



## **Speaker Abstracts**

**The Annual Conference of the Palestinian Society for Biological Sciences (ACPSBS):**

**“Integrative Biology: diversity for sustainable life and bio-economy”**

4-5 September 2021

# **First Session: Microbiology**

## **Adaptation and Diversity of Microorganisms to Thrive in Extreme/Harsh Environments**

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The extreme environments are characterized by harsh environmental factors/conditions such as extreme high or low temperature, anoxia, aridity, low concentrations of organic matter, high salinity, extreme acid & alkaline conditions, intense radiation, near zero gravity, and pollution with toxic and waste contaminants. Such habitats are considered inhospitable for life, interestingly a variety of microorganisms have been shown that they not only can tolerate these conditions, but that they also require those conditions for optimal survival.

Microbial life evolved to occupy virtually all available environmental niches. Microorganisms which live optimally under extreme conditions are considered to be extremophiles, whereas those that can tolerate such conditions are known as being extreme-tolerant and are classified according to the conditions in which they grow. They possess several molecular adaptation mechanisms that allow them to withstand such harsh conditions. These include production of stable enzymes at extreme temperatures and pH, altered membrane composition, production of compatible solutes, and secondary metabolites that tolerate radioactivity.

The study of life in extreme environments is one of the most exciting areas of research and can tell us much about the fundamentals of life.

The mechanisms by which different microorganisms adapt to extreme environments provide a unique perspective on the fundamental characteristics of several biological processes. The adaptability and stability of microorganisms at extreme conditions make useful application of their enzymes, which remain catalytically active under extremes conditions, in several biotechnological applications. Furthermore, the study of extreme environments has become a key area of research for astrobiology

In my talk I will explore some of my research work on the diversity of microorganisms, to adapt and live in different harsh environmental conditions, notably hot springs, oil polluted environments, and near-zerogravity in outer space.

## Association between water electrolytes and bacterial antibiotic resistance development in drinking water

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Antibiotic resistance (AR) and its wider consequences are threatening the world with an increasing health problem. Latest literature refers to the environment as a core component of the spread of resistant bacteria and the development of resistant pathogens. However, there is also a lack of a deeper understanding of the developmental and ecological processes that lead to the clinical expression of resistance genes. One of the environmental causes of the AR ecosystem is electrolytes. When bacteria are subjected to large concentrations of electrolytes, they serve as a harmful agent for these organisms. Furthermore, Accumulation of reactive oxygen species (ROS) occurs as a response to electrolyte toxicity when the bacteria are under environmental stress. ROS has many effects on the bacterial genetic material and proteins, particularly these changes that occur in the genetic material leading to mutations, and protein biochemical and structure leading to changes in protein function and the structure of the genetic material, which play a crucial role in the production of AR. In this study different drinking water samples were collected, and their bacterial sensitivity was tested before exposure to electrolytes comparing those results with the sensitivity of those bacteria after exposing to different concentrations of electrolytes to interpret the effect of electrolytes on AR of drinking water bacteria. After exposing 4 types of isolated bacteria to Fe, Cu and K electrolytes for a month the results show a direct relationship between rising in Fe and Cu concentration and *Shigella sp.*, *Pseudomonas aeruginosa*, *Staphylococcus epidermidis*, bacteria resistance level for antibiotics. After specific high concentrations those bacteria started adapting the stress by moderating the resistance. The results of K electrolytes vary between mild to no effect with antibiotic resistance for bacteria in general. Otherwise, *Staphylococcus aureus* had no change in antibiotic sensitivity level due to its own mechanism to adapt electrolytes stress.

**Keywords:** Antibiotic resistance, antibiotic sensitivity, water electrolytes, drinking water, resistance genes

## **Comparison of antibody titers following different vaccination schedules for Infectious Bronchitis Virus on 2 chicken farms in Hebron.**

*Dr. Robin Abu-Ghazaleh, Bayan Jawad Alnatshah, Bushra Seif Hashlamoun, Palestine Polytechnique University*

Infectious bronchitis virus (IB) from the family *Coronaviridae* was an acute respiratory disease that infects the chickens, it causes serious symptoms and affects egg production. So, it causes significant economic losses to the poultry sector. This study aimed to improve the vaccination program by experimenting with several schedules on different farms and monitoring the titer's value.

In this study, we were applied different doses of Var2 IBV vaccine in 2 different farms each of them contains two barracks, each of them were vaccinated twice with at same days (day 10 and 25), and the serum samples collected on about the same days (day 9, 19, 23/25, 35/36), and ELISA test were performed to show the titer value. The results show different values of titer depended on the dose and the environment around the farm.

To determine the level of risk in the region, many samples were taken from some farms and backyard chicken from the areas (Hebron, Bani Naim, Dura, Taffouh, and Al-Dhahiriya). Blood samples, swab samples, tracheal and lung tissue samples were collected from chicken flocks for testing for the presence of antibodies against IBV using the enzyme-linked immunosorbent assay (ELISA) and Polymerase Chain Reaction (PCR). The result of these experiments confirms the seriousness of the virus and the importance to give the appropriate vaccination.

This study found that the value of maternal antibodies does not provide adequate protection and has short longevity and the presence of these maternal antibodies delays the early response to vaccination and the response begins when it disappears. Also, it's clear that the prime dose of vaccination is not enough, so needs to be reinforced with a booster dose, and the low vaccine dose does not provide sufficient protection against the virus, but a high dose reduces the response, therefore it is better to adopt an average dose.

**Keywords:** Infectious bronchitis virus, Hebron, Seroprevalence, vaccination program, Enzyme-linked immunosorbent assay, PCR.

## التعرف على الفطريات الجلدية عن طريق تعدد أطوال جزء الحصر في مدينة رام الله, فلسطين

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:الخلفية: الفطريات الجلدية هي مجموعة من الفطريات الخيطية التي تتغذى على الكيراتين وبدورها تسبب التهابات جلدية تعرف باسم (القوباء الحلقية). (02-02) % من سكان العالم مصابون بالعدوى الفطرية السطحية التي تعتبر الفطريات الجلدية العامل المسبب للمرض الأكثر شيوعاً بنسبة 02-02 % من إجمالي سكان العالم ، مما يجعلها مصدر قلق للصحة العامة. لذلك ، فإن الطريقة الدقيقة للتشخيص مهمة لتحديد الفطريات الجلدية من أجل الحصول على العلاج المناسب. لهذا الغرض ، يتم استخدام تقنية RFLP-PCR لتحديد الفطريات الجلدية على مستوى الأنواع. المنهجية: 52 عينة تم تجميعها من منتصف شهر كانون الثاني حتى نهاية شهر أيلول من عام 2020 والعينات تشمل (الشعر، الظافر والجلد) حيث تم اخذهم من 25 مريضاً تم تشخيصهم بالتهاب القوباء الحلقية (05 ذكرا و 20 انثى). لعزل الفطريات الجلدية تم زراعتها في البيئة الزراعية المناسبة لهذا الفطر. ثم تم إجراء التحديد الجزيئي باستخدام البادئات العالمية الخاصة بالفطريات (ITS1) و (ITS4) لتضخيم منطقة ITS في جين rDNA لتحديد الفطريات الجلدية. لتحديد الفطريات الى مستوى الأنواع، تم استخدام انزيم BstN1 لهضم منطقة ITS المضخمة لإنتاج انماط نطاق مميزة. النتائج: في هذه الدراسة تم فحص 52 عينة من 25 مريض (05 ذكور) (5.44 ، 20% إناث (0.22) % كانت سعة الظفر هي السائدة حيث توجد 24 عينة (2.20) % تليها سعة الرأس بـ 02 عينة (2.40) %). 02 فطر تم عزلهم، كان Trycophyton هو الجنس السائد بـ 02 عينة بنسبة (2.25) % يليه Mycrosporium بأربع عينات (0.00) %، في حين ان جنس Epedermophton لم يظهر منها في هذه الدراسة. العامل المسبب السائد في هذه الدراسة هو T. rubrum. حيث كان هناك 2 عينات (2.05) % يليه T. verconsum. T. schoenlenii و T. audouinii و M. Canis و T. mentagophytes يليه (02.5) % مع عزلتين لكل منهما (2.02) %). من 02 عينة ، تم تحديد تسع عينات بواسطة PCR ، ومن هذه العينات التسع تم تحديد ثلاثة على مستوى الأنواع بواسطة RFLP ، حيث كانت عينتين ل T. rubrum و عينة واحدة ل T. schoenlenii. الخاتمة: من بين جميع الفطريات الجلدية، كان تضخيم مناطق ITS في rRNA ناجحاً في عدد كم العينات باستخدام البادئات العالمية الخاصة بالفطريات ITS1 (و ITS4) وتقنية RFLP-PCR. ولكن، في هذه الدراسة لوحظ انها لم تكن ناجحة بما يكفي في عينات اخرى من عينات الدراسة. هذا قد يكون السبب تعود الى المادة الوراثية المستخلصة، حيث انها قد تكون غير نقية او الن تركيزها كان منخفض

## **Second Session: Plant Biology**

### **Enabling an intelligent, sustainable and future-oriented bioeconomy: From problematic wastewater to circular water management with the help of algae?**

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Phototrophic microorganisms, e.g. microalgae, have been considered a possible solution for food and energy problems since several decades. This is due to their capacity of fast growth and nutrient uptake, and versatile cultivation options. Especially in densely populated areas, sustainable solutions for food, feed, (waste)water and energy are wanted, but complex in their implementation. In this regard, the vast potential of PMO has still only been scratched. Despite several drawbacks mostly due to production cost, it still engages research and development world-wide, driving development of high-value or niche products, while trying to establish bulk products like biomass for feed and food with the improving techniques. Notably, microalgae cultivation can be coupled into many other processes; they are a part of the very complex solution to a circular bioeconomy, from agricultural to urban applications, from fertilization to rainwater treatment, in diverse climates. Methods like these, implementable on small or large scale, may enable independent bioeconomic solutions and motivate finding and developing more. Sustainability and resource management are becoming a necessity, and the tools are available; this is one of them.

## **The Agri-nanotechnology in Palestine challenges and perspectives**

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In the last decades, many unforeseen challenges have been facing us, one of them climate change, water scarcity and land erosion. The Impact of these factors was seen on the agriculture sector and the whole ecology system (1). As a response the world leaders agreed on the 2030 agenda for sustainable development, they affirmed on "Determined to protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources and taking urgent action on climate change". In addition to other goals including improving water availability and quality, reducing the untreated water, and ending hunger by improving land and soil quality so that it can support the needs of the present and future generations (2). In this regard, nanotechnology has demonstrated its ability to protect plants and ecosystems by improving plants to withstand environmental stress and diseases (3,4). There are novel Nano-Agri applications that can be applied to influence crop productivity by using NPs as nanocarriers for delivering beneficial DNA and improving genetic traits and breeding of seeds (4). Additionally, increase plant resistance to severe climate change in the long term (5). As for protecting and improving the soil quality and not wasting nutrients, can be used nano-nutrients, nanofertilizers, nanopesticides, nano-herbicides, and nano-fungicides (6,7). Also, before agricultural irrigation, the wastewater was treated by using nanofertilizers, nanopesticides, and nanosensors (4). To facilitate the research and development in nanotechnology, increasing the investment is needed (8).

The Palestinian authority in their national agricultural sector strategy (2017-2022), they have been working in the resilience and sustainable development. They agreed to promote innovation and adaptive solutions that mitigate the effects of climate change (9). In this work, we will analyze and suggest response solutions that could be possible to use in the present and the future by incorporating nanotechnology in the agricultural sector with a focus on the Palestinian perspective.

**Keywords:** Agriculture, Green chemistry, Nanotechnology, Recent approaches, Sustainable development.

## Effects of Salinity Stress on Ten Certified Palestinian Barley Cultivars During Seed Germination and Growth Stages

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Agriculture in Palestine is suffering from several stresses affecting the plant growth, these are divided into two main categories: Biotic stress and Abiotic stress. One of the main abiotic stresses is the salinity stress. There are many sources of salinity, however, in Palestine soil in general and quarries land in particular seems to be affected by salinity. On the other hand, barley (*Hordeum vulgare* L.) as one of the most important crops in the world and Palestine should be examined for its tolerance to salinity stress. In this research study, the impacts and consequences of salinity stress (50, 85, 120 and 175mM NaCl) on seed germination, early growth stage and morpho-anatomy of certified ten Palestinian barley cultivars (Baladi, Improved Baladi, Rihane, ICARDA 1 ICARDA 15, ACSAD 68, ACSAD 176, ACSAD 1417, ACSAD 1732 and ACSAD 1744) were investigated. In addition, selected sixteen soil samples from quarries in Hebron governorate were analyzed for their electrical conductivity to predict the soil salinity. In this context, soil salinity determination is needed in order to help in rehabilitation of quarries, their landfill and nearby areas. Palestinian barley cultivar seems to be resistant to salinity stress up to the level of 175 mM NaCl. The results reveal that Acsad 1732 cultivar is the most resistant cultivar with 80%±1 seed germination percentage on high salinity level (175 mM) and G<sub>50</sub> of less than 2 days at all the tested NaCl concentrations. In addition, this cultivar shows a semi-constant growth in which the difference between its seed germination at zero NaCl and 175 NaCl was only 17%. In contrast, cultivars such as Acsad 68, Improved Baladi and Rihan seems to be very sensitive to high salinity stress in which half of their germination was declined at 175 mM NaCl. Moreover, Improved Baladi doesn't reach the G<sub>50</sub> at any NaCl concentration. Some cultivars show a moderate response to salinity stress, ICARDA I, for example, give 80% seed germination at 120 mM NaCl and 60%±2.65 seed germination at 175 mM NaCl. It also reached its G<sub>50</sub> at all the used NaCl concentration with a range of 1.5-2.125 days. However, the cultivars were able to grow up under high salinity conditions, but less than its control.

The examined soil samples for their electrical conductivity give values of EC ranges from 0.328×10<sup>-4</sup> – 9.071×10<sup>-4</sup> dS/m which are below the normal EC (11-57\*10<sup>-4</sup> dS/m), this may contraindicate with the hypothesis says that quarries land suffering from salinity stress.

In conclusion, the authors are highly recommending ACSAD1732 cultivar for cultivation in areas of low precipitation and high salt accumulation, mainly, the land and/or soil of quarries, their landfills and nearby areas in Palestine.

**Keywords:** Biomass, Electrical conductivity (EC), Morphological analysis, Palestinian Barley, Quarries, Root system, Salinity stress, Shoot system.



## Microalgae and Biochar Agro-fertilization of the Palestinian Rehan Barley Cultivar Under Salinity Stress

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The efficient transfer of nutrients to plants in the form of biofertilizers on poor substrate was investigated. Biofertilizers; biochar and dried algae biomass as well as mineral fertilizer were used to test the growth of the Palestinian “Rehan” barley cultivar under salinity stress (4, 8 and 16 EC). Rehan cultivar showed resilience to moderate levels of salinity and could still grow under high salinity stress (16 EC). Rehan barley possessed a better growth at early growth stage under the applied biofertilizers such as dried freshwater algal biomass (*Chlorella vulgaris*), and nutrient-laden biochar. It showed a better growth than wheat (ssp. *scirocco*) under the same conditions. Its growth was highly improved by biochar treatment in low and moderate salinity conditions. Moreover, the combined effect between biochar and dried algae biomass could improve Rehan Barley growth, but less than the effect of each biofertilizer separately. The biofertilizers affected most plant growth parameters under the salinity level of 4 and 8 EC positively, while the growth declined again at 16EC. Overall, the biochar treatment showed the same effect as the mineral fertilizer on most of the parameters. The dried algae biomass and biochar also affected soil conditions. The highest soil water content (15.09 %) was found in algae biomass treatments with 16 EC. Biochar with 4 and 8 EC had the highest pH value near the rhizospheres. The nitrogen level was highest for biochar with 4 and 8 EC. Meanwhile, the phosphate concentration was the highest in mineral fertilizer treatments, and lowest for the biochar. The dried algae biomass and the biochar treatments proved to be soil conditioners improving substrate quality and fertility. These fertilization solutions should therefore be considered to initiate replacement of chemical and manure fertilization to avoid their negative impacts on soil and environment.

**Keywords:** Algae, Biochar, Biofertilizer, *Chlorella vulgaris*, Rehan Palestinian Barley Cultivar, Salinity stress.

## **Investigating Aneuploidy-Inducing Effect of Namacur, Rogor, and Dursban in Human Peripheral Blood Lymphocyte Cultures**

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For many years, organophosphate (OP) pesticides have been considered an attractive choice for pest control around the world. Excessive use of OPs is a concerning issue for human health. Although the genotoxic effect of these pesticides has been reported, studies that examined their aneuploidy-inducing effect are limited or absent. Therefore, we sought to investigate the potential of organophosphate pesticides, which are extensively used in the Gaza Strip, to induce aneuploidy in human peripheral blood lymphocyte (PBL) cultures. To achieve this goal, we first assessed the cytotoxic effect of selected concentrations of Namacur (fenamiphos), Rogor (dimethoate), and Dursban (chlorpyrifos) on human PBL cultures by the MTT assay. Then, fluorescence *in situ* hybridization (FISH) technique was used to determine the frequency of induced aneuploidy (chromosome loss or gain) in human PBL cultures treated with different concentrations of the three types of OPs. We found that all the OPs treatments used did not show appreciable cytotoxic effects. Increase in frequencies of aneuploidy, chromosome loss, and chromosome gain were observed after each treatment as compared to the results of their respective solvent control cultures, and that increase of aneuploidy was significantly evident at 0.050 mg/mL of Namacur. It was also noticed that chromosome loss is more frequent than chromosome gain for each concentration of the three types of OPs. While the aneuploidy induction effect of the investigated Ops is not significant (except for the 0.050 mg/mL of Namacur), these pesticides should be examined further since many people are exposed to them.

## Effects of Alkalinity Stress on Ten Certified Palestinian Barley Cultivars during Seed Germination and Growth Stages

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Barley (*Hordeum vulgare* L.) is considered as one of the most important crops in the world and Palestine. Barley as well as many other crops are affected by stresses of either biotic, and/or abiotic. One of the main abiotic stresses that threatens the vegetation is the alkalinity stress. There are many sources of alkalinity, however, in Palestine the quarries industry seems to be the most devastated one in the form of  $\text{NaHCO}_3$  and  $\text{CaCO}_3$ . In this research study the effect of alkalinity stress of 50mM, 85mM, and 120mM  $\text{CaCO}_3$  on certified 10 barley cultivars (Baladi, Improved Baladi, Rihane, ICARDA 1 and 15, ACSAD 68, 176, 1417, 1732 and 1744) during seed germination and growth stages was investigated.

Alkalinity stress decreases the percentage of seed germination and an increase in the  $G_{50}$  in all tested cultivars. ICARDA 1 cultivar has improved to be resistant at even the highest concentration of 120mM  $\text{CaCO}_3$  during seed germination (90%) with a  $G_{50}$  of  $1.5 \pm 0.1$  days. In contrast, Improved Baladi cultivar was the most sensitive one (13%) and didn't succeed even to reach 50% germination. While other cultivars are moderately resistant to the alkaline condition. The seed germination percentage in most of the tested cultivars ranges from 53% to 90%, and reaching the  $G_{50}$  time in an estimated time of 1.6 to 3.3 days. The average length of the shoot and root in all of the tested cultivars ranging from 4cm to 7.6cm, and 1.8cm to 4.9cm respectively. However, while the root number wasn't affected by the alkaline stress. The dry weight to water content ratio has increased in the majority of the tested cultivars with increased alkalinity. The anatomical results revealed a putative rupture in the cortical cells close to vascular system of the root to break the water column for less water transferring to the shoot system, thus reducing the efflux of ions to the cellular sap. In conclusion, some barley cultivars are resistant to abiotic stresses such as alkalinity stress. Therefore, we recommend the ICARDA 1 cultivar for cultivation in quarries soil, their landfill and nearby areas.

**Keywords:** Abiotic stress. Alkalinity. Barley. Growth. *Hordeum vulgare*. Quarries. Seed germination.

## **In vitro evaluation of biochemical parameters for selected and certified barley cultivars grown under salinity and alkalinity stresses**

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Quarries negatively affect the growth and development of plants because of high salinity and alkalinity pollution in their soil lands. Some Palestinian barley cultivars adapted very well to such stresses during the germination stage. In this research project, the biochemical parameters of three certified Palestinian barley cultivars (ICARDA 1, ACSAD 1417 and Improved Baladi), such as leaf extract pH, relative water content (RWC), chlorophyll content, chlorophyll fluorescence and ascorbic acid content (has been postponed), were measured in order to estimate the ability of these cultivars to adapt with alkalinity stress. In addition, this is important for reclaiming the poor soil in the Palestine agriculture, such as the quarries soil and their landfills.

Alkalinity stress decreases the chlorophyll content of Improved Baladi by 16% and 23.5% at 85 mM and 120 mM respectively, while the chlorophyll content for ICRDA1 slightly decrease and that of ACSAD1417 was not affected under these concentrations, alkalinity stress has caused a marked reduction in the Quantum yield of photosystem II (QY) of Improved Baladi cultivar by 38% and 39.3% at 85 mM and 120 mM respectively, it's also decrease the QY of ICARDA1 but with a lower degree at these concentrations ,QY of ACSAD1417 decrease at 85mM but increase again at 120 mM ,the RWC in the three cultivars ranges from 74% to 96% ,RWC of ICARDA 1 increases with increase in CaCO<sub>3</sub> concentration to 120mM,however RWC for Improved Baladi slightly decrease ,while that of ACSAD 1417 appear to be not affected by the increase in the alkalinity stress intensity, leaf extract pH of the three cultivars was not affected by the increase in CaCO<sub>3</sub> concentration.

In conclusion, some barley cultivars are resistant to alkalinity stress. Therefore, we recommend ACSAD1417 for cultivation in quarries soil, their landfill and nearby areas.

**Keywords:** Abiotic stresses, Alkalinity, Ascorbic acids, Barley, Chlorophyll, Chlorophyll fluorescence, Extract, Salinity, Quantum Yield.

## **Synergic Effects of Salinity and alkalinity in Certified Ten Palestinian Barley Cultivars During Seed Germination and Growth Stages**

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Drought and low rainfall have harmed agriculture in Palestine in recent decades, resulting in an increase in salinity and alkalinity in the soil. In addition, the spread of quarries in Palestine produces alkaline salts such as calcium carbonate  $\text{CaCO}_3$ , and multiple sources of salinity. Barley (*Hordeum vulgare* L.) is one of Palestine's essential crops. It has been seriously harmed by abiotic stresses. One of the major abiotic stresses is salinity and alkalinity stresses (SAS) that affecting seed germination, plant growth, development, and restricting crop production. The synergic effects of alkaline and saline stress ( $\text{CaCO}_3$  and  $\text{NaCl}$ ) at different concentrations (0, mM, 50mM, 85mM, and 120mM  $\text{CaCO}_3$  and  $\text{NaCl}$ ) on seed germination and growth stages of certified ten Palestinian barley cultivars (Baladi, Improved Baladi, Rihan, ICARDA 1 and 15, ACSAD 68, 176, 1417, 1732 and 1744), was explored. The effect of Salinity-alkalinity stress (SAS) has been studied on the following: Seed germination%, time of G50, number roots, length of roots and shoot, total % of dry biomass of the roots and shoot, total % of water contents of roots and shoot. From the results, it was found that the growth of different Palestinian barley cultivars increased in the conditions of low SAS, while the growth was less efficient in high Salinity-alkalinity (SA) than in low Salinity-alkalinity (SA). The most resistant cultivar is Rihan. Meanwhile, ACSAD1417 is the most sensitive one. However, ICARDA1 is the moderate. In conclusion, the authors recommend Rihan cultivar to be cultivated in quarries, their landfill and the nearby areas.

These three cultivars were investigated in the last stages of morphological analyses, which will help enhance yields and profit from landfills near quarries.

**Keywords:** Abiotic Stress, Alkalinity, Barley, Biomass, Growth parameters, Quarries, Salinity, Water content.

## **Organic fertilizer and biostimulants can promote the growth of young olive trees**

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In 2019-2020 trials were carried out in order to evaluate the effects of an organic fertilizer (Grena “olivo special”) and two biostimulants (Idrogrena and Idrogrena Energy) on the growth and physiology of olive trees. Growth was estimated in terms of both diametral increase of the main stem and of the total height of the trees. The experiments were carried out using potted trees. The effects of the organic fertilizer, reported to have also a biostimulant action, and the two biostimulants were evaluated along with those of the fertilizer urea used as control. The organic fertilizer was all supplied at the beginning of the experiment. Urea and biostimulants were supplied weekly through fertigation and the latter also through foliar treatments. The organic fertilizer, compared with the control, was effective in promoting the growth of young olive trees. The addition of biostimulants, through fertigation and foliar treatments, to trees supplied with the organic fertilizer seemed to have a further positive effect on the growth of the trees. An attempt to evaluate the relative effects of the applied fertilizer and biostimulants was made.

**Keywords:** biostimulants, *Olea europaea* L., organic fertilizer, photosynthesis, plant nutrition

## **Third Session: Molecular and Genetic Applications**

### **Investigating effects of nutraceuticals on abilities of human diseased chondrocytes to form articular cartilage tissues in vitro**

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Articular cartilage (AC) is the smooth white connective tissue that lines moving joints. It acts as a lubricant as well as a distributor of loads applied to joints. During life, AC tissues are subject to extreme mechanical loads and harsh chemical conditions. As a tissue, AC is unique in being void of blood and nerve vessels. As such, upon injury or damage, it has very limited regenerative capabilities. AC failure results in osteoarthritis (OA) which is the leading cause worldwide for work-related disabilities and sharply on the rise. Currently, no successful long-term treatments are present for OA. OA patients resort to nutraceuticals which are food derived products with pharmaceutical value for inflammation reduction and reduced pain. Literature studies that validate whether or not such nutraceuticals should be used by OA patients are largely lacking. In an effort towards learning more, we utilized a tissue engineering platform to test if four nutraceuticals can promote chondrocytes abilities to form AC tissues. These nutraceuticals were catechin hydrate (C), gallic acid (G), alpha tocopherol (Alpha), and ascorbic acid (AA). OA human chondrocytes isolated from AC tissues collected from patients undergoing total knee replacement surgeries were categorized according to phenotype. In the first study, cells were categorized according to sex while in the second study they were categorized according to age. Cells were cultured for 21 days in bioreactors with controlled environments. Cells in each study were divided into five groups. Cells within each group received chondrogenic media with one of the nutraceuticals added while cells in the negative control received no nutraceuticals. The formation of AC in the four groups and in the negative controls was assessed histologically and colorimetrically for glycosaminoglycans and collagen formation as well as using PCR for key chondrogenic markers. Reduction in inflammatory environment was assessed using a Griess assay. This talk will highlight findings from these two studies as well as will introduce other ongoing relevant AC studies.

## **Functional Role of TET3 Enzyme in Breast Tumorigenesis**

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Carcinogenesis is a multistep process that involves altered gene expression because of both genetic and epigenetic alterations. One of the most studied epigenetic modifications is DNA methylation. Aberrant DNA methylation is linked to carcinogenesis in different cancer types. Progression of such tumors is associated with an imbalance in DNA methylation and demethylation. Previously, methylation was thought to be an irreversible event until the recent discovery of the TET family of enzymes that includes TET1, TET2 and TET3. While TET1 and TET2 roles in breast tumorigenesis were previously studied, little is known about TET3 role in breast tumorigenesis. In the present study, we tried to elucidate the behavior of TET3 in breast tumorigenesis by overexpressing TET3 cDNA in breast cancer cells that exhibit low TET3 expression. Then, we tested the effect of TET3 overexpression on different cancer phenotypes. Our results showed that TET3 overexpression leads to an increase in cell proliferation as well as survival rate of infected cells when compared to normal cells. Additionally, infected cells showed a higher migration capacity than normal, non-infected cells. Moreover, we tested the expression level and localization of TET3 enzyme in breast cancer samples using IHC. We also tested the expression level of TET3 mRNA using relative qRT-PCR in different breast cancer cell lines under different contexts. We found that invasive breast cancer samples had higher levels of TET3 compared to normal or early stage samples. Additionally, we did qRT-PCR on some target genes that are related to the different cancer hallmarks that we tested in order to find any correlation between the genotype and phenotype and found that TET3 overexpressing cells upregulated some oncogenes while it had a slight or no seen effect on other genes like tumor suppressor genes. Lastly, and to be able to correlate our findings with clinical cases, we used the Kaplan-Meier (KM) plotter in order to assess the association of TET3 on survival. The obtained results showed that high TET3 expression predicts poor prognosis in breast cancer patients. In conclusion, our results show for the first time that TET3 exhibits an oncogenic behavior.



## **Correlation of Major Iron Metabolism Related-Genes Single Nucleotide Polymorphisms (SNPs) with Autism Spectrum Disorder (ASD) in Palestinian Patients.**

*Sabha Fahmi Rabaya and Hisham Darwish, Arab American University, Ramallah, Palestine*

Autism spectrum disorder (ASD) is a heterogeneous group of neurodevelopmental diseases with genetic and environmental components<sup>1,2</sup>. ASD diagnosis is currently based only on clinical criteria, which rise the need for early diagnostic genetic markers. As iron plays a crucial role in brain development, neurotransmitter synthesis, neurons myelination and mitochondrial function<sup>3</sup>, we hypothesized that brain iron dysregulation may play a role in ASD development and pathogenesis. The aim of our study was to assess the association of a number of single nucleotide polymorphisms (SNPs) within transferrin receptor 1 gene (TFRC) rs11915082, solute carrier family 11 member 2 gene (SLC11A2) rs1048230 and rs224589, solute carrier family 40 member 1 gene (SLC40A1) rs1439816, and hepcidin antimicrobial peptide gene (HAMP) rs10421768 with ASD risk. The study included 48 Palestinian individuals with ASD and 88 non-ASD controls. Genotypes were determined by RFLP-PCR or Sanger's sequencing. Our data revealed that the rs11915082 G allele ( $p=0.008$ , OR= 2.06, 95% CI=1.19-3.55) and the rs1439816 C allele ( $p<0.0001$ , OR=5.13, 95% CI=3.00-8.79) were associated with ASD pathogenesis. At the genotype level, the polymorphisms rs11915082 ( $p=0.041$ ), rs1439816 ( $p=0.000$ ), and rs10421768 ( $p=0.028$ ) showed a significant association with ASD overall phenotype. Our data demonstrate the role of iron dysregulation in ASD development and pathogenesis and indicate that some genetic variations in iron metabolism genes can be applied as genetic markers for early diagnosis of ASD.

# **Microsatellite Instability and Mismatch Repair Genes' Variations Testing for the Identification of Individuals at Risk for Lynch Syndrome among Palestinian Colorectal Cancer Patients**

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**Background:** Colorectal cancer (CRC) is the second most common cancer in Palestine. Lynch syndrome (LS) is an autosomal dominant hereditary condition caused by germline mutations in one of the mismatch repair genes (MLH1, MSH2, MSH6, and PMS2). LS accounts for 2-4% of CRC cases and patients have 50-80% lifetime risk of CRC and other cancers. This study aims to screen Palestinian CRC patients for LS, examine their family history, and identify the clinicopathological characteristics.

**Methods:** In this retrospective study, 176 CRC patients were recruited from Beit-Jala Governmental Hospital and Augusta Victoria Hospital. Clinico-pathological data and FFPE blocks were retrieved for all patients. Immunohistochemistry using a two-antibody screening panel for MSH6 and PMS2 was performed. Patients with negative immunostaining were considered for MLH1 and MSH2 immunostaining, microsatellite instability testing (MSI), and pedigree analysis.

**Results:** The male to female ratio among CRC cases was 0.9:1 with a mean age at diagnosis of  $57.5 \pm 13.3$  years and the majority being from the south (42.6%).

Rectal tumors were the most common (39.2%), followed by sigmoid tumors (22.7%). More than 50% of CRC patients had advanced disease. Thirteen patients (7.4%) had a loss of MMR proteins; loss of expression of PMS2 and MLH1 was detected in seven patients (4%), loss of MSH6 and MSH2 in one patient (0.6%), and loss of PMS2 in five patients (2.8%). Of these 13 patients, 11 patients had  $\geq 30\%$  unstable markers (MSI-H) and two patients had only one unstable marker (MSI-L). Pedigree analysis was performed for nine patients; four of them had multiple family members with previous cancer incidence.

**Conclusions:** The prevalence of LS is estimated to be 7% among Palestinian CRC patients, but genetic testing is required to determine the exact prevalence. Families with a family history of cancer need close follow-up. Screening for LS is recommended for all newly diagnosed CRC patients.

**Keywords:** Lynch syndrome, immunohistochemistry, microsatellite instability.

## **Bidirectional PCR Amplification of Specific Alleles (Bi PASA) for Detection of Booroola Gene Zygosity in Palestine**

*Robin Abu-Ghazaleh , Wedad Jawdi Murrar , Beesan Taha Al-Fasfous, Palestine-korea Biotechnology Center*

The Booroola mutation in the BMPR-IB gene (FecB) increases the fecundity in the sheep, the heterozygous sheep with a single allele of Booroola mutation (FecBB+) considered as the desirable genotype due to the ability to give high number of live babies that doesn't require a high quality of care, so it can be used in cross-breeding to give high litter size with less mortality, and this can be detected via the genotyping tests. To date, there is no published or reported Bidirectional PCR Amplification of Specific Alleles (Bi-PASA) test to detect the zygosity of this mutation. Also, there is no genotyping test of FecB available in the West Bank, so farmers tend to go to Occupied Palestine to make other tests to detect the zygosity. This project aims to develop a Bi-PASA test to differentiate between the wild homozygous (FecB++), mutant homozygous (FecBBB) and heterozygous (FecBB+) Booroola genotypes. Blood and swab samples were collected from non-tested sheep; the DNA was extracted and amplified using our designed Bi-PASA test by using the four primers. The results were compared with the sequencing results to determine the accuracy of our test. The results of the Bi-PASA test can distinguish between the genotypes by the differences in the lengths of the bands; PQ and PB for FecB++, PQ and AQ for FecBBB, and PQ, PB and AQ for FecBB+ . PQ=341bp, PB=225bp and AQ=166bp. The use of the Bi-PASA method to genotype the Booroola mutation will be more cost-effective and simpler than other methods used currently.

## **Structural and functional compatibility of a novel mutation asp413asn and the gly420arg mutation in the factor x gene**

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Factor X is a vitamin k dependent serine protease; produced in the Liver and has a pivotal role in the coagulation cascade. Factor X is encoded by a gene on chromosome 13 consisting of 8 exons. More than 130 mutations have been reported in F10 gene, represented mostly by missense mutations.

Recently, two novel mutations were identified in the FX gene in our group, one a substitution (c.1237 G>A) leading to missense p.Asp413Asn mutation. Another missense mutation (p.Gly420Arg) in the F10 gene (c.1258 G>A) was reported in a previous study. Our study aimed to understand the functional and structural implications of both missense mutations on FX protein.

The full-length wild type F10 cDNA was obtained commercially and used to generate both indicated missense mutations using site-directed mutagenesis. The wild type and mutant constructs were transfected in HEK293t cells. Western blot analysis of the lysates from transfected cells showed no significant reduction in the FX protein level in both mutants compared to the wild type. FX activity (PT) was measured in the media of transfected cells and showed significant lower activity of both mutants compared to the wild type. Wild type and mutants F10 mRNA levels were measured in transfected cells and showed no significant difference. Bioinformatic analysis showed the both Asp413 and Gly420 are highly conserved in the catalytic domain of the protein among different species which indicates that both amino acids are crucial for FX protein activity. Molecular modeling analysis showed noticeable structural change in the protein. This change was more apparent in the Gly420Arg mutant than Asp413Asn mutant, which is predicted from the nature of amino acid change; however, both mutants were predicted to be damaging in the protein structure. This is consistent with the FX protein and mRNA levels and loss of FX activity described above.

## **Fourth Session: Ecology and Environmental Sciences**

### **Threats and conservation strategy for a UNESCO World Heritage Site in an Area of Conflict: Al-Makhroul Valley, Palestine as a case study**

*Mazin Qumsiyeh , Palestine Institute for Biodiversity and Sustainability, BU, Bethlehem,*

Al-Makhroul Valley is the last remaining biodiversity-rich area in Bethlehem district, 2.6 Km<sup>2</sup> of natural areas interspersed with agriculture and rich flora and fauna, and an equivalent buffer zone of more than 5 km<sup>2</sup>. It is one of 13 Important Bird Areas in Palestine. It is rich in cultural and natural heritage and was designated a UNESCO World Heritage Site (WHS). Mostly included in area C of the West Bank (Israeli military and civilian control on Palestinian areas), and having marginalized villages, the local communities of humans and all living things have been threatened by both Israeli settlers' and locals' activities. We studied the area over a three year period documenting habitats and species diversity (over 417 vascular plant species, >15 mushroom species, 105 bird species, 3 amphibians, 12 reptiles, and 31 mammals species. Additionally we recorded hundreds of species of invertebrates. The challenges to biodiversity include harmful agricultural practices, lack of awareness of local people, construction of settlements, urbanization, habitat loss, and land fragmentation. Poverty in the area is impacted by the occupation, abandonment of agriculture, and poor planning of productive and sustainable practices (such as ecotourism). Focus group meetings with the locals and with experts were carried out to pinpoint the challenges and design appropriate interventions. The 3 year project addressed the above challenges, as well as others, through utilizing traditional knowledge updated with more modern permaculture techniques to enhance eco-agricultural practices. Four marginalized communities (Al-Walaja, Battir, Husan, and Beit Jala) benefited in the targeted area via: a) working with 80 farmers in the four communities, which enhanced their (healthier) agricultural production while protecting the environment, b) developing women cooperatives in the communities and empowering them in areas ranging from production to marketing, and c) enhancing ecotourism in the area, which in-effect enhanced both biodiversity and the local economy. The project gave positive outcome to natural and human communities in a critical area. This included research reports and publications, developing databases relating to fauna, flora, habitats and threats, generating management plans (key biodiversity aspects amended to the WHS MP), training (capacity building) for locals and others, developed ecotourism trail and information (including brochure for ecotourists and signs in the valley path), designed more than 10 educational modules, implemented restoration scheme in selected three Donums of the area, and benefitted more than 400 households (farmers and women entrepreneurs).

## **On the Hunting of the Common Quail (*Coturnix coturnix* Linnaeus, 1758) Along the Mediterranean Coast of the Gaza Strip – Palestine**

Abdel Fattah Nazmi Abd Rabou, Department of Biology - Islamic University of Gaza - Gaza Strip - Palestine.

Palestine is a major route for migratory birds coming from Europe to Africa and vice versa. Both migratory and resident birds are commonly hunted for different purposes using different means in the Gaza Strip. The current descriptive study, which is the first of its kind, aims at introducing information on the hunting of the Common Quail (*Coturnix Coturnix* Linnaeus, 1758) in the Gaza Strip, which is a 365 km<sup>2</sup> arid to semi-arid coastal zone lying in the southern part of the Palestinian coast along the eastern shore of the Mediterranean Sea. Since 2015, frequent field visits and discussions with bird hunters and other stakeholders have been carried out to get more information on quail hunting. Annually, hundreds of trammel or mist nets with camouflaging colors, having a height of about 2.5 meters and a distance of 100-200 meters off the coastline, are cleverly placed along the beach to hunt Common Quails and other non-target birds. Guns are used in hunting of quails scattering among inland low-growing vegetation types. The Common Quail is a source of livelihood for dozens of Gazan families, though it does not generate large sums throughout its hunting season. For several reasons, quail hunters claimed that the current quantities of Common Quails reaching the Gaza Strip do not exceed 20% of the amount that arrived 30-40 years ago. Along with the Common Quail, 50 migratory and resident bird species, with passerines making their half, were found to be incidentally caught in quail nets. Because of its feeding and healthy values, the demand of Gazans on Quail and its eggs is increasing day by day, and as a result, quail breeding was found to be a successful task in the Gaza Strip. The goodness of wild quail is many times greater than its farmed counterpart. The price of wild quail is USD 6-7 per pair, while the farmed counterpart is about USD 2 per pair. Finally, bird hunting should be regulated in the Gaza Strip in order to conserve wildlife in a sustainable fashion.

**Keywords:** Common Quail, *Coturnix coturnix*, migratory birds, Quranic birds, hunting, trammel nets, quail farming, Gaza Strip.

## **Nitrate Removal from Drinking Water by Sodium Thiosulfate and its impact on health.**

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Nitrate is a stable and highly soluble ion with a low potential for precipitation or adsorption, nitrate is seldom present in geological formations and therefore contamination due to nitrate is mainly attributed to anthropogenic sources.

Pollution of water resources by nitrate occurs due to many reasons, which has effects on environment and human health so nitrate removal from drinking water is necessary.

In this research nitrate removal is attempted by addition of sodium thiosulfate, 72% reduction in nitrate level was noticed when 1ml of 1.09% solution of sodium thiosulfate was added to 100 ml of polluted water after 30 minutes of contact time. Literature was reviewed to determine the effect of sodium thiosulfate on human health.

## **Spatial Distribution of Heavy Metal Disseminated from Quarries and Their Consequences on Human Health in Hebron Governorate**

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A part of almost 300 quarries that devastate Palestine, 142 quarries are located in Hebron governorate. Quarries are considered as essential pillars of the national economic development by creating 20,000 job. In contrary, they induce serious environmental consequences. In the present study, the spatial distribution of heavy metals (chromium, cadmium, and lead) dominated by quarries and their possible consequences were determined calorimetrically and supported by questionnaires. This accomplished by analysis of 20 soil samples that selected by quadrat method from four regions in Hebron governorate and analyzed by UV-visible spectrophotometer. The results reveal that soil of quarries in Hebron governorate possesses Cr (VI) concentration within the declared level of chromium in soil. However, Cd, and Pb (II) contents locates above their declared level in soil. In addition, quarries are responsible, in part, for causing diseases to worker and people in nearby areas. The putative diseases are asthma, breath reached, kidney stones, hearing problems, back problems, cancer incidence, vision problems, and exposure to noise, as well as other injuries such as hand fracture, fractures of the legs, and fingers amputated. In addition, quarries negatively affected the air, soil, water, agriculture, topography of the earth, and to the biodiversity of plants and animals. Moreover, there is positive economic effects through providing jobs, improve local economy, and decreasing value land, the existence of social effects related to improving the educational level in the region. In conclusion, risks from heavy metals and the asthma of quarries in Hebron governorate for workers and nearby populations are evident. The main risk is from cadmium and lead will negligible risk from chromium. The authors suggested that the governmental parties and social agencies have to increase the control and restrictions on this industry, in order to avoid and/or minimize its environmental and health consequences.

**Keywords:** Cadmium, Chromium, Environment disease, Heavy metals, Quarries, Lead, Marble, Soil



## **Imperiled ecosystems in Palestine: Rare plants as Indicators**

*Banan Al-Sheikh and Mazin B. Qumsiyeh, Palestine Institute for Biodiversity and Sustainability, Bethlehem University, Bethlehem, Palestine*

Palestinian areas face the same stresses on floral biodiversity as other areas (desertification, climate change, urbanization, rapid population growth, industrial development etc.) but face additional threats such as local Israeli colonial activities (building infrastructure, colonial settlements, population displacement). Much work remains to be done on mapping the current status of plants in the area and delineating clearly those plants most endangered by these threats. This preliminary metaanalysis identified 600 species that are of concern in the Israeli occupied West Bank of which 187 are endangered, 171 very rare species, 238 rare (R, found in 11-30 sites), and four already extinct in this area. Plants thus provide the loudest alarm bell for a deteriorating environment in need of protection. We argue that protection is feasible: 1) in situ in the declared protected areas which are just beginning to be studied and managed properly, 2) in situ in special areas of rich biodiversity that would be informally protected, 3) ex situ in botanic gardens such as that at the Palestine Institute for Biodiversity and Sustainability.

**Keywords:** Occupied Palestinian Territories; Endangered flora; impact of colonization, invasive species

## **Bio-plastics and edible films for food packaging**

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Currently, more than 300 millions tons of oil-derived plastics are produced each year, 50% of which is for single use purpose. By 2050, there could be more plastic in the ocean than fish by the weight. Most of the food packaging available in the market is developed from synthetic traditional polymers such as polyethylene, polypropylene, or polystyrene causing health hazards due to migration of toxic additives into the consumables. Plastic degradation is very long process it required more than 50 years to fully degrade. Now a days, worldwide working to find out an alternative product to plastic that cannot pollute our environment it called "Bio-plastics" that could be bio-based, biodegradable or both. Moreover, edible film is defined as a thin film obtained from hydrocolloid substances, which allow the film to be ingested without causing any adverse health problem to human. This films can be deposited on the food surfaces or between the food components.

Edible films can be synthesized from different carbohydrates and/or protein such as pectin, chitosan, plant and animal proteins. In this work the attention was in the industrial by-product like the wastes that derived from the oily seed after the oil extraction it called defatted cake. Our attention was to find out the cheap protein or polysaccharide sources to use it to prepare the edible films. We intended to use the *Nigella sativa* defatted seed cake to extract the protein, which used to prepare the *Nigella stevia* protein films. Glycerol (30% w/w protein) as plasticizer was used to obtain good film properties because without plasticizer cannot form films. Recently, we find out that using only 2 % (v/v) grape juice is enough to obtained handleable films without glycerol. Moreover, microbial transglutaminase enzymes (20 U/g protein) that used as crosslinker showed an important strategies to improve the *Nigella stevia* protein films with promising properties. Pectin films with glycerol and nanoparticles were used to extend the strawberry shelf-life up to 8 days at refrigerated temperature. Moreover, chitosan and protein films under vacuum were used to extend the Nabulsi cheese shelf-life without salt up to 12 days under refrigerated temperature.

In conclusion, using bio-plastic and edible films is a promising strategies to reduce the plastic food packaging that will help to reduce the environment pollutions. *Nigella stevia* protein, pectin and chitosan showed a positive effect to enhance food shelf-life. Nanoparticles, cross-linker, plasticizer, essential oil and may other materials have a potential effect on the functionally properties of the obtained materials.

## Fifth Session: Medicinal Plants and Nutrition

### Antileishmanial activity of selected medicinal plants in Palestine

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Herbal and traditional medicine is commonly and widely used in Palestine. There has been no ethnopharmacological study to document the usefulness of traditional or medicinal plants from Palestine against leishmaniasis, a spectrum of severe parasitic diseases that occur worldwide and is caused by protozoa of the genus *Leishmania*. The aim of the present study was to collect and analyze some of the traditionally used medicinal plants from Palestine against *Leishmania major* parasites that cause cutaneous leishmaniasis. Plant materials were collected during spring and summer of the year 2011, identified and the voucher numbers were kept at Al-Quds University Gardens (AQUG). The whole plant (except roots), flowers, fruits or seeds were collected, washed with distilled water, air dried in the shade for 20 days and then powdered in an electric grinder. For each plant species, alcoholic and dimethyl sulfoxide extracts were tested in vitro against *L. major* promastigotes and their antileishmanial activities were evaluated by Alamar Blue bioassay. Twenty plant species belonging to 14 families were examined for their in vitro anti-parasitic effect against *L. major*. Among the total crude extracts tested; five were found to have various levels of activities (20%), some extracts having significant antileishmanial activity with IC<sub>50</sub> values ranging from 8.83 to 100 µg/mL. The most active crude extracts were from the shoots of *Artemisia inculta* and *Malva sylvestris* with activity of 84.1%, IC<sub>50</sub> = 8.8 µg/mL. And 90.1%, IC<sub>50</sub> = 19.5 µg/mL respectively. The results demonstrate that the crude extracts of *Artemisia inculta* and *Malva sylvestris* showed promising antileishmanial activity, further and extensive studies should be carried out; particularly bio-guided fractionation to identify the active fraction and further chemical characterization of structure.

## **Effect of transglutaminase on the film properties obtained by blending *Nigella sativa* protein concentrate and pectin**

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Plastic poses a real danger to the environment due to inability to degrade naturally. Thus, several researches have studied and developed green alternatives to plastic termed as biodegradable edible films. Edible films made from one or more renewable biological polymers such as protein, polysaccharides and oils. Protein can provide films having good mechanical proprieties. But, the basic function of polysaccharides based edible films is to serve as an oxygen and carbon dioxide barriers because of strength of hydrogen bonds network. Whereas, lipids limit moisture transmission. Generally, green food packaging industry towards to develop and increase mechanical and barriers properties of edible coatings. Recently, studies indicated the blending of two or more biopolymers have markedly improved mechanical and barriers properties. In addition, enzymatic modification such as transglutaminase enzyme (TGase) has a role in improving mechanical properties for protein based edible films. In this study, edible films were prepared by blending protein concentrate obtained from *Nigella sativa* seeds (NSPC) that was extracted from defatted seeds and pectin at different ratios (40:0, 40:6, 40:10, 40:40 w/w) with different concentrations of TGase (10 U/g NSPC & 20 U/g NSPC) to evaluate the effect of TGase on mechanical properties, water content, water uptake and biodegradability rate of NSPC and blended edible films.

The findings of the study indicated that different concentrations of both the pectin and/or TGase have significant effect on improving mechanical properties of NSPC based films. Cross-linked NSPC/PEC (40:40 w/w) with low TGase concentration generated films with significantly high tensile strength values as compared to the control film (NSPC without TGase). However, cross-linked NSPC/PEC with high TGase concentration forms films with high elongation at break values except high concentration of pectin. Moreover, low concentration of enzyme increases water content and uptake of the films and also, decreases biodegradability rate that means film more resistance to biodegradation processes. Promising blended edible films from locally abundant and low price materials for food packaging was successfully obtained in the presence of TGase enzyme.

## **Ethnopharmacological survey of medicinal plants used by patients with gastrointestinal tract disorders in the Northern region of Palestine**

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**Background:** There are many medicinal applications of natural plant remedies. Several illnesses are still being treated by Palestinian people using medicinal plants. This research was intended to study the use of natural plants to treat different types of gastrointestinal tract disorders (GITD).

**Method:** In the Northern part of Palestine ( Jenin, Tulkarm, Qalqilia and Nablus) , an ethno-pharmacological study of medicinal plants used to treat GITD has been carried out. A questionnaire was circulated to 120 informants. The details gathered included the names of the plants, the parts used, the diseases for which the products were used, as well as the method of preparation. To evaluate results: UV (used value), Fic (factor of informant consensus) and FL (fidelity-level) was calculated.

**Results:** This study showed that 40 plant species of 16 families were used for GITD. Labiatae (10 species) and Umbelliferae (8 species) were the most prevalent plant families. The pieces used most commonly were leaves and seeds. Decoction was the technique of preparation and was taken as a hot drink. Abdominal flatulence (0.88) was the highest Fic value, followed by constipation (0.80), The maximum FL were reported for *Cucumissativus* (100) and *Prunusamygdalus* (100) for heart burn, *Solanum tuberosum* (100) for vomiting and diarrhea, *Ficuscarica* (100) as laxatives.

**Conclusions:** The information provided on medicinal plants, with maximum UV & FL values can serve as basic data for further research to identify the active biological ingredients in these plants, and thereafter, to develop new drug preparations for the treatment of disorders of the digestive system.

## In Vitro Activity of Some Medicinal Plants on Blood Coagulation

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The concern towards seeking for remedies devoid for unfavorable side effects have prompted the interest for natural haemostatic agents discoveries. Therefore, the *in vitro* activity of *Aizoon hispanicum* L. (Aizoaceae), *Centaurea hyalolepis* Boiss. (Asteraceae), *Heliotropim maris-mourtui* Zohary. (Boraginaceae), *Parietaria judaica* L. (Urticaceae), *Polygonum arenarium* Waldst. & Kit. (Polygonaceae) and *Verbascum sinuatum* L. (Scrophulariaceae) on blood coagulation was evaluated in this study via the prothrombin time (PT) and activated partial thromboplastin time (aPTT) analysis. Aqueous extracts from the plant species under study were prepared to a final concentration equal to 50 mg/ml. Then, the *in vitro* PT and aPTT assays were conducted on normal platelet poor plasma blood samples by a digital coagulation analyzer. Based on the obtained results, all plant extracts revealed an effect on the coagulation cascade by increasing either PT or aPTT or both except for *V. sinuatum* extract, which reduced only the aPTT value. Moreover, the recorded PT values provided that *A. hispanicum*, *H. maris-mortui*, and *P. arenarium* significantly prolonged the prothrombin time relative to the control ( $P < 0.05$ ). Additionally, the results clearly showed that *V. sinuatum* acted as coagulant agent based on aPTT values, while all other plants, in contrast, acted as strong anticoagulants. Among the studied plant species, *A. hispanicum*, *H. maris-mortui* and *P. arenarium* extracts prolonged both PT and aPTT significantly ( $P < 0.05$ ). This could be referred to their additional effect on the common pathway. However, *C. hyalolepis*, *P. judaica* and *V. sinuatum* had no significant effect on PT values ( $P > 0.05$ ). In conclusion, the positive recorded data from this research could serve as an identification of a novel, effective haemostatic agents that improve the management of cardiovascular diseases, in addition to further discovery in research and for commercial economic purposes.

## **IN VITRO ANTICANCER EFFECT OF DIFFERENT EXTRACT TYPES OF EPHEDRA APHYLLA AND EPHEDRA FOEMINEA ON HELLA CELLS**

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Statistics indicate that millions of people are diagnosed with cancer annually. There are many curing cancers protocols, never the less, have low success rate and are still associated with high mortality. Cancer deaths were 14.7% of the total reported deaths in Palestine recently. As the utilization of complementary and alternative medicine in Palestine is very common, accordingly, the discovery of novel effective compounds could be achieved by exploring unknown folk medicinal wild plants. The clinical interest in the folk use of Ephedra increased during the 20th century especially for the treatment of cancer. From this point, the ongoing research project issue has emerged, which is to investigate the antitumor effect of aqueous, methanol and ethanol extracts of both Ephedra aphylla and Ephedra foeminae (Gymnosperms) on HeLa cell line in Palestine. As no previous studies on that issue were conducted. Aqueous, methanol and ethanol extracts were prepared at different final concentrations 4, 2, 1, 0.5 and 0.25 mg/ml. Both cytotoxic and cytostatic effects of all extract's types were investigated using inverted microscopy morphological screening and MTT assay under final treatment concentrations equal to 400, 200, 100, 50, 25  $\mu$ g/ml. The acquired results revealed morphological alteration in which cancerous cells became shrunken, rounder and detached in comparison to the normal and negative controls and MTT cell viability decreased at all examined plant species different extract types all screened concentrations in dose dependent manner. However, the strongest antitumor effect was referred to E. aphylla ethanol extract followed by E. foeminea methanol one. As 10% and 28% cell viability at 400  $\mu$ g/ml was obtained, respectively. The observed acquired antitumor effect could be achieved via anti-proliferative effect cytostatic rather than cytotoxic effect. It worth noting that the traditional Palestinian medicinal plants can serve as a source for the discovery of new anticancer agents. However, further research is needed to fully characterize their activity to exclude or include the activity of additional compounds in the plant's species under study in this research.

## **Anti-migratory and anti-proliferative effects of Sumac plant on uterus cervix cancer**

*Samer Abdallah, Biology Department, Faculty of Science, An-Najah National University, Nablus, Palestine*

Cervical cancer of the uterus is one of the most prevalent malignant gynecological tumors in women around the world. Its usual treatment options include radiotherapy and chemotherapy, which are both very toxic, costly, and exhaustive for patients. Medicinal plants have become a better and safer medicinal option in recent years. *Rhus coriaria* L., Anacardiaceae, is a medicinal plant with anti-cancer effects that have been studied in a variety of cancers, including breast and colorectal cancer. Its impact on uterine cervix cancer, however, remains unknown. Our study shows that non-cytotoxic concentrations of *R. coriaria* reduces the migration capacity of uterus cervix cells. We also discovered that *R. coriaria* has a time- and concentration-dependent growth inhibitory impact on cervical cancer cells. We used a liquid chromatography–mass spectrometry approach to analyze the phytochemical components in *R. coriaria* extract in order to find bioactive chemicals in *R. coriaria* extract that could potentially cause its anti-cancer activity. Our findings suggest that *R. coriaria* could be used as a therapeutic medication candidate for uterine cervical cancer.



## **The feasibility of food fortification in Palestine; wheat flour and edible oils as examples**

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The long-term conflict in the Palestine, occupation restriction, faltering economic growth, increases unemployment and hindering access to food, this affect food and nutrition security pillars (accessibility, affordability, stability and utilization), affecting the access and availability of sufficient, safe, and nutritious food, leading to dramatic consequences on nutritional status among population (e.g., low fat-soluble vitamins, and low iron levels). Wheat flour and edible oil utilization is depend on many factors including; availability, processing, and cooking methods. Palestinian markets of food stuff suffering from fluctuation of prices, shortages, and decline of purchase power among population. Wheat flour fortification started in Palestine since 2005, but high micronutrient deficiencies levels still persist in both Gaza strip and West Bank, according to PMS, 2013, the prevalence of low plasma vitamin A (below 1.05  $\mu\text{mol/L}$ ) is 72 percent among children (6-59 months old) and up to 58 percent among pregnant women. This may refer to restriction of premix entry to oPt, low compliance, weakness of monitoring institutes, lack of instrumentation, and uncontrolled entry of wheat from boarders. Thus, considering edible oil fortification with fat-soluble vitamins is more feasible than flour fortification due to the scientific, technical, and financial aspects.

The available options may vary between keeping vitamins A and D in the flour fortification program, meanwhile, only vitamin E added to edible oils; or excluding vitamins A and D from the flour fortification program, and vitamins A, D, and E added to edible oils; and the third option is to keep vitamins A and D as a part of the flour fortification program, at the same time adding vitamins A, D, and E to edible oil.

## **Six Session: Biology of Communicable and Non-communicable Diseases**

### **Are we losing the war against covid-19? Status and prospects**

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SARS-CoV-2 virus has shown unprecedented success in adapting to humans and spread like fire across the world. The disease caused by this virus, Covid-19, caused by now around five million deaths and >200 million infections. The devastating effect of the pandemic reached every country on the planet. Our response to the pandemic was swift and fast. New technologies were employed to develop vaccines and within 6-10 months >8 successful vaccines were introduced by different countries. Mass vaccination campaigns were initiated and sooner resulted in a remarkable reduction in infections and death due to covid-19. Unfortunately, vaccination was not equally introduced across the world and only rich countries were able to vaccinate most of their populations, while other countries hardly reached 10% vaccination rates. Lack of vaccination in addition to other health policy failures had resulted in uncontrolled waves of infections. More virulent and highly fit variants emerged and dominated the scene. A dangerous and highly contagious variant, Delta, is currently spreading across the world and threatens to erase most of our gains in this fight. Fortunately, existing vaccines are effective against these variants and can still protect against hospitalization and severe disease. Vaccination is the only tool available for achieving our goal in conquering covid-19 and ending the pandemic. Limitation of availability of vaccines requires priorities be set for fair distribution to every country. New initiatives for administering a third dose to already vaccinated persons in rich countries while the majority of the world is still waiting for the first dose is unfair and needs reconsideration. Emergence of the super virulent Delta variant confirms that No one is safe until we all are safe.

## Health Status of $\beta$ -Thalassemia Patients in the West Bank: A Retrospective Study

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**Introduction:** Management of  $\beta$ -thalassemia in developing countries is demanding due to the great potential disease outcomes and the absence of available therapies rather than recurrent transfusion and chelation therapy. This study aims to describe the patients' demographic characteristics and to evaluate patients' hematological, biochemical and hormonal profiles and their correlation with iron overload.

**Methods:** A retrospective cohort study was conducted between January 2017 and December 2018. Data were collected through medical files of  $\beta$ -thalassemia patients from eight primary healthcare clinics, nine emergency departments, and 11 governmental hospitals across the West Bank. The hematological, biochemical, hormonal evaluations included; hemoglobin, serum ferritin (SF), kidney, liver, thyroid, and parathyroid function tests. Furthermore, we collected data regarding the use of chelation therapy. Frequencies and percentages were calculated together with t-Test comparison and Pearson correlations.

**Results:** A total of 309  $\beta$ -thalassemia patients were included. The male to female ratio was 1:1 with an average age of  $23.4 \pm 10.4$  years, ranged from 2 – 68 years. Anemia presentation was reported in 78.6% of the patients with a Hb mean of  $80.4 \pm 10.4$  g/L, and severe iron overload was reported in 73.1% of them with a SF mean of  $3175.8 \pm 3378.8$   $\mu$ g/L. Evaluation of liver tests showed elevated alanine transaminase and aspartate transaminase, both of which were positively associated with SF levels. Moreover, kidney tests did not show any significant correlations with SF levels. As for iron chelators, 73.5% of the patients received Deferasirox, while only 26.5% received Deferoxamine. We found that patients receiving Deferoxamine showed significantly higher SF levels than patients receiving Deferasirox ( $p = 0.009$ ).

**Conclusion:** This study justified the importance of the comprehensive assessment and follow-up of  $\beta$ -thalassemia patients with an emphasis on blood transfusion and iron chelation practices. Therefore, the establishment of advocacy programs aiming to increase patients' adherence to treatment and follow-up programs through the collaboration of a specialized clinical multidisciplinary therapeutic team all over Palestine should be a high priority. No funding body had any input or influence on this study.

## Hereditary Polyposis Syndromes among Palestinians: A Retrospective Study

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**Background:** Polyposis syndromes make up 1-3% of all colorectal cancers in Europe. The syndromes are easily recognizable and when diagnosed, measures can be taken to prevent colorectal cancer. This makes polyposis syndromes a good candidate for cost-effective screening and cancer prevention. In the Middle-East the cancer incidence has steadily risen over the past 30 years and presents itself in a younger population than in Europe. The etiology of colorectal cancer in the middle-east is still largely unknown, preventing targeted measures from being implemented. In Palestine polyposis patients have not been identified systematically before, this research aims to identify polyposis patients in Palestine to be used in future research, offer genetic testing to establish a diagnosis, recommend screening and treatment and evaluate the current screening.

**Method:** A network of gastroenterologists, oncologists and surgeons in the West-Bank was used to refer known polyposis patients. Questionnaires were filled during personal interviews and the endoscopy/pathology reports were collected. The information was collected on standardized forms. A family pedigree was drawn for each family. The collected data was sent to a specialist to establish a differential diagnosis and recommend screening and treatment.

**Findings:** A total of 24 families were referred by the network, six of whom had polyposis. Only two out of the eight families had genetic testing done and were diagnosed as SMAD4 and APC-gene mutations. The remaining six families had, according to our specialist, polyposis of either FAP or MAP type and will undergo genetic testing to confirm the diagnosis in the coming year.

**Interpretation:** The number of patients does not allow for conclusions on epidemiologic parameters, exposing the main limitation of this research: the lack of an electronic patient system suitable for systematic searches limited the number of possible patients. Relying on the network of physicians introduced a selection bias. Furthermore, small (private) clinics were not included in the research. With regards to the family history, there were no records or previous histories to check our findings.

## **Specification of blood meals ingested by female sand flies caught in Palestinian foci and identification of their concomitant leishmanial infections**

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Since leishmaniasis are zoonotic vector-borne diseases transmitted through the bites of infected female sand flies, identification of the sources of imbibed blood meals and the detection and identification of leishmanial DNA in them are important in discerning animal reservoirs, clarifying the epidemiology and facilitating control of local leishmaniasis. CDC light traps, aspirators and sticky paper traps were used to collect sand flies in four Palestinian foci of both, CL and VL. Phlebotomine species identification was based on morphological keys. Female specimens were screened to detect and identify leishmanial infections, using kDNA-PCR and ITS1-PCR, and engorged female specimens were analyzed to identify the origin of their blood meals, using an RDB blood meal assay based on the amplification of the cytochrome b gene (cytb) of vertebrate mitochondrial DNA (mtDNA). Twenty sand fly species, 11 of the genus *Phlebotomus* and nine the genus *Sergentomyia*, were identified. The most abundant species was *Ph. papatasi* (33.7%), followed by *Ph. sergenti* (21%). Among the 691 female sand fly specimens, 18.5% (128/691) were positive for leishmanial DNA, using the kDNA-PCR and 6.4% (44/691) were positive using the ITS1-PCR. DNA from parasites of the genus *Leishmania* was identified in only 1.5% of the infected sand flies. That of *Leishmania tropica* parasites was detected in six female specimens of *Ph. sergenti* and that of *L. major* parasites in two female specimens of *Ph. papatasi*. Interestingly, two engorged females of the species *Se. (Neophlebotomus) sp.* were positive for *L. tropica* DNA. Ninety engorged female sand flies of *Ph. papatasi* and 104 of *Ph. sergenti* had fed on a large variety of vertebrate hosts such as humans, hyraxes, rats, cows, goats, and birds. Regarding blood-meals showing a mixture from different species of animal host, hyrax and rat blood was revealed in 8/104 (7.7%) females of *Ph. sergenti*. Detection of hyrax blood in engorged female sand flies of the species *Ph. sergenti* supports the role of hyraxes being a potential reservoir of *L. tropica* in Palestinian regions. Rat blood meals might be significant since a few strains *L. tropica* and *L. infantum*

## **Induction of Apoptosis by Hypoxia in C-4 I Human Cervical Cancer Cells**

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**Background:** Hypoxia defined as hypobaric stress conditions due to the atmospheric pressure in body cells and tissues. Hypoxia induces formation of free radicals and causes damage to the cell. The aim of this study was investigated antiproliferative effects of hypobaric stress conditions and determine whether hypoxia could induce apoptosis in C-4 I cervical cancer cells.

**Methods:** Human cervical carcinoma C-4 I cell line, were used in this study. Cells have passaged twice a week and hypoxic conditions were performed in a specially prepared hypobaric cabinet with a rate of 98% N<sub>2</sub>, 2% O<sub>2</sub>. Fractional hypobaric hypoxia conditions were applied 3 times for 3 hours at 24- and 48-hours intervals. MTT assay were used to measure C-4 I cell proliferation under hypobaric stress conditions, and morphological changes and cell density were investigated under phase contrast microscope. Apoptotic Index (AI) and apoptotic morphological parameters were assessed by fluorescent microscopy using DAPI stain. Statistical significance was determined using one-way ANOVA and unpaired Students't test ( $p < 0.05$ )

**Results:** According to the results, hypobaric stress conditions inhibit proliferation of C-4 I cells in a time dependent manner, and induced apoptosis in C-4 I cells.

**Conclusions:** These results provide evidence that hypoxia induces antiproliferative effects and apoptosis in C-4 I cells. Thus, the results of this study will be the basis for further studies of hypobaric stress conditions to develop new alternative cancer treatment methods.

**Keywords:** Hypobaric Conditions, Hypoxia, Apoptosis, Cervical Cancer

## Effect of Magnetic field on the growth of the cultured *Entamoeba histolytica* isolated from patients in Palestine

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Static magnetic field (SMF) is generated in vicinity of moving charge or current passing through conductor. In this study, we aimed to investigate the effect of SMF on the growth of the cultured *Entamoeba histolytica* (*E. histolytica*) trophozoites. Different SMF strengths with maximum value equals 30 mTesla (mT) was applied on the *E. histolytica* for different periods of times: 0 hours, 24 hrs, 48 hrs, and 72 hrs. A modified diphasic liver infusion agar medium was used for culturing *E. histolytica* in vitro. The results showed the successful stabilization of culture of *E. histolytica* trophozoites. If we kept the sample for longer time, e. g. 14 days, the growth rate decreases to zero. When applying 10 mT and 15 mT SMF on the sample, it is found that the cultivated *E. histolytica* trophozoites dies after 4 and 2 days respectively. The experiments suggested that the SMF inhibited the growth and the propagation of *E. histolytica* cells. In addition, it completely killed all the cells in a short time interval which depend on the SMF strength. It is concluded that the SMFs inhibits the growth of *E. histolytica* and change the morphology of these cells. We recommend that the safety of SMF treatment must be demonstrated in several cells from the host and in animal models.

**Keywords:** Static magnetic field; *Entamoeba histolytica*; bowel lumen; bowel wall; tissues; antiamoebic activity.