advances in the characterization and application of microalgal bioactive compounds, as well as strategies for improving their production through integrated biotechnological approaches. Overcoming current limitations will be essential to fully exploit microalgae as a sustainable resource and to support their contribution to industrial development and global sustainability goals.

BP01

# Production of bioplastic from algae

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## ABSTRACT

The environmental impact of petroleum-based plastics has driven the search for biodegradable alternatives. This study investigates marine algae (Ulva reticulata and Eucheuma cottonii) as sustainable sources for bioplastic production. Films were prepared using seaweed extracts, cornstarch, and glycerol (10–30 mL) via solvent casting.Results showed that lower glycerol (10 mL) improved tensile strength, while higher levels (30 mL) enhanced flexibility. The films exhibited significant biodegradation within 15 days in soil. Additionally, microalgae-based production of polyhydroxyalkanoates (PHA), supported by advanced tools like CRISPR-Cas9, highlights future potential for higher efficiency.Overall, algal bioplastics offer an eco-friendly and scalable solution to reduce plastic pollution and support a circular bioeconomy.

**Keywords :** Marine macroalgae, Bioplastics, Ulva reticulata, Eucheuma Cottonii, Glycerol, Biodegradability, Tensile strength.

BP02

# Algae and their byproducts as determinants of tap and bottled water quality

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## ABSTRACT

The present study was conducted to assess the presence of algal cells and their disinfection byproducts as determinant of tap and bottled water quality in Sohag city. The results revealed the presence of algal cells (> 5000 cell/mL) in some tap waters, while no bottled water brand had any discernible cell levels. However, high amounts of algal detritus (i.e., decaying algae and cell debris) were found in all tap water samples and one brand of bottled water, appearing as brownish-red particles or slime. The algae found in tap water were represented by green algae and diatoms, with no observable cyanobacterial cells. Both tap and bottled waters were negative for total coliforms (TC) and Escherichia coli (E. coli). Total Trihalomethanes (TTHMs) were detected at levels exceeding the WHO limit (100 ug/L) in all tap water samples and one brand of bottled water. Microcystin concentrations in all tap water samples were below the WHO guideline limit (1ug/L). Microcystin levels in all bottled water samples were undetectable. The study recommends regular monitoring of tap and bottled water for the presence of disinfection byproducts and microcystin, particularly during summer when conditions are favorable for algal and cyanobacterial growth.

**Keywords**: Algae, tap water, bottled water, disinfection byproducts, water quality

BP03

# Effect of excretory products from *Aspergillus terreus* and *Alternaria alternata* on germination and growth of wheat seedlings

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## ABSTRACT

This experiment was to determine the effect of the secondary products of *Aspergillus terreus* and *Alternaria alternata* on the germination and growth of wheat plant seedlings, the Fungi were inoculated on liqud media by-products were extracted by filtration using filter papers to remove the mycelia, and this extract was used in different concentrations in testing the extent of its effect on the germination of wheat grains in several steps, wheat plant represents one of the crop plants in which we find fungal pests that may kill the crop if they begin to appear. The measurements were recorded and the calculations required finding the percentage of germination was done to test the effect of wheat seeds with the extract, and we also noticed that the lengths of plant seedlings were affected by different concentrations, which were largely graded. To conclude the results of the experiment, it was found that a decrease in the germination rate of wheat grains as a result of the treatment, as well as a decrease in fresh and dry weights and a noticeable decrease in seedling lengths, and the effect increased with increasing concentration, which indicates that the by-products of the fungus have an inhibitory effect on germination and growth of wheat grains. Therefore, these by-products can be used by adding them to inhibit the growth of weeds growing with wheat crop, which depletes its nutrition, and this contributes in improving the productivity of the wheat plant and resisting the harmful effect of weeds that grow in wheat fields.

**Keywords**: Secondary products, Fungi, Wheat.

BP04

# Biosynthesis of nanoparticles through direct reduction by respiratory electron transport chain

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## ABSTRACT

Nanotechnology has emerged as a promising field in modern science due to its wide applications in medicine, environment, and industry. Nanoparticles possess unique physical and chemical properties because of their small size and high surface area. Recently, green synthesis methods have gained attention as eco-friendly alternatives to traditional chemical and physical methods. Plant extracts, such as onion (Allium cepa), contain bioactive compounds like flavonoids, phenolics, and sulfur compounds that act as reducing and stabilizing agents in nanoparticle synthesis.

This work aims to present a simple, cost-effective, and environmentally friendly approach for the synthesis of nanoparticles using onion extract. The proposed study focuses on utilizing natural resources to produce stable nanoparticles and evaluating their potential applications, particularly in antimicrobial and antioxidant activities. This approach reduces the use of toxic chemicals and supports sustainable nanotechnology.

The proposed method involves preparing onion extract and mixing it with a metal salt solution, leading to the formation of nanoparticles indicated by a color change. Phytochemicals in the extract reduce metal ions into nanoparticles and stabilize them to prevent aggregation. The synthesized nanoparticles can be characterized using techniques such as UV-Vis spectroscopy and evaluated for their biological activities, demonstrating their effectiveness in various biomedical and environmental applications.

BP05

# Experimenting Biodiesel Production from Castor Bean *(Ricinus Sp)* seeds

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**ABSTRACT**

Biodiesel is a renewable and biodegradable fuel derived from natural sources such as vegetable oils, animal fats, and waste cooking oils. It is considered an environmentally friendly alternative to conventional diesel due to its lower emissions and sustainability. The production of biodiesel typically involves chemical processes such as transesterification, where triglycerides react with alcohol in the presence of a catalyst to produce fatty acid methyl esters (FAME), which constitute biodiesel.

This work aims to present a concept for producing biodiesel from sustainable and low-cost raw materials, with a focus on improving fuel quality and reducing environmental impact. The proposed project highlights the importance of utilizing waste resources and renewable feed stocks to support clean energy production and reduce dependence on fossil fuels.

The proposed approach involves collecting and pre-treating raw materials, followed by a controlled transesterification process using an appropriate catalyst. The produced biodiesel is then purified and tested for key properties such as viscosity, density, and combustion efficiency. This system is designed to be efficient, cost-effective, and applicable for small-scale and industrial production.

**Key words**: Biodiesel – Castor Bean - Trans esterification

BP06

# Bioelectricity of potato battery

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## ABSTRACT

The potato battery is a simple electrochemical device that converts the chemical energy stored in a potato into electrical energy through redox reactions. This concept provides an educational, low-cost, and environmentally friendly alternative for generating small amounts of clectricity. It is increasingly recognized as a practical demonstration of basic principles in electrochemistry and a potential source of low-power energy for small electronic applications. This work aims at developing an innovative potato battery with enhanced performance and stability by optimizing the selection of electrodes, the number of cells, and the configuration of connections. The study focuses on increasing the output voltage and current, improving energy efficiency, and achieving a more reliable and consistent power source suitable for real-life applications such as powering LEDs, small calculators, or sensors. The proposed design uses aluminum and graphite clectrodes inserted into a single potato, which acts as the electrolyte due to its natural acid and ionic content. The aluminum electrode serves as the anode, while the graphite electrode serves as the cathode. The chemical reaction between the aluminum anode and the graphite cathode generates electrons that flow through an external circuit, producing electrical energy. Multiple potato cells can be connected in series or parallel to increase voltage or current, respectively. Factors such as electrode surface area, distance between electrodes, potato size, and temperature are investigated to optimize battery performance. This project also emphasizes the sustainability and accessibility of using biodegradable materials to generate clean energy. The results of this work can be applied in science education, renewable energy awareness, and simple electronic device development, encouraging innovation in green energy solutions. This is a presentation of an idea to develop a potato battery as a simple, low-cost, and eco-friendly source of electrical energy for educational and small-scale applications.

BP07

# AN idea of an innovative Smart Kitchen Basket

**Prof.Dr. Ahmed Mazen, Salma Tareq, Amany Alsaed, Marsel Aead, Norhan Ahmed, Sara Milad**

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## ABSTRACT

Biogas is a renewable energy source produced through the anaerobic digestion of organic matter. With the increasing global demand for sustainable energy and the urgent need for waste reduction, converting household organic waste into fuel has become a vital solution. This technology not only manages waste effectively but also reduces greenhouse gas emissions by capturing methane for productive use.

This work aims at developing an innovative, smart bio-digester system designed for residential kitchen use. The proposed system focuses on recycling organic leftovers, such as fruit and vegetable peels, into clean biogas for cooking and high-quality organic fertilizer for domestic gardening. It is specifically designed to be costeffective, compact, and suitable for modern indoor environments.

The proposed concept utilizes a high-efficiency anaerobic chamber connected to a specialized filtration unit to ensure clean gas flow. To enhance user experience and safety, the system is integrated with an IoT-based monitoring module (Mobile App) connected to internal sensors. These sensors track gas pressure, temperature, and waste levels in real-time, providing users with immediate data on their smartphone. This integration of biotechnology with digital monitoring enables a simple, low-cost, and "smart" transition toward a zero-waste, sustainable lifestyle. This is a presentation of an idea to develop a smart household bio-digester for producing clean cooking fuel and organic fertilizer from kitchen waste.

BP08

# An idea of a natural hydrogel from *Aloe vera* to improve water holding capacity

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## ABSTRACT

Water scarcity is a major challenge in arid and semi-arid regions, limiting agricultural productivity due to low soil moisture retention and high evaporation rates. In this context, natural biopolymers derived from plants have gained attention as sustainable amendments to improve soil water management. *Aloe vera*, a succulent plant well known for its high content of polysaccharides, mucilage, and gel-based compounds, has strong potential for water binding and retention.

This study aims to evaluate the water holding and retention capacity of *Aloe vera* extract and its effectiveness in improving soil moisture availability for crop growth in arid soils. The extract was prepared from fresh *Aloe vera* leaves, filtered, and applied at different concentrations to sandy soil samples. Soil moisture retention was assessed using gravimetric analysis, water retention curves, and evaporation experiments under controlled conditions.

The results showed that *Aloe vera* extract significantly increased the soil's water holding capacity and reduced water loss through evaporation compared to untreated soil. The highest concentration of extract (5%) exhibited the strongest moisture retention, improving soil structure and enhancing available water for plants over an extended period. Moreover, treatment with *Aloe vera* extract improved soil porosity, reduced bulk density, and supported better seed germination and plant growth.

These findings indicate that *Aloe vera* extract can serve as an eco-friendly, cost-effective, and sustainable soil amendment to enhance water use efficiency in arid agriculture. Its application can contribute to improving crop productivity, conserving water resources, and promoting sustainable farming in water-limited environments.

This is a presentation of an idea to evaluate the ability of *Aloe vera* extract to hold and retain water and its potential use in agriculture for improving soil moisture in arid lands.

BP09

# The Role of Bacteria in Minimizing Pesticides Hazards

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## ABSTRACT

Pesticides are essential in modern agriculture for protecting crops from pests, weeds, and pathogens, ensuring productivity and food security. However, extensive use of chemical pesticides raises concerns about environmental contamination, soil degradation, biodiversity loss, and health risks (Aktar et al., 2009). Microorganisms, particularly bacteria, offer solutions by degrading harmful chemicals and serving as environmentally friendly biopesticides.

Soil bacteria such as ***Pseudomonas spp***. and ***Bacillus spp***. can enzymatically break down toxic pesticides into less harmful compounds, reducing environmental persistence and improving soil fertility (Singh et al., 2006). Other bacteria act as biopesticides: ***Bacillus thuringiensis*** **(Bt)** produces insecticidal toxins that target specific larvae without harming non-target organisms (Bravo et al., 2011), while ***Bacillus subtilis*** exhibits antifungal activity and induces systemic resistance in plants.

Bacterial mechanisms in pesticide systems include enzymatic degradation, toxin production, pathogen competition, and stimulation of plant defenses. These processes support sustainable pest management, reduce reliance on synthetic chemicals, and align with integrated pest management (IPM) strategies (Köhl et al., 2019).

Agriculturally, bacterial applications provide multiple benefits: lower chemical residues, healthier soils, higher yields, and reduced long-term costs. Despite challenges like environmental sensitivity and formulation issues, bacteria offer a promising path toward sustainable and responsible farming.

**Keywords**: Pesticides ,Biopesticides,Soil bacteria,Microbial degradation,Environmental contamination,Sustainable agriculture

BP10

# Alleviation of fungi toxicity on wheat plant by phytohormone (salicylic acid)

**Prof. Dr. Fayza A. Faheed, Dr. Marwa Rajah, Hatem Salah Hafez, Gehad Mamdouh Mohammed, Julia Elsabe Gerges**

Botany & Microbiology department, Faculty of science Sohag University, Sohag , Egypt

## ABSTRACT

This study evaluates the synergistic impact of Salicylic Acid (SA) and fungal inoculants (Trichoderma hamatum, Aspergillus terreus, and Aspergillus oryzae) on the early development of Geza and Seds 12 wheat cultivars. Seedlings were evaluated for growth parameters, germination percentage, and biomass accumulation across four treatments. The results consistently demonstrated a growth-defense tradeoff; while the combined SA and fungal treatments significantly inhibited shoot and root elongation compared to the control, they triggered a substantial increase in biomass. Notably, in Geza wheat, the SA+Fungi treatment resulted in a six-fold increase in dry weight (0.51 { g}) relative to the control (0.09 { g}). Similar trends of "compact robustness" were observed in Seds 12, where metabolic resources were redirected from vertical expansion toward tissue densification and structural reinforcement. Although germination rates varied by fungal strain, the overall seedling quality was enhanced through improved carbon partitioning. This study concludes that the integration of SA and beneficial fungi acts as a potent biostimulation strategy, producing sturdier wheat seedlings with superior potential for environmental stress tolerance. These findings offer valuable insights into optimizing plant resource allocation for ehnhanced agricultural resilience.

**Keywords:** Trichoderma hamatum, Aspergillus terreus, Aspergillus oryzae and Salicylic Acid .

# Botany & Microbiology Department Experiments

| No. | Name of Experiment | Category | Students | Supervisor |
|---|---|---|---|---|
| **BE01** | Biosynthesis of nanoparticles through direct reduction by respiratory electron transport chain | | 1- Manar H. Radwan Mennat Allah M. Mohamed<br>2- Malak H. Mohamed<br>3- Malak M. Abdelhafeez | Prof. Dr. Ahmed Mazen |
| **BE02** | Experimenting Biodiesel Production from Castor Bean (Ricinus Sp) seeds | | 1- Sarah. Ahmed<br>2- Hasnaa.Salama<br>3- Jehad.Hassan<br>4- Taghreed.Ashraf<br>5- Rana. El-Sayed | Prof. Dr. Ahmed Mazen |
| **BE03** | Bioelectricity of potato battery | | 1- Gabriel Mohamed Gabriel<br>2- Abdullah Gamal Ahmed<br>3- Fathi Ahmed Fathi<br>4- Ali Ayman Mokhtar<br>5- Mohamed Abdel Wahab El Sayed | Prof. Dr. Ahmed Mazen |

| | | | | |
|---|---|---|---|---|
| **BE04** | AN idea of an innovative Smart Kitchen Basket | | 1- Salma Tareq<br>2- Amany Alsaed<br>3- Marsel Aead<br>4- Norhan Ahmed<br>5- Sara Milad | Prof. Dr. Ahmed Mazen |
| **BE05** | An idea of a natural hydrogel from Aloe vera to improve water holding capacity | | 1- Blqys Gaber<br>2- Dawlat Elsyedl | Prof. Dr. Ahmed Mazen |


Zoology
SOHAG UNIVERSITY


مؤتمر الأبحاث الطلابية
كلية العلوم - جامعة سوهاج
بحث - ابتكار - تميز

# Zoology

ZO01

# On Some Trematode Parasites Infecting the Western Cattle Egret (*Ardea ibis ibis)* in Sohag Governorate, Egypt; with Redescription of *Nephrostomum ramosum* (Sonsino, 1895)

**Momen Eldamarany Ebrahhem*[1], Marco Romany Saad Tadros[2]**

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## ABSTRACT

The heron (*Ardeola ibis ibis*) is a widely distributed wild bird in Egypt and serves as an important host for a wide range of parasites, including the trematode parasites, due to its opportunistic feeding habits and its and ecological activity. It inhabits agricultural landscapes and livestock environments and is considered a valuable bioindicator of environmental health and a potential source of some parasites that may be affecting the domestic poultry, livestock animals and humans sharing the same habitats. This study aimed to investigates the trematode fauna infecting the cattle egret *Ardea ibis ibis* in Sohag Governorate, Egypt, with emphasis on the prevalence patterns of the recovered trematodes and the redescription of *Nephrostomum ramosum* (Sonsino, 1895). Examination of a total nine collected birds using light microscopy revealed five trematode species with varying infection rates. *Apharyngostrigea ibis* (Azim, 1935) Ukoli, 1967 was the most prevalent, occurring in 66.6% of examined hosts, indicating its strong establishment in local egret populations. *Nephrostomum ramosum* followed with a prevalence of 55.5%, highlighting its significant epidemiological presence and warranting detailed morphological reassessment. *Stomylotrema ali-ibrahimi* Hilmy, 1949 was detected in 44.4% of birds, while *Echinochasmus echinochasmus* and *Paramonostomum aegyptiacum* Khalifa and El-Naffar, 1978 each occurred at a prevalence of 22.2%. A redescription of N. ramosum is done, including some morphological characters crucial for distinguishing it from other closely related nephrostomids. The presence of multiple trematode species at relatively high prevalence confirms the role of cattle egrets as important definitive hosts in the parasite life cycles. These findings enhance current knowledge of avian trematode biodiversity in Sohag and Upper Egypt and provide a foundation for future parasitological and ecological studies.

**Keywords**: Trematodes, Wild birds, Cattle Egret, *Ardea ibis ibis*, Sohag, *Egypt.*

ZO02

# THE DRUGS USED FOR THE TREATMENT OF CARDIC DISEASE

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## ABSTRACT

Beating at the third week of intrauterine life, this relentless hollow muscular machine only the size of a human fist can circulate >1500 gallons of blood per day around the body There has been no visible change in heart's morphological anatomy for an exceedingly long time, with the heart muscle connected to the great vessels and powered by a unique electrical system with one-way direction of flow governed by four valves. However, in the era of state-of-the-art cardiac interventions and surgery, it is has never been more crucial to understand its exact anatomy for accurate targeted interventions and minimal complications, heart is a muscular pump, located in the protective thorax, which serves two functions: (1) collect blood from the tissues of the body and pump it to the lungs; and (2) collect blood from the lungs and pump it to all the tissues of the body. The heart's two upper chambers (or atria) function primarily as collecting chambers, while two lower chambers (ventricles) are much stronger and function to pump blood. The right atrium and ventricle collect blood from the body and pump it to the lungs, and the left atrium and ventricle collect blood from the lungs and pump it throughout the body. There is a one-way flow of blood through the heart which is maintained by a set of four valves (tricuspid, bicuspid, pulmonary, and aortic). The tissues of the heart are supplied with nourishment and oxygen by a separate vascular supply committed only to the heart; the arterial supply to the heart arises from the base of the aorta as the right and left coronary arteries, and the venous drainage is via cardiac veins that return deoxygenated blood to the right atrium.

**Myocarditis** is an uncommon, potentially life-threatening disease that presents with a wide range of symptoms in children and adults. Viral infection is the most common cause of myocarditis in developed countries, but other etiologies include bacterial and protozoal infections, toxins, drug reactions, autoimmune diseases, giant cell myocarditis, and sarcoidosis. Acute injury leads to myocyte damage, which in turn

activates the innate and humeral immune system, leading to severe inflammation. In most patients, the immune reaction is eventually down-regulated and the myocardium recovers. In select cases, however, persistent myocardial inflammation leads to ongoing myocyte damage and relentless symptomatic heart failure or even death. The diagnosis is usually made based on clinical presentation and noninvasive imaging findings. Most patients respond well to standard heart failure therapy, although in severe cases, mechanical circulatory support or heart transplantation is indicated. Prognosis in acute myocarditis is generally good except in patients with giant cell myocarditis. Persistent, chronic myocarditis usually has a progressive course but may respond to immunosuppression.

ZP01

# Invertebrate Venoms: Diversity, Mechanisms of Action, and Therapeutic Potential

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## ABSTRACT

Invertebrate venoms are highly specialized mixtures of bioactive compounds that have evolved primarily for predation, defense, competition, and survival in different ecological environments. This study highlights the diversity of invertebrates' venoms, their action mechanism, and their biomedical applications. Venoms are composed of a wide range of substances, including peptides, enzymes, toxins, and small organic molecules. Furthermore, the action mechanisms of venoms are species-specific which involve neurotoxic, cytotoxic, and hemotoxic effect by interfering with ion channels, disrupting cellular membranes, and affecting blood components; hence leading to paralysis, tissue damage, or physiological dysfunction in target organisms. Besides their natural roles, invertebrate venoms have attracted significant consideration in biomedical and pharmaceutical research. Many venom-derived compounds are being explored for their potential use in drug manufacture, particularly in pain control, neurological disorders, and cancer therapy. Understanding the venoms composition and biological effects provides valuable information for their potential roles as promising resources for future therapeutic applications.

**Keywords**: Venom, Neurotoxins, venom-derived compounds, action-mechanism, therapeutic applications.

ZP02

# Genetic effects of FTO gene variants in childhood obesity

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## ABSTRACT

**Background:** Genetic variation in the fat mass and obesity-associated (*FTO*) gene is a key determinant of obesity susceptibility; however, variant-specific metabolic effects remain insufficiently characterized in paediatric populations. This study investigated the association of three *FTO* polymorphisms (rs1421085, rs9939609, and rs8050136) with metabolic and biochemical profiles in Egyptian children.

**Methods:** A cohort of children (n = 34) was stratified into healthy (n = 3), dyslipidaemic (n = 19), insulin-resistant (n = 9), and diabetic-dyslipidaemic (n = 3) groups based on clinical and biochemical criteria. Anthropometric measurements and biochemical parameters—including fasting blood glucose, lipid profile, insulin, and HOMA-IR—were assessed. Genotyping of rs1421085, rs9939609, and rs8050136 was performed using PCR-based methods. Statistical comparisons were conducted using one-way ANOVA, and associations were evaluated using multivariate models with significance set at $p < 0.05$.

**Results:** Significant differences were observed across study groups for key metabolic parameters. Fasting blood glucose increased progressively from healthy (72.67 ± 9.07 mg/dL) to diabetic-dyslipidaemic children (111.33 ± 7.51 mg/dL; $F = 23.70$, $p < 0.001$). Total cholesterol levels were significantly elevated (182.83 ± 2.75 vs 236.67 ± 25.17 mg/dL; $F = 5.92$, $p = 0.003$), along with triglycerides (63.63 ± 7.41 vs 146.67 ± 23.50 mg/dL; $F = 6.59$, $p = 0.001$) and LDL (124.80 ± 1.80 vs 162.00 ± 21.54 mg/dL; $F = 3.55$, $p = 0.025$). Fasting insulin ($F = 10.55$, $p < 0.001$) and HOMA-IR ($F = 25.29$, $p < 0.001$) were significantly increased in insulin-resistant and diabetic groups, confirming progressive metabolic dysregulation.

Genotype-phenotype analysis demonstrated that the rs1421085 variant was strongly associated with dyslipidaemia and adverse lipid profiles, whereas rs8050136 exhibited modest modulatory effects. In contrast, rs9939609 showed no significant association with metabolic parameters. These findings support a hierarchical regulatory model in which

rs1421085 functions as the primary metabolic variant, rs8050136 as a secondary modifier, and rs9939609 as an indirect or weak marker.

**Conclusion:** *FTO* polymorphisms exert variant-specific effects on paediatric metabolic profiles. The rs1421085 variant is the principal contributor to dyslipidaemia and metabolic dysfunction, likely mediated through IRX3/IRX5 regulatory pathways, whereas rs8050136 has a modest influence and rs9939609 shows limited direct impact. These findings emphasize the importance of variant-specific genetic stratification in paediatric metabolic risk assessment and provide novel evidence from an Egyptian cohort.

**Keywords:** *FTO* gene; rs1421085; rs9939609; rs8050136; childhood obesity; dyslipidaemia; HOMA-IR; IRX3; IRX5; Egypt.

ZP03

# Ecological Distribution and Environmental Control Strategies of Mosquito Species in Egypt

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[2] Students of 4th level/Zoology & Chemistry Program, Zoology Department, Faculty of Science, Sohag University, 82524, Sohag, Egypt

## ABSTRACT

This study provides a comprehensive survey of 29 mosquito species recorded in Egypt, analyzing their geographical and ecological distribution based on records from the Ministry of Health, Cairo University, and the World Health Organization. The findings reveal the dominance of the "House Mosquito" (*Culex pipiens*) at 65% of the total population, followed by rural species (*Culex antennatus*) at 12%.

The research transitions from identification to practical application within the Sohag Governorate, a region characterized by a dual nature (semi-urban and semi-agricultural). The study emphasizes replacing traditional chemical pesticides with an "eco-friendly" control protocol based on three primary pillars. Biological Control: Supporting natural predators such as Lutzia tigripes larvae, which are known to prey on other mosquito species, and utilizing specialized bacteria (BTI). Environmental Management: Targeting specific habitats for each species, such as clearing "Water Hyacinth" to eliminate Coquillettidia richiardii , and securing clean water containers to limit the spread of *Aedes aegypti*. Mechanical & Physical Solutions: Implementing bio-traps that utilize natural $CO_2$ Emissions and physical barriers to prevent the entry of larger species like Culiseta longiareolata. The study concludes that a precise understanding of species percentages—including salt-marsh mosquitoes at 8% and winter mosquitoes at 5%—allows for more efficient resource allocation. This ensures a healthy environment without disrupting the biological balance in Upper Egypt.

ZP04

# Bio-Detoxifying Agents in Fish Diet: A Descriptive Review

**Fatma Ahmed[1], Asmaa M. Abdelrahim[2], Reem A. Ismail[2], Alaa M. Abdel-Raouf[2], Mohamed N. Mahmoud[2], Androw Galal[2], Shahanda H. Mohamed[2], Shaimaa S. A. Ali[2], Asmaa M. A. Hasan[2], and Hamdy A. M. Soliman[1]**

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## ABSTRACT

Fish feed supplementation with biological detoxifying agents is a recent development that benefits aquaculture. They are crucial for mitigating the harmful effects of several toxicants in aquaculture, such as heavy metals, mycotoxins, organic pollutants, etc. Several bio-detoxifying reagents, including bio-adsorbents (clay minerals, yeast cell walls), and bio-transformers (microbes and exogenous enzymes), are known for their efficacy in breaking down toxins into non-toxic metabolites. In fish feed diets, several natural reagents were reported for their detoxifying efficacy. The current report is a descriptive review of the naturally effective detoxifying reagents incorporated in the diet of toxified fish. Our survey includes natural adsorbents and reagents, phytogenetic feed additives, and microorganisms.

Natural adsorbents include bio-sourced zeolites. The natural reagents include exo-polysaccharides and bio-nanocomposites derived from biosafe, biodegradable, marine-sourced chitosan. Phytogenetics refers to plant-based or derived compounds, including herbs, medicinal plants, and the seeds of flowering plants. The microorganisms include marine microalgae (i.e., *Nannochloropsis oculata*), probiotics (i.e., *Bacillus* sp., *Lactobacillus* sp.), yeast cell wall components (natural binders), and microbes.

These functional feed additives in the fish feed regimen act by reducing the bioavailability of contaminants, enhancing fish antioxidant defense systems, and improving growth performance under stress.

**Keywords**: Bio-feed, Fish, Detoxification, Microbes, Nanocomposites, Phytogenetics, Zeolites

ZP05

# Navigating Complexity: An Investigation of Learning and Spatial Memory in Terrestrial Isopod, *Porcellio laevis*, Using Food-Rewarded Maze

**Asmaa N. Mustafa[1], Tarek G. Ismail[1], Asmaa A. Mohmoud[2], Safa M. El-masry[1]**

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2. B. Sc. Student, Zoology Department, Faculty of Science, Sohag University

## ABSTRACT

Spatial learning in terrestrial isopods remains poorly understood, particularly regarding sex differences and behavioral flexibility. Using a T-maze, we investigated learning in *Porcellio laevis* under fixed (Experiment 1) and alternating reward contingencies (Experiment 2). In Experiment 1, individuals demonstrated rapid and significant latency reductions across three trials ($F = 19.33$, $p < 0.0001$), with median latency decreasing by 81.2% (256s to 48s). Choice accuracy improved from 30% to 85% ($Q = 14.30$, $p < 0.0002$). Behavioral decomposition revealed complete elimination of non-goal-directed behaviors (stops and wall contacts) by Trial 3, while goal-oriented time to first movement decreased by 83.7%. Both sexes learned robustly with comparable efficiency (learning index: females 0.70, males 0.75, $p = 0.8$). In Experiment 2, under alternating contingencies (R-L-R-L), individuals showed significant improvement for right-side repeats (52.9% latency reduction, $p = 0.025$) but not left-side repeats. Reversal cost analysis revealed asymmetric flexibility: initial reversals produced improvement (negative costs), while the final reversal imposed a significant positive cost (+20.5s, $p = 0.02$). Choice accuracy reached 80% only by Trial 4 ($p = 0.012$). Females consistently outperformed males in latency and accuracy, though sex differences were not statistically significant. Comparison between experiments revealed comparable final latencies ($U = 97.0$, $p = 0.162$). These findings demonstrate that *P. laevis* exhibits developed, multi-component spatial learning, with distinct mechanisms for initial acquisition and flexible improving under changing circumstances.

**Keywords:** *Porcellio laevis*, Cognitive learning, Reversal learning, Memory, Decision-making

ZP06

# Some Nematode Parasites Infecting the Western Cattle Egret (*Ardea ibis ibis) in Sohag Governorate, Egypt*

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[2] A 4th -Level student, Molecular biology & Parasitology Program, Zoology Department, Faculty of Science, Sohag University, Sohag 82524, Egypt

## ABSTRACT

In Egypt, the cattle egret (*Ardea ibis ibis*) is a widely distributed wading bird commonly associated with agricultural landscapes and livestock. The feeding habits and ecological activity of this Wild bird make it a suitable host for a variety of helminth parasites, including nematodes of veterinary and ecological significance. The studies of nematode parasites that infect Wild birds worldwide are ongoing. Although, several studies in Egypt have documented nematode infections in the cattle egret, there is no information about nematode parasites infecting the Western Cattle Egret in Sohag Governorate. So, the present study aimed to identify nematode parasites infecting *A. ibis ibis* in Sohag Governorate and to estimate their prevalence, worm burden, mean intensity and mean abundant, with emphasis on morphological and morphometric characters relevant to their classification. During this study, a total of 14 cattle egrets were collected from the agricultural lands and examined for the presence of nematode parasites in gastrointestinal tract using standard parasitological methods, of which 11 individuals (78.5%) were infected with one or more nematode species. Parasitological examination in the present study revealed that three nematode species were identified with the following prevalence rates: *Desportesius invaginates* (42.9%), *Microtetrameres spiralis* (21.4%) and *Porrocaecum* sp. (7.1%). Also, each nematode species is redescribed and compared with the previously published descriptions by some authors to confirm species identity. In conclusion, this first parasitological examination of herons in Sohag Governorate provides valuable insights into the parasites of wildlife in Upper Egypt and highlights the need for continued surveillance of wild bird parasites, particularly in regions where wildlife and domestic animals interact closely.

**Keywords:** Nematodes, Wild birds, Cattle Egret, *Ardea ibis ibis*, Sohag, *Egypt.*

ZP07

# Biodiversity of Arthropod Communities in Pigeon Nests as a Microhabitat: A Comparative Study of Collecting Methods

**Safa M. El-masry[1] Zainab H. Atef [2]**

[1]Zoology Department, Faculty of Science, Sohag University, Egypt

[2]B.Sc. Student, Zoology Department, Faculty of Science, Sohag University, Egypt

## ABSTRACT

Feral pigeon (*Columba livia*) nests serve as unique microhabitats supporting diverse arthropod communities. This study aimed to investigate the taxonomic diversity, abundance, and trophic structure of arthropods inhabiting pigeon nests. Arthropod extraction was conducted using a dual-methodological approach: direct visual examination for macro-fauna and Berlese funnel extraction for micro-fauna. A total of 227 arthropod specimens were collected, representing two major classes (Insecta: 70.5%, Arachnida: 29.5%) and seven distinct orders. The order Coleoptera (specifically family Tenebrionidae) was numerically dominant, comprising 47.1% of the total fauna, highlighting their primary role as detritivores. The extraction successfully isolated specialized keratin-feeders (Dermestidae and Tineidae larvae) and ectoparasitic breeding stages, notably flea larvae (Siphonaptera). Furthermore, a robust predatory guild was identified, consisting of predatory mites (Acari) and 37 spiders (Araneae) spanning six families, suggesting a natural biological control mechanism. The findings demonstrate that pigeon nests function as complex, self-sustaining micro-ecosystems with a balanced trophic web (scavengers, parasites, and predators). The recovery of developing ectoparasites underscores the potential public health risks associated with abandoned nests in urban environments. The study also confirms the high efficacy of thermal gradient extraction methods (Berlese funnels) for accurate biodiversity assessments of nest micro-fauna.

# Zoology Department Experiments

| No. | Name of Experiment | Category | Students | Supervisor |
|---|---|---|---|---|
| **ZE01** | Preimplantation Genetic Testing for Aneuploidies (PGT-A) in ART | | 1- Amira Edfawy<br>2- Rahma Mamdouh | Prof. Tito Naeem Habib |


Geology Departement


مؤتمر الأبحاث الطلابية
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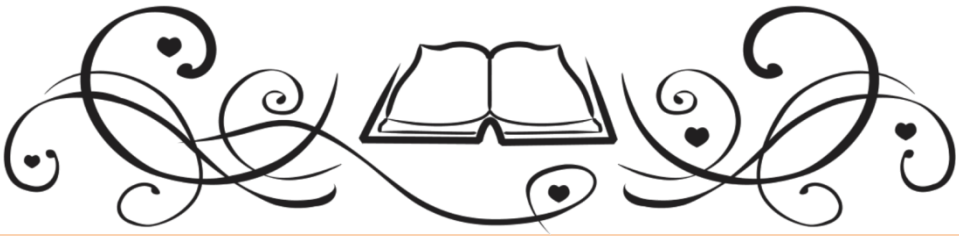

# Geology

GO01

# Machine learning applications in geology

**Dalia Ali, Shimaa Mohamed, Alaa Ramadan**

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## ABSTRACT

Machine learning (ML) is increasingly transforming geoscience by enabling faster and more accurate analysis of complex, high-dimensional geological data. This work introduces ML in various geological applications. These applications include remote sensing for mineral exploration, seismic interpretation, and well log–based prediction of reservoir properties. 1) For remote sensing, ML models help with lithological mapping by learning patterns from multispectral and hyperspectral images. 2) For seismic interpretation, supervised and deep learning methods can help find faults and classify facies. This will make things easier and more consistent. 3) In subsurface work, ML improves well logs to estimate petrophysical parameters and predict reservoir quality. Despite these advances, there are still problems, such as data scarcity, label uncertainty, the need for consistent predictions, and the need for models that work across regions. This work concludes by discussing these problems and suggesting ways to improve ML workflows in geology.

GO02

# Remote sensing and Geology

**Mai Ahmed Abu-ElHamd; Shimaa Mohamed Ali; Rania Mohamed Ali; Maya Ayman Mahmoud**

Geology Department, Faculty of Education, Sohag University

## ABSTRACT

Remote sensing has become an important tool in modern geology. It provides a wide area of spatial and spectral information that supports geological interpretation without the need for continuous field presence. This presentation introduces the concept of remote sensing, its main types (passive and active), and explains how remotely sensed data can be used to produce geological maps, discriminate lithological units, and delineate structures. It also highlights the role of multispectral and hyperspectral imagery in mineral exploration through mapping. Also, how radar and LiDAR data contribute to terrain analysis and digital elevation models. The presentation emphasizes integrating remote sensing outputs with GIS and field observations (ground truth) to improve reliability. Finally, it outlines major advantages, including rapid coverage and repeat monitoring, as well as limitations related to data resolution, vegetation and weather effects, and the surface sensitivity of many sensors.

GO03

# Geological and natural hazards, with a focus on their consequences and ways to deal with and mitigate them.

**Mariam Adly; Yasmin Mohamed Youssef; Habiba Naser; Asma Mohamed; Hoda AbdElNaser**

Geology Department, Faculty of Education, Sohag University

## ABSTRACT

When geological and natural hazards meet people and poor planning, they become disasters. This presentation discusses some of the most common hazards, including earthquakes, volcanoes, landslides, floods, ground subsidence, and tsunamis. It also discusses how these hazards affect lives, infrastructure, the economy, the environment, and essential services. It helps people deal with risk in a practical way by reducing the likelihood of disasters, assessing risk, and mapping hazards and susceptibility. Non-structural mitigation includes land-use planning, rules, and public awareness. The presentation also discusses how to be ready, respond, and recover to help people grow stronger over time. Finally, it discusses the importance of early warning systems and taking action ahead of time, and how combining remote sensing, GIS, and field monitoring can help people make quick decisions and reduce losses.

GO04

# Wastewater Risk Management in West Sohag - An Analytical Study of Environmental Impacts and Sustainable Solutions

**Omar Hashim Radwan; Amr Mohamed Myrghani El-Said; Mohamed El-Badry**

Geology Department, Faculty of Science, Sohag University

## ABSTRACT

Wastewater risk management is critical to protecting the environment and public health in arid regions, such as Upper Egypt. Uncontrolled disposal of wastewater can lead to rapid degradation of soil and groundwater quality. This study focuses on the West Sohag area and examines how wastewater practices can lead to environmental impacts, including the formation of uncontrolled surface ponds, the transport of microbial pollutants, and the movement of heavy metals into the soil and aquifer. Based on monitoring findings and published studies, this work identifies key risk factors, such as groundwater seepage, pollutant transport via flash floods, and exposure through irrigation or domestic use. It proposes a sustainable, innovative solution package that combines improved treatment efficiency, lining of conveyance channels and storage basins, and discharge control with nature-based solutions. The study emphasizes the importance of innovative solutions.

GO05

# Integrated Assessment of Groundwater Quality for Sustainable Agricultural Activities in the Nile Valley, Sohag Governorate, Egypt

**Nourhan Mahmoud Ahmed; Mary Akram Fawzy**

Geology Department, Faculty of Science, Sohag University

## ABSTRACT

This research, conducted in the Nile floodplain of Sohag Governorate, Egypt, analyzed groundwater chemical characteristics to determine their suitability for agricultural activities using integrated multivariate statistical techniques and geochemical modeling, based on 904 well samples. The study uncovers the complex interaction between natural hydrogeochemical processes such as water–rock interaction, ion exchange, and evaporation, and the accelerating influence of human activities and land-use changes. The study reveals that both anthropogenic and geogenic sources remain a challenge, especially in areas with limited data on aquifer stratigraphy. The calculated Irrigation Water Quality Index (IWQI) shows significant regional variability, ranging from 8.01 to 88.4. About 10.7% of the samples were categorized as unsuitable (severe restrictions), in which groundwater can be used only for irrigation of high-salt-tolerance plants. While 19.5% of the investigated wells were located within the very poor category, 34.1% within the poor category, 32.3% within the good category, and 3.5 within % excellent category for irrigation. Furthermore, Wilcox and USSL diagrams supported the IWQI findings. Ultimately, the study offers practical insights into sustainable groundwater management in highly populated, water-stressed areas, serving as a methodological framework for analogous places globally.

GP01

# Flood and heavy metal risks from wastewater site in Sohag Governorate, Egypt: integrating hydrological modeling and mapping

**Abdallah Mohamed; Osama Ahmed; Mohamed Gamal**

Geology Department, Faculty of Science, Sohag University

## ABSTRACT

Untreated wastewater disposal sites along Upper Egypt's Nile Valley pose major environmental and public-health risks because they are close to flood-prone wadis, cultivated and reclaimed lands, residential areas, and surface-water systems. This study assesses flood inundation hazard and heavy-metal contamination in the Al-Kola Basins (Sohag, Egypt) by integrating hydrological modeling with geochemical analysis. Flood scenarios were simulated using a 12.5 m DEM and GIS-based soil/land-use maps (HEC-HMS and HEC-RAS) and validated against the 1994 rainfall flood event. Increasing rainfall depth from 20 to 60 mm raised the average water depth from 1.48 to 2.29 m, the flow velocity from 2.41 to 3.76 m/s, the inundated area from 26% to 37%, and the extreme hazard from 23% to 42%. Eighteen soil samples around the disposal sites show Pb, Cd, Co, Cu, Ni, and Zn concentrations above international baseline levels, with contamination factors from moderate to very high; statistical results indicate an anthropogenic source linked to municipal wastewater leakage. The combined evidence suggests floodwaters can transport contaminants to agriculture and urban areas, irrigation canals, and the River Nile, amplifying health and environmental impacts.

GP02

# Sinkhole and cavity detection using geophysical ERT techniques

**Mohamed Hanafi; Shinoda Monir; Abdel Rahman Ahmed Shihata; Abd El-Latif Azaby; Sara El-Said; Mohamed Abd El-Latif**

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## ABSTRACT

Sinkholes are among the environmental and geological hazards that can be induced by human activities. Recently, a significant number of sinkholes have been reported in Egypt. These sinkholes are formed due to different mechanisms (e.g., cover-collapse, caprock-collapse, sagging-collapse, bedrock-collapse, sagging, and doline types). Some of these sinkholes occurred in the Sohag region, Egypt. Geologically, the area is distinguished by the presence of Eocene limestone formations, which represent the main karstic rock Formation in the area. The essence of this research is to use geophysical techniques, specifically ERT, to identify and detect subsurface cavities. Finally, the results support our assumption that ERT is very suitable for detecting subsurface cavities and dissolution features.

GP03

# Geological history up to the emergence of humankind

**Nourmina Karam Aziz; Hylana Moawd Thabit**

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## ABSTRACT

This poster outlines Earth's geological timeline from its formation ~4.6 billion years ago to the emergence of modern humans. It summarizes major milestones, including continental growth, the evolution of the atmosphere and oceans, and the rise of life. Key events, including plate tectonics, mass extinctions, and biological radiation, are highlighted for their role in shaping landscapes and ecosystems. The poster also reviews Quaternary climate fluctuations and ice ages and how they influenced landforms, ending with human dispersal and early interactions with changing environments.

GP04

# Integration of 2D geoelectrical resistivity imaging and boreholes as rapid tools for geotechnical characterization of construction sites: A case study of New Akhmim city, Sohag, Egypt

**Dina Awad Lotfy; Aya Madkor Abd El-Aty**

Geology Department, Faculty of Science, Sohag University

## ABSTRACT

To address urban expansion pressures—including high population density and land scarcity in Sohag, Egypt—New Akhmim City was proposed as a strategic construction site. This study evaluates the geotechnical characteristics, bedrock depth, and subsurface lithology of the site. We utilized 2D Electrical Resistivity Tomography (ERT) with an 8-profile Wenner array, processed via Res2dinv and validated by borehole data. Results delineated three distinct resistivity zones: a top layer of gravel and coarse sand,an intermediate shale layer, and basal sand. While the presence of shale necessitates caution due to its potential for causing differential cracking, the absence of structural faults or cavities confirms the site's overall suitability for construction.

GP05

# Palynofacies Insights and Paleoenvironmental Evolution of Lower Cretaceous Deposits in the Obaiyed Field, Shushan Basin, North Western Desert, Egypt

**Doha Mohamed; Basma Said**

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## ABSTRACT

The ditch-cutting samples from the Lower Cretaceous successions of the OBA D-8 borehole in the Obaiyed Field, Shushan Basin (northwestern desert, Egypt) were analyzed to reconstruct prevailing palynofacies and paleoenvironmental conditions. The integrated dataset, combining palynofacies assemblages, palynomorph groups, ternary plots, and lithological composition, revealed two distinct palynofacies units. PF-1 corresponds to clastic sediments of the Alam El Bueib Formation, deposited in marginal marine (deltaic) settings during a regressive phase under suboxic–oxic conditions, resulting in poor to relatively good preservation of organic matter. PF-2 represents sediments from the Alamein (mixed clastics–carbonates), Dahab, and Kharita formations, deposited in an inner marine environment during progressive regression under suboxic to anoxic conditions. These successions reflect sea-level fluctuations associated with Tethyan transgressions and regressions, superimposed by Early Cretaceous tectonic uplift and rifting of the Shushan Basin. The study highlights the significance of palynofacies and palynology in deciphering depositional environments and organic matter preservation, thereby advancing our understanding of the paleoenvironmental evolution of the Obaiyed Field and its role as a major hydrocarbon reservoir in northwest Africa.

# Geology Department Experiments

| No. | Name of Experiment | Category | Students | Supervisor |
|---|---|---|---|---|
| **GE01** | Estimating the phosphorus concentration in water to determine its drinking quality | Water Quality | 1- Zainab Amgad<br>2- Asma Farid<br>3- Nouran Safwat | Dr. Shimaa Rizk |
| **GE02** | Estimating the ammonia concentration in water to determine its drinking quality | Water Quality | 1- Ismail Yasin<br>2- Ahmed Yasin<br>3- Abd Allah Karim | Dr. Shimaa Rizk |
| **GE03** | Using Google Earth to study the sewage area of Al-Kola, Sohag, from 1985 to 2026 | Remote sensing | 1- Mahmoud Hasan<br>2- Mohamed Medhat<br>3- Khalf Samir<br>4- Asma Khalid | Dr. Bosy ElHaddad<br>Ms. Yasmin Hamdy |
| **GE04** | Using a sieve to separate the different components of soil and determine the weight and proportion of each part | Soil Analysis | 1- Omnia Ashraf<br>2- Hind Ibrahim<br>3- Sarah Salah | Dr. Shimaa Rizk |
| **GE05** | Using Google Earth to determine the change in the water level of Lakes Tushka in southern Egypt from 1985 to 2026 | Remote sensing | 1- Fatima Rabiay Ahmed<br>2- Rehab Khairy<br>3- Al-Zahra Talat | Dr. Bosy ElHaddad<br>Ms. Yasmin Hamdy |

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# المؤتمر الثاني للأبحاث الطلابية
# كلية العلوم - جامعة سوهاج
# ٥ مايو ٢٠٢٦


## كلية العلوم- جامعة سوهاج

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