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فهرس المجلة | Index

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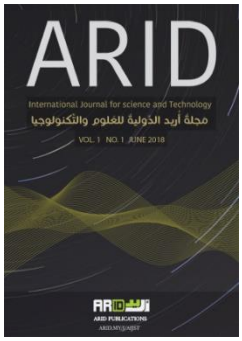

رسالة المحرر

يُعدُّ العلماءُ العرب المسلمون الذين يمثلون في قدراتهم وإمكانياتهم العلمية وتعدد مواهبهم نماذج للعلوم والعلماء متعددي التخصصات، فالحسن بن الهيثم وهو عالم موسوعي عربي عراقي مسلم ولد في البصرة سنة 965م، وتوفي 1040م قد قدّم إسهاماتٍ كبيرة في الرياضيات والبصريات والفيزياء وعلم الفلك والهندسة وطب العيون والفلسفة العلمية والإدراك البصري والعلوم بصفة عامة بتجاربه التي أجراها مستخدمًا المنهج العلمي، وكانت له العديد من المؤلفات والمكتشفات العلمية التي أكَّدها العلم الحديث، كما صحح ابن الهيثم بعض المفاهيم السائدة في ذلك الوقت اعتمادا على نظريات أرسطو وبطليموس وإقليدس. وضعت صورة هذا العالم الجهبذ على موقع جوجل وعلى العملات المالية في بعض الدول العربية تخليدًا لذكراه.

مثال آخر للعالم الموسوعي متعدد التخصصات هو المسلم الطبيب أبو بكر الرازي الذي كان فيلسوفا، وكيميائيا، وطبيبا بارعا ، ومخترعًا، له مؤلفات عديدة فهو صاحب الكتاب الشهير في الطب (الحاوي) بـ 30 مجلدًا، واقام مختبرًا متطورًا في بغداد وحضّر أكثر من 70 نوعا من العطور بطريقة التقطير، كما وضعت صورته -بوصفه عالما مسلما- مرسومة على نافذة كنيسة بجامعة برنستون الأمريكية حامِلاً في يده اليمنى ريشة الكتابة وفي اليسرى كتابه الحاوي وقد بُدئ بـ << بسم الله الرحمن الرحيم>>، وله تمثال أيضا أمام مكتب الأمم المتحدة في فيينا.

يعد التعاون البحثي في العصر الحديث غاية بالاهمية وركيزة لا غِنى عنها لتطوير المعرفة وتقدم الأمم. أمثِلة ذلك قد تكون لا حصر لها نذكر منها أمثلة للدلالة فهناك دراسة مشتركة لتحديد مستقبل الوقود الهيدروكربوني (النفط والغاز) كمصدر للطاقة، حيث نشرت مجلة (فيزياء اليوم Physics Today) التابعة لمعهد الفيزياء الأمريكي في 2016 ورقة بحثية بعنوان «الفيزياء، والتصديع المائي، والوقود، والمستقبل»، شارك في إعدادها مجموعة من العلماء متعددي التخصصات ما بين مهندس وجيولوجي وعالم بالفيزياء، وناقشت الورقة استدامة النفط والغاز الطبيعي اليوم والتوقعات المستقبلية له . وفي مجال التعاون بين الأبحاث النظرية والتطبيقية فإن مجال الفيزياء متأصل في العديد من التخصصات العلمية، وإنه يجب تشجيع ومواصلة التعاون بين الأبحاث

النظرية والتطبيقية لتأمين إمدادات الطاقة في المستقبل فضلاً عن تفعيل مشاركة مجتمع الفيزيائيين في دراسة أثر قضايا الطاقة ووضع الحلول لها عبر تطوير مصادر الطاقة البديلة مثل مفاعلات الاندماج النووي، والخلايا الشمسية ومصادر الطاقة الأخرى. يجمع التعليم مُتعدِّد التخصصات أبحاث متعددة التخصصات بين خبرات متفرقة تتضافر لتكوين مجال بحثي واعد، أو لحل مشكلة متعددة الجوانب فالنانوتكنولوجي يتطلب المعرفة بالكيمياء، والأحياء، والفيزياء، وعلوم المواد، والهندسة وغيرها.

ويمكن تقديم التعريف العملي للأبحاث متعددة التخصصات والوارد في تقرير الأكاديميات الوطنية بالاتي :

" البحث متعدد التخصصات هو طريقة البحث من قبل فرق أو أفراد التي تدمج المعلومات والبيانات والتقنيات والأدوات والمنظورات والمفاهيم و/ أو النظريات من اثنين أو أكثر من التخصصات أو هيئات المعرفة المتخصصة لتعزيز الفهم الأساسي أو لحل المشاكل بطريقة تخرج عن نطاق اختصاص واحد أو مجال ممارسة البحث "

أمَّا السيطرة على الأمراض، فتتطلب جهود علماء الأحياء الجزيئية، وخبراء الإحصاء الحيوي، ومسؤولي الصحة العامة، وعلماء الاجتماع، ومشاركتهم جميعًا في ذلك. وعلوم البيئة بدراستها للنظم البيئية المتشابكة وتأثيرها في السياسات، هي في جوهرها مجال متعدِّد التخصصات. إن الأبحاث ذات المردود العلمي القيّم تتطلب توافر الدعم المادي أسوة بتوافر الأمكانات البشرية المميزة. ويعد برنامج المِنَح لإجراء الأبحاث والتعليم متعددة التخصصات في القضايا العلمية المعقدة، مثل مراقبة المناخ والغلاف الجوي، واستعادة المياه الجوفية، وفي وقت يشهد ركودًا في حجم مبالغ التمويل للأبحاث المتخصصة مثالا يجب ان يحتذى به. إن العديد من الجامعات العالمية تُجْرِي تغييرات هيكلية لتعزيز الأبحاث متعددة التخصصات، ومن أبرز هذه التغييرات إنشاء مراكز، أو معاهد متعددة التخصصات، فجامعة قطر كمثال تدعم إجراء البحوث البينية متعددة التخصصات والمشاريع البحثية في مؤسسة قطر للتربية والعلوم وتنمية المجتمع، وتركز جامعة حمد بن خليفة على البحوث المبتكرةِ متعددة التخصصات، ومؤسسة حمد الطبية في تكوين فريق متعدد التخصصات واعطى مثالاً لحالة سرطان الدماغ الذي يتكون من اختصاص جراحة مخ وأعصاب، واختصاص الأشعة، وطب الأورام، وطبيب مختبر الأنسجة، وشخص من العلاقات العامة لتنسيق الاتصالات والمواعيد ويضع القرار في الحاسوب، وحيث ينظر الى حالة المريض من زوايا مختلفة ويتخذ قرارًا واحدًا من قبل اللجنة لوضع استراتيجية العلاج.

إن بعض التخصصات المغمورة قد لا تتمكن حاليا من الوصول الى المجتمعات العلمية الأخرى لصعوبة النشر الدولي فيها إما بسبب كونها باللغة العربية، أو عدم توافق تلك البحوث مع الاهتمامات الدولية لتلك التخصصات . واليوم علينا أن نفكر بجدية على استحداث طرق ناجعة لتطوير البحث العلمي العربي؛ لذا اقترحنا استحداث مجموعات بحثية في منصة "أريد" تعمل على

مشاريع بحوث متعددة التخصصات، من خلالها تحديد أولاً ما هي الاختصاصات العلمية والإنسانية ذات الصلة ومن ثم تشخيص المعوقات التي تواجه الباحثين في نشر نتاجاتهم وأبحاثهم، ووضع خطة عمل لتجاوز تلك المعوقات، بعد توفير الدعم والتمويل اللازم لتنفيذ بحوثهم. ووفق تلك النظرة والتوجه استحدثت " مجلة أريد الدولية للعلوم والتكنولوجيا "، و " مجلة أريد الدولية للعلوم الإنسانية والاجتماعية"، و " مجلة أريد الدولية للعلوم الصحية والطبية" لتكون خطوة أولى تتبنى نشر البحوث الجديدة والأصيلة بعد خضوعها للتحكيم العلمي أسوة بالمجلات الدولية لإيصال هذه الابحاث إلى المستوى الدولي، وتعريف الباحثين في العالم بأبحاث الناطقين بالعربية، وأن تؤدي هذه البحوث لمشاريع تخدم خطط التنمية في بلدان العالم النامي.

في الجزء الثاني من المحاضرة أود أن أستعرض لكم بعضًا من الإحصائيات التي أجريناها حول النشر في المجلات العالمية ضمن قاعدة بيانات سكوباس عن أنواع الخلايا الشمسية الذي تضاعف عددها إلى ثلاث مرات ما بين الأعوام 2009 – 2017م، وهذه الإحصائيات لنمو النشر العلمي عن خلايا السليكون البلوري الشهير، والخلايا الشمسية العضوية وهي الجيل القادم والتي تتميز بكونها خفيفة الوزن، وذات مرونة ميكانيكية، وذات التكلفة القليلة. تشير الإحصائيات أيضا إلى زيادة النشر لخلايا الأسلاك النانوية، وخلايا الصبغات الحساسة للضوء التي صنعت منذ العام 1988م، وخلايا النقطية الكمومية، وخلايا الأنابيب الكربونية، وخلايا الكرافين.

وفي الجزء الثالث سوف نتطرق إلى أحد العلوم الحديثة اليوم وهو النانوتكنولوجي، فتقنية النانو تتعامل مع الأجسام ذات الأبعاد التي تتراوح بين 1 و 100 نانومتر، والماء مثلا تبلغ قطر جزيئته حوالي 1 نانومتر في حين يبلغ قطر كرية دم حمراء بشرية حوالي 7000 نانومتر بينما يبلغ قطر الشعرة الواحدة من شعر الإنسان حوالي 10000 نانومتر.

إن المواد بهذه الأبعاد تكون مثيرة للاهتمام لأنها تظهر خصائص معززة مختلفة تمامًا أو متطورة عما تكون عليه عند الأبعاد والأحجام الكبيرة، إذ يطرأ هذا التغير على خصائص وسلوك المواد نانوية الأبعاد بسبب الزيادة الكبيرة في مساحة سطح المادة بالنسبة لحجمها، وسيطرة ظواهر وتأثيرات ميكانيكا الكم بدلًا من ظواهر ميكانيكا نيوتن التقليدية. فزيادة نسبة مساحة سطح المادة لحجمها من شأنه تعزيز خاصية التفاعلية الكيميائية مما يجعل بعض مواد النانو مفيدة جداً كمحفزات في الصناعات البترولية والبتروكيميائية ومحسنات لفعالية خلايا الوقود والبطاريات.

لذا تهدف تقنية النانو إلى استثمار هذه التأثيرات المرتبطة بالأبعاد النانوية للمادة لتكوين نظم وأجهزة وبنى ذات خصائص ووظائف جديدة مفيدة تبعا لهذه الأبعاد والأحجام الجديدة.

وتعني كلمة نانو باللغة اليونانية قزم (dwarf) والتي تساوي جزء من البليون، وعليه فإن نانومتر واحد يساوي عشر ذرات هيدروجين متراصة طوليا بجانب بعضها البعض.

لقد استخدمت المواد النانوية منذ آلاف السنين دون إدراك ماهيتها ومنها كأس الملك الروماني لايكورغوس Lycurgus في القرن الرابع الميلادي الموجود في المتحف البريطاني الذي يحتوي على جسيمات ذهب وفضة نانوية حيث يتغير لون الكأس من الأخضر إلى الأحمر القاني عندما يوضع فيه مصدر ضوئي.

كان العرب يصنعون السيوف الدمشقية المعروفة بالمتانة ويدخل في تركيبها مواد نانوية تعطيها صلابة ميكانيكية، واستخدم الفينيقيون صانعوا الزجاج حبيبات الذهب والفضة بالإضافة إلى المواد النانوية الغروية للتلوين. وكذلك اعتمدت تقنية التصوير الفوتوغرافي منذ القرنين الثامن عشر والتاسع عشر الميلاديين على إنتاج فيلم أو غشاء مصنوع من جسيمات فضية نانوية حساسة للضوء.

وتدخل المواد النانوية اليوم في تطبيقات عديدة ومتشعبة سواء في الطب أو الزراعة أو حفظ الأغذية وكثير من الصناعات الأخرى.

وتعدُّ صناعة تحلية المياه وترشيحها هي إحدى القطاعات الصناعية المستهدفة، إلى حد بعيد من التطورات الحديثة في تقنية النانو، لمواجهة تحديات شح المياه العذبة عالميا وتوفير ماء عذب نظيف للاستخدام البشري . ومن المتوقع أن تلعب تقنية النانو دورا مهمًّا للغاية في معالجة المياه والحد من انتشار الأمراض الناجمة عن استخدام المياه غير صالحة للشرب نظرا لصغر حجم الجراثيم المسببة للأمراض لاسيما وأن 80% من الأمراض المعروفة في الوقت الراهن تنتقل عبر المياه .

يقوم بعض الباحثين بالعمل على صنع أصغر فرشاة في العالم، شعيراتها أدق من شعرة رأس الانسان بألف مرة، ذات تطبيقات كثيرة ، منها تنقية المياه، والتي من شأنها بهذه الشعيرات صغيرة القطر أن تحجز الملوثات العالقة في الماء بشكل لا يسمح سوى بمرور جزيئات الماء النقي ، علاوة على ماصّة الحياة(Straw Life) والتي يمكن من خلالها إمتصاص حوالي 700 لتر نقي من المياه الملوثة كاستخدام شخصي لما تحويه من مرشح نانوي يساعد على تنقية المياه الملوثة بالطمي والعوالق الترابية وغيرها

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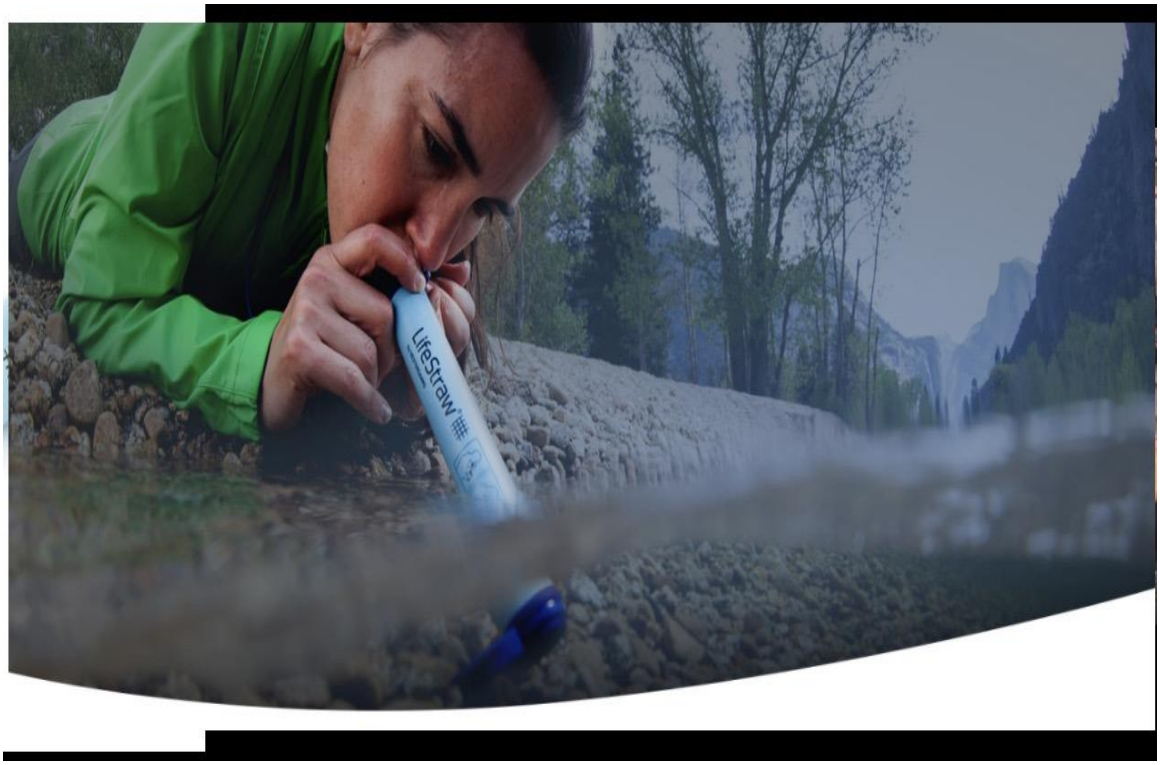

إن تقنية النانوتكنولوجي تشبه أية تقنية أخرى، حيث تبرز إمكانية استخدامها لأغراض أخرى بعيدة عن الأغراض الرئيسية التي صنعت لأجلها، ويمكن حصر الأخطار المرتبطة باستخدام تقنية النانو في هذه المجالات:

- الأخطار الصناعية.
- أخطار متعلقة بالبيئة.
- أخطار اجتماعية ناجمة عن التطورات في تقنية النانو وتشمل تطور التطبيقات العسكرية لهذه التقنية .
- أخطار صحية والمرتبطة بالسلامة العامة التي قد تنجم من إهمال بعض الجزيئيات النانوية ذات التأثير السلبي.
- عدم وجود قوانين تنظم إنتاج ذرات النانو المصنعة أو السلع والمواد التي تحتوي على ذرات النانو، أو قوانين تنظم تداولها أو تصنيفها.

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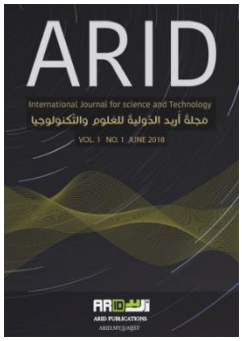

Letter by the Editor

Arab Muslim scientists, with their scientific capabilities, potentials and multiple talents, are models of multidisciplinary science and scientists.

Hasan Ibn Al-Haytham for example (born in Basra in 965 and died in 1040) was an Arab Muslim Iraqi encyclopedic scientist. He has made significant contributions to mathematics, physical optics, physics, astronomy, engineering, ophthalmology, scientific philosophy, visual perception and science in general, with his science-based experiments.

He had many scientific literatures and findings which were authenticated by modern science.

Ibn Al-Haytham has also corrected some of the prevailing concepts at his time which were based on the theories of Aristotle, Ptolemy and Euclid.

Google Doodle celebrated this unrivalled scientist, and his image was featured on the currencies of some Arab countries to commemorate this great scientist.

The Muslim physician Abu Bakr al-Razi, who was a philosopher, chemist, brilliant Physician, and inventor, is yet another example of encyclopedic and multidisciplinary scientist.

He wrote many books, including the 30-volume famous book of medicine tilted (Al-Hawi).

He set up a sophisticated laboratory in Baghdad and prepared more than 70 kinds of perfumes using the distillation method.

His portrait as a Muslim scientist was painted on a window glass in a church at Princeton University. In the portrait, he is shown holding a writing feather in his right hand while holding his Al-Hawi book in the left, beginning his writing with the commonly used opening phrase “In the name of Allah the Merciful”. Moreover, his statue was placed in front of the United Nations Office in Vienna.

Scientific research collaboration in modern times is an important and indispensable pillar for the development of knowledge and progress of nations.

There are lots of examples on such scientific research collaboration, including but not limited to a joint study which was conducted to determine the future of hydrocarbon fuels (oil and gas) as a source of energy.

In 2016, the American Institute of Physics affiliated “Physics Today” journal has published a paper entitled "Physics, Hydrogenation, Fuel and the Future". The paper was co-authored by a group of multidisciplinary scientists, including an engineer, a geologist and a physicist.

The paper dealt with the sustainability of oil and natural gas today, and its prospects.

In the field of cooperation between theoretical and applied research, it is noted that the field of physics is well-rooted in many scientific disciplines.

Therefore, the cooperation between theoretical and applied research to secure energy supplies in the future should continue and be promoted. In addition, there is a need to activate the involvement of physicists' community in examining the impact of energy related issues, and solutions for these issues should be provided through the development of alternative energy resources, such as nuclear fusion reactors, solar cells and other energy resources.

Multidisciplinary education is another example which combines multidisciplinary researches of diverse experiences that consolidate to bring forth a promising research area or solve a multifaceted problem. Nanotechnology, as an example, requires knowledge of chemistry, biology, physics, materials science, engineering, etc...

The practical definition of interdisciplinary research is introduced in the National Academies Report as follows:

Interdisciplinary research (IDR) is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice. The discipline of disease control, for instance, requires consolidated efforts by bimolecular scientists, biostatisticians, public health officials and sociologists.

Environmental sciences, which examine, inter alia, the interlinked ecosystems and their impact on policies, are essentially multidisciplinary disciplines.

Distinguished human potentials alone cannot ensure a valuable scientific return of researches unless augmented by financial support.

As funds for specialized multi-disciplinary research are notably stagnant, the multi-disciplinary research and education scholarship program for complex scientific issues such as climate and atmospheric monitoring and groundwater recovery, is an example that must be emulated.

Many of the world's universities are making structural changes to promote multidisciplinary research, including the establishment of multidisciplinary centers or institutes. Qatar University is an example of institutions that support inter-multidisciplinary research and research projects within Qatar Foundation.

Hamad Bin Khalifa University focuses on innovative multidisciplinary research, while Hamad Medical Corporation focuses in bringing into being a multidisciplinary team. A brain cancer case is an example that necessitates a multidisciplinary cooperation between a neurosurgeon, radiologist, oncologist, histologist, as well as a public relation specialist to conduct communications, arrange appointments and register the medical team's decision in the computer.

Thus, the case of the patient is viewed from different perspectives, and only one decision is taken by the committee with regard to the treatment plan.

Some unknown disciplines may not have access to other scientific communities at the time being due to hurdles that prevent its global dissemination, including the sole use of Arabic language in such disciplines, or the lack of international interests for such disciplines.

Nowadays, we must look seriously for effective ways to develop Arab scientific research. Therefore, I proposed the formation of research groups within the "ARID" platform that promote multidisciplinary research projects, identify the relevant scientific and humanitarian disciplines, recognize the obstacles that face researchers as they try to publish their findings and research, and develop a plan of action to overcome these obstacles, after securing the required support and funding for the implementation of their research.

Based on the above proposal, “ARID International Journal for Science and Technology (AIJST)”, “ARID International Journal for Educational and Social Sciences (AIJESS)” and “ARID International Journal for Health and Medical Sciences (AIJHMS)” has been established as a preliminary step to help disseminate new and original researches after being scientifically evaluated as per the common practice followed by international journals. Thus, these researches could be disseminated at the international level, and researches of Arabic speaking authors could be best introduced to the world of researchers, yielding projects that promote development plans in the countries of the developing world.

In the second part of the lecture some statistics will be presented which were collected from the international publication of researches on the types of solar panels that multiplied three times from 2009 to 2017, within Scopus data. These statistics are about the growth of the scientific publication on the famous crystalline silicon cells and next-generation organic solar panels, which are characterized as being light, mechanically flexible and cost-effective.

Moreover, these statistics show the increase in the publication of researches on nanotubes, light-sensitive dye cells manufactured since 1988, quantum dot cells, carbon-nanotube cells, and graphene cells.

In the third part of the lecture, the focus will be one of today's modern sciences; the Nanotechnology. NANO is a Greek word which means dwarf, and it equals a fraction of a billion, so one nanometer equals ten hydrogen atoms, paralleled longitudinally to each other.

Nanotechnology deals with objects with dimensions ranging from 1 to 100 nanometers. Water molecule is about 1 nanometer in diameter, while the diameter of one human red blood cell is about 7,000 nanometers, and the diameter of one human hair is about 10,000 nanometers.

Materials with such dimensions are very interesting because they show enhanced characteristics which are fully different or sophisticated when compared with materials with large dimensions and sizes.

This change occurs in the properties and behavior of nanomaterials due to the significant increase in surface area of the material relative to its size, as well as the prominence of the phenomena and effects of quantum mechanics in the place of the phenomena of Newton's traditional mechanics. An increase in the surface area of material relative to its size, boosts the chemical reactivity, making some nanomaterials very useful as catalyst agents in petroleum and petrochemical industries, or useful agents for improving the efficiency of fuel cells and batteries.

Therefore, Nanotechnology aims to utilize these effects which are associated with the Nano dimensions of material, to establish systems, devices and structures with useful new properties and functions depending on these new dimensions and sizes.

Nanoparticles have been used for thousands of years without being realized. For example, the Roman Cup of Lycurgus, (currently preserved in the British Museum) which dates to 4th century AD, contains gold and silver nanoparticles. The color of the Cup changes from green to dark red when exposed to light.

The Arabs used to make the famous robust Damascene swords. These swords were fitted with nanomaterials that give them mechanical robustness. Phoenician glass makers used gold and silver granules as well as colloidal nanoparticles for coloring. In the 18th and 19th centuries, photography technique was based on film or tape made of light-sensitive nanoparticles.

Nanomaterials today are being used in numerous applications, including medicine, agriculture, food preservation and many other industries.

The water desalination and filtration industry are one of the industrial sectors targeted, to a large extent, by recent developments in nanotechnology, to meet the challenges of global freshwater scarcity, and provide clean fresh water for human use. Nanotechnology is expected to play a very important role in water treatment and prevention of the spread of diseases caused by unsafe drinking water which contains small size of pathogenic germs. It is known today that 80% of the currently well-known diseases are transmitted through the water.

Some researchers have embarked on making the world's smallest brush, with bristles finer than the hair of a human's head a thousand times. The brush will be used for many applications, including water purification. These small bristles will help trap contaminants in the water, allowing only the passage of pure water molecules. Another technique for water treatment known as Life Straw, is fitted with nanocrystalline filter that helps purify water contaminated with mud, sediments and other particles. The device can absorb about 700 liters of purified water for personal use.

Nanotechnology is similar to any other technology, and it can be used for other purposes that are far from the main purposes for which it was manufactured. The risks associated with the use of nanotechnology in these areas can be summarized as follows:

- Industrial Hazards
- Environment-related Hazards
- Social Risks arising from the developments of nanotechnology, including the development of military applications utilizing this technology.
- Public safety associated with health risks that may result from neglecting certain negative nanoparticles

Absence of laws regulating the production of manufactured nanoparticles or goods and materials containing nanoparticles; or absence of laws regulating their circulation or classification

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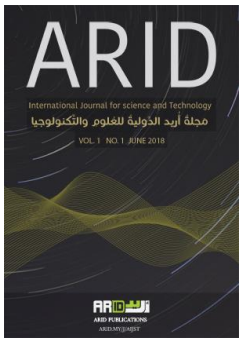

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A STUDY OF NATURAL RADIOACTIVITY IN CEMENT OF MASS FACTORY FROM NORTH IRAQ

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دراسة النشاط الإشعاعي الطبيعي لإسمنت معمل ماس في شمال العراق

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ABSTRACT

The aim of this work is to measure the specific activity of Ra-226 which belongs to U-238 chain, Ac-228 which belongs to the Th-232 chain, and K-40 in the cement samples manufactured in Mass factor (north of Iraqi-Sulimania). These specific activities can be determined by gamma-radiation detection Unit based on p-type coaxial Hyper-Purity Germanium (HPGe) detector cooled by liquid nitrogen typeGCD-40 190 in a low background configuration. Measurement of natural radioactivity in the environment are of very importance to monitor and control the levels of radiation from, the earth, the sky and different atoms existing in the wider, water, food, metals and building materials.

Indoor exposures arise from the soils in the building stand, which was used during construction. All building materials include levels of radionuclides of U-238; Th-232 and K-40.Result study show the amount of these specific activities and the risk of exposure to natural radiation from those radioactive isotopes. Where the results we have obtained are shown to be within the permissible limits compared to the results of the International Atomic Energy Agency. Therefore, the cement product of a Mass plant has characteristics and radiation properties that are safe when using these materials in building materials. Where the results obtained in this study were shown (50.27, 36.841 and 132.58 $Bq.kg^{-1}$for Ra-226, Th-232 and K-40) respectively is 0.46 $msv.y^{-1}$ {UNSCEAR;2000}.

Keywords: Neutral radioactive, building material and Hyper-Purity Germanium (HPGe).

الملخص

إن هدف الدراسة هو قياس تراكيز النشاط الإشعاعي الطبيعي لنظير(Ra-226)المتواجد ضمن سلسلة اليورانيوم (U-238)و (Ac-228) المتواجد ضمن سلسلة الثوريوم(Th-232) وكذلك نظير(K-40) .إن النماذج المقاسة في هذه الدراسة تمثل نماذج عدده ستة تم اختيارها من معمل اسمنت ماس الواقع في شمال العراق – محافظة السليمانية وهذا الاسمنت الأكثر استخداما في الأسواق العراقية . تم استخدام كاشف الجرمانيوم م عالي النقاوة نوع (GCD-40 190) لقياس هذه النماذج المربوط مع منظومة متعدد القنوات . إن دراسة النشاط الإشعاعي الطبيعي لمختلف المواد المتواجدة في البيئة مهم جدا لكونها تمثل العنصر الأساسي لاستمرار الحياة، وتحتاج إلى مراقبة مستمرة للمواد الرئيسية التي تدخل كعنصر أساسي في حياة الإنسان مثل الغذاء والماء والهواء ومواد البناء . وأهمية دراسة النشاط الإشعاعي في مواد البناء هو استخدام الإنسان لها بشكل مستمر ومباشر مما يعرضه لاستلام جرع إشعاعية إضافية. إن النتائج التي حصلنا عليها في هذه الدراسة وهي (50.27).(36.841)و(132.58)Bq/Kg للنظائر(Ra-226),(Th-232)و(K-40) 0.46 msv/y هي طبيعية وضمن الحدود المسموحة عالميا مقارنة بالمحددات التي وضعتها الوكالة الدولية للطاقة الذرية، وخصوصا للنظائر (Ra-226),(Th-232) و(K-40) التي تؤثر بالجرعة الاشعاعية $0.46\ msv.y^{-1}$ (UNSCEAR,2000).

1. Introduction:

The environment in which we live consists of several substances that affect our lives. In other words. The environment consists of the main factors are air, water and soil, which are an important part of human life. These factors include naturally radioactive elements; the human receives the natural radiation of cosmic, terrestrial rays and building materials consist of different amounts of natural radioactivity in the soil, mainly containing U-328, Th-228 and K-40 agree with {UNSCEAR, 2000}is 0.46 $mSv.y^{-1}$[1,2,3]

The study of radioactivity in the building materials is of great importance to monitoring. Due to the natural environmental radiation hazards affecting humans, it is necessary to continuously monitor the environment for the purpose of determining the limits according to the requirements of the IAEA. Determination of natural radionuclide determinants can be used to determine the personal exposures of humans according to the environment in which they live. Construction materials are derived from both natural sources (e.g. rock and soil) and waste products (e.g. phosphate, alum shale, coal fly ash, oil shale ash and certain slugs). It is necessary to study the natural environmental radiation level from building materials for the estimation of the exposures to natural radioactivity [1].

The International Atomic Energy Agency (IAEA) has published data and limitations on the radiation doses that humans can be exposed to in their lives. The exposures to cosmic -ray are about 0.38 $mSv.y^{-1}$ to terrestrial radiation 0.45 $mSv.y^{-1}$, this figure increase about 20% for brick concert buildings, to air, water and food 1.5 $mSv.y^{-1}$.

The exposures from air flights, color TV and nuclear power plants is about 0.1 $mSv.y^{-1}$ and to the other factor like X-rays diagnostics are about 0.4$mSv.y^{-1}$. Thus, the human being receives about 2.7 $mSv.y^{-1}$ from natural radiation. The lowest radiation dose received by the general population

is 1 $mSv.y^{-1}$. Cement is one of the important and expensive materials used by the building industry in Iraq. [4]

Most of the construction in Iraq uses cement, which contains natural radioactive isotopes, which is an additional factor exposed to humans {UNSCGAR, 2000} [5].

2. Samples Preparation:

Six samples were collected from production plants of local cement Mass-North of Iraq for analysis.

Each sample, estimated to be 1 kg, was dried in an oven at about $80c^{o}$ for four hours until complete removal of any residual moisture and ensuring that a constant weight samples are used. The samples are placed in a Marinelli Beakers to measure the radioactivity by (HPGe) which were stored one month to allow for radioactive equilibrium to be reached (secular equilibrium where the rate of decay of the daughter becomes equal to that the parent).[6,7]

3. Method of Measurement:

Before activity measurement, we must make calibration to determine absolute gamma-ray energies. In this study a Gamma source (Eu-152) was chosen for energy calibration due to the wide range of gamma-ray energies (121 kev to 1408 kev) emitted from this source.

The calibration source (Eu-152) was placed in liter Marinelli Beaker of the same geometry as that of sample measurement in order to reduce the error in the determination of the peak energy {Gilmore 2008} as shown in figures (1) and (2).

Efficiency $\varepsilon_{(E_\gamma)}$ is a measure of the percentage of radiation that a given detector detects from the overall yield that is emitted from the source into a solid angle of usually 4π in the photo-peak .The detector efficiency is calculated as in the following equation.

$$\varepsilon\,(E_\gamma) = \boldsymbol{N}\mathrm{t} * 100/\boldsymbol{N}_\gamma$$

Where: -

$\mathbf{N}_t$ = Net area per unit of time over the whole recorded spectrum (minus the background rate).

$\mathbf{N}\gamma$ = Absolute activity per unit of time.

Spectrum of full energy for range of discrete gamma-ray energies chosen from standard sources is illustrated in Figure (3). Each sample was analyzed by using high resolution Gamma spectrometry system. It consists of high pure germanium detector having 40% relative efficiency, its energy resolution measured in terms of Full With Half Maximum (FWHM) is 2.1 keV at 1332 keV of Co-60 Gamma energy. The pulse amplitude is converted to a discrete number using the 4096 channel in a multi-channel analyzer (MCA). Gamma ray spectrometry measurements were analyzed using genie 2000 software [8,9].

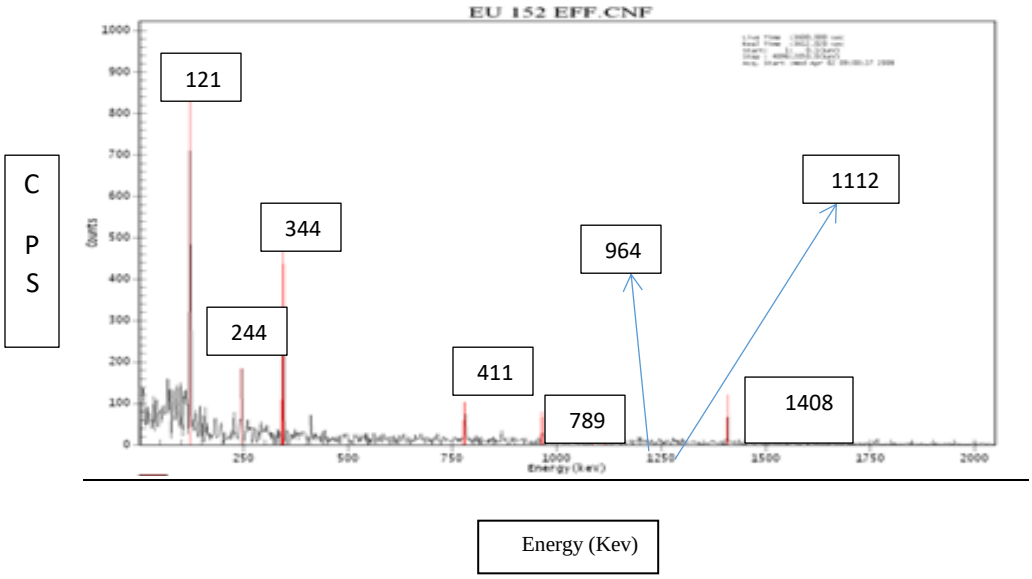

Figure (1): Calibration spectrum energy for rang of discrete gamma-ray for Eu-152.

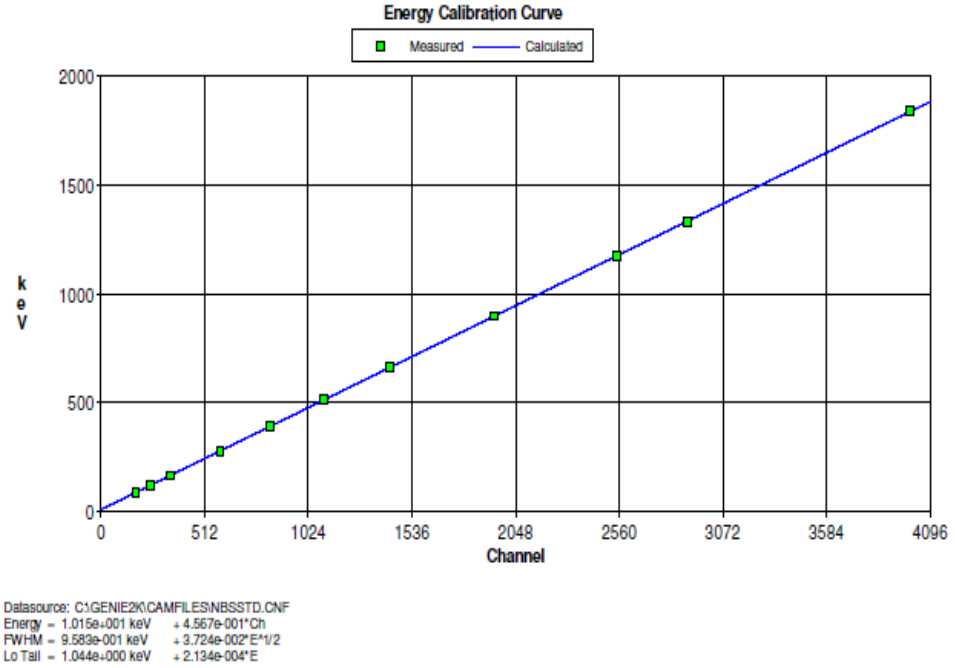

Figure (2): Energy calibration using Eu-152 radioactive standard

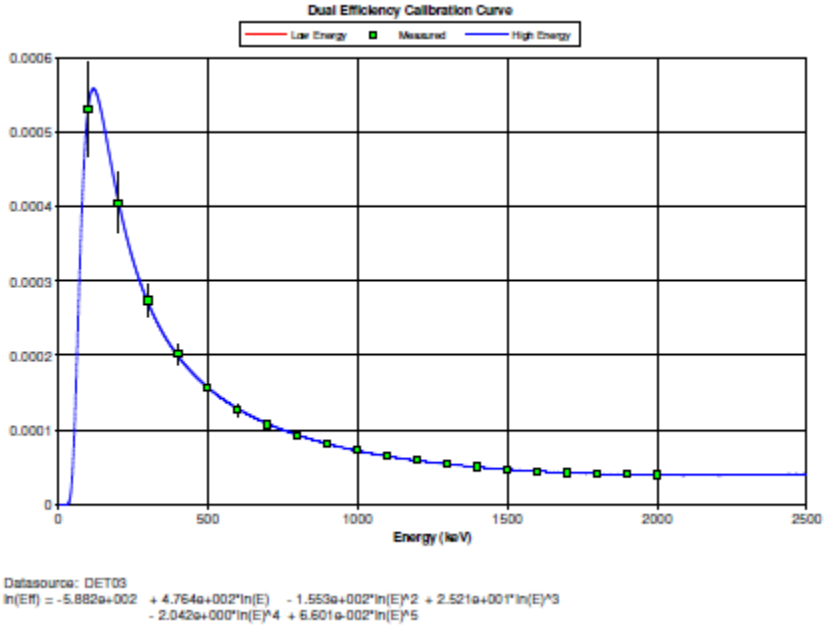

Figure (3): Efficiency calibration curve of (HPGe) detector using Eu-152

4. Results and Discussion:

Cement is a very important construction material for house and building material of Iraq. It is used for plastering and concrete manufacturing as well as for building block sand walls, which are made of bricks. However, the information of the specific activates in terms of the activity concentration is defined as the activity per unit mass of the sample. After by using net area of spectrum, the specific activity calculated of the mean range of three radionuclides (Ra- 226, Th-232, and K- 40) are 50.27, 36.841 and 132.58 Bq. kg^{-1} respectively and have been determined as presented in Table (1).

The specific activity spectrum of cement sample is shows in Fig (4) the specific activity for Ra-226, Th-232 and K-40 was calculated using the following relation:

$$\boldsymbol{A}(\, Bq.kg-1\,) = \boldsymbol{N}/\,\varepsilon\,(\,E_{\gamma}\,)\,\boldsymbol{I}(\,E_{\gamma}\,)\,\boldsymbol{tcm}$$

where: -

A: - Is the specific activity in (Bq. kg^{-1}).

N :- Is the corrected net peak area of the ($N = N_s - N_b$).

N_s :- Is the net peak area in the sample spectrum .

N_b :- Is the corresponding net peak area in the background spectrum.

$\boldsymbol{\varepsilon}_{(E_\gamma)}$:- Is the efficiency of the detector .

$\boldsymbol{I}_{(E_\gamma)}$:-Is the intensity of gamma energy [E]

$\boldsymbol{t}_c$;- Is the counting time.

m :- The mass (kg) of the sample.

Energy (Kev)

The results in the present study for cement have also been compared with values of the worldwide specific activity of Ra-226, Th-232 and K-40 (in $Bq.kg^{-1}$) for other countries of the world are shown in Table (2). Therefore, the cement product of a Mass plant has characteristics and radiation properties that are safe when using these materials as building materials [3, 8, 10, 11, 12, and 13].

Table (1): Results of cement plants Mass samples

Samples No.North Iraqi/cement Mass	Ra-226 $Bq.kg^{-1}$	Th-232 $Bq.kg^{-1}$	K-40 $Bq.kg^{-1}$
M1	60.32	35.37	130.11
M2	55.54	37.45	135.21
M3	58.62	37.88	128.5
M4	65.34	36.23	140.12
M5	50.68	36.61	125.33
M6	56.12	37.51	136.21
Average	50.27	36.841	132.58

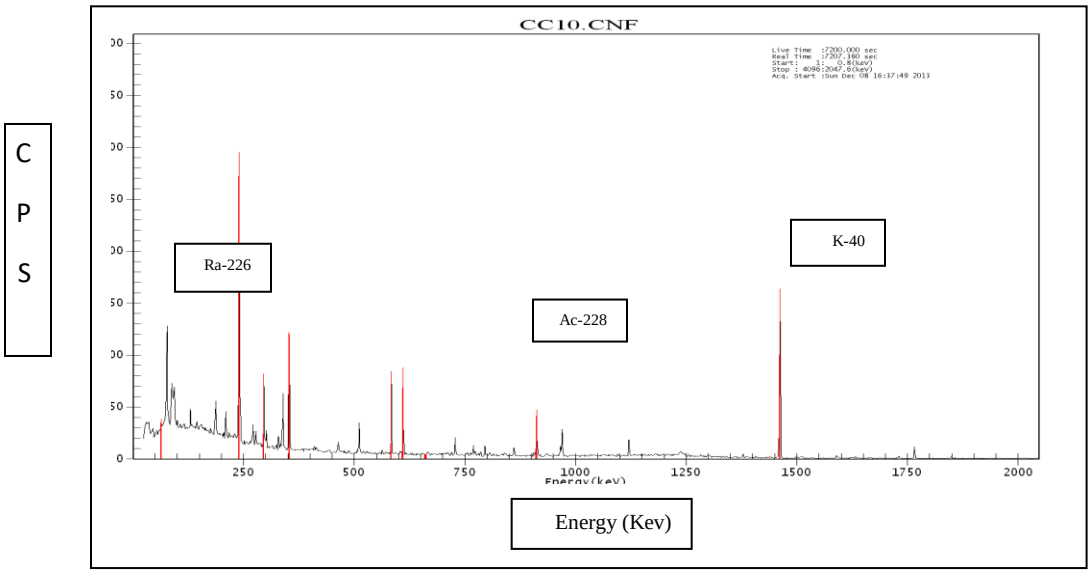

Figure (4): Spectrum of the radioactive sample for cement Mass – north of Iraq

Table (2): Comparison between the activity concentrations (in $Bq.kg^{-1}$) of our building materials cement with that of other countries of the world.

Country	Ra-226	Th-232	K-40
Average cement Mass-Iraq	50.27	36.841	132.58
Egypt[8]	31.3	11.1	48.6
Iran[10]	39.6	28.9	290
Jordan[3]	43.21	11.23	265.12
K.S.A[11]	38.4	45.3	86
Turkey[12]	24.7	20.7	249.31

5. Conclusions

We believe all construction materials are important and the most important is the cement material because it contains several primary materials collected from mines from different countries. Therefore, you need continuous monitoring, especially radiological monitoring. As we have previously said, humans live for long periods of time in contact with cement. From the observation of the results, Mass cement is widely used in Iraqi markets. It was found that natural radionuclide in these studies were within permissible limits compared with global research publications.

List of Abbreviations:

1- International Atomic Energy Agency (IAEA).

2- Hyper-Purity Germanium (HPGe).

3- Full of Half Maximum (FWHM).

4- Multi-channel analyzer (MCA).

Acknowledgement:

Dedicate to colleagues who are competent to benefit. For general knowledge and special thanks to the journal and its editor**.**

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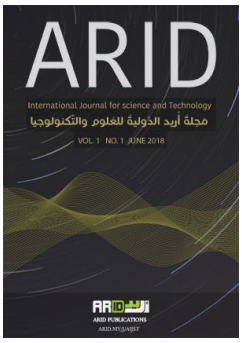

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GROWTH OF SOLAR CELLS ARTICLES AT ELSEVIER JOURNALS

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نمو الخلايا الشمسية في مقالات مجلات السيفير

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ABSTRACT

The knowledge of researcher on the growth of published articles in any subject represented an important thing which enables him to follow the importance of the subject, which aims to work on it through the global research trend. In this paper, a systematic method for researchers was presented for researchers especially postgraduate students to help them determine the importance of the research they have chosen. A quick look regarding solar cells and the development of the number of researches that published in Elsevier in the period from 2009 to 2017 has given. Some types of solar cells namely the silicon, organic, dyes, nanocrystalline, carbon nanotube, quantum dot silicon and graphene are selected, and the number of researches published for these types is followed. It is noted that the number of most types of the solar cells papers have been tripled during the specified period and the highest ratio of publication was for the organic solar cells followed by silicon and dyes cells.

Keywords: Silicon solar cells, organic solar cells, dyes, nanocrystalline, carbon nanotube, quantum dot silicon and graphene

الملخص

يعد اطلاع الباحثين على النمو في عدد البحوث المنشورة في أي تخصص ما من الأمور المهمة التي تمكن الباحث من متابعة أهمية الموضوع الذي يروم العمل عليه من خلال التوجه البحثي العالمي. في هذه الورقة، نقدم طريقة منهجية للباحثين وخصوصا طلبة الدراسات العليا بغية مساعدتهم في تحديد أهمية البحث الذي اختاروه والاهتمام العالمي به. قدمنا نظرة سريعة حول موضوعة الخلايا الشمسية وتطور عدد الأبحاث المنشورة في دار النشر السيفير للفترة من 2009 ولغاية 2017. تمَّ اختيار أنواع محددة من الخلايا الشمسية لنمو النشر العلمي، منها خلايا السليكون البلوري الشهير، والخلايا الشمسية العضوية ، خلايا الأسلاك النانوية، وخلايا الصبغات الحساسة للضوء، وخلايا النقطية الكمومية، وخلايا الأنابيب الكربونية، وخلايا الكرافين.

تم تتبع عدد البحوث المنشورة لتلك الانواع ولوحظ أن أغلب أنواع البحوث قد تضاعف عددها ثلاث مرات خلال الفترة المحددة، وأنَّ أعلى نسبة نشريات كانت للخلايا الشمسية العضوية، وتليها الخلايا السليكونية وخلايا الصبغة.

1. Introduction

Solar cell or Photovoltaic devices absorb sunlight and enable the conversion of solar radiation into useable electrical energy [1]. With the expansion of industry and population growth as well limiting resources of fossil fuels, the world needs to new energy sources. In addition, new energy sources must be environmentally friendly to reduce the increasing pollution of the air such as solar energy that is gaining more and more importance. Thus, photovoltaic (PV) is a fast-growing market. The Compound Annual Growth Rate (CAGR) of PV installations was 40% between 2010 to 2016. Concerning PV module production in 2016, China &Taiwan hold the lead with a share of 68%, followed by Rest of Asia-Pacific & Central Asia (ROAP/CA) with 14%. Europe contributed with a share of 4% (was 5% in 2015); USA/CAN contributed 6% [2]. For example, in 2016, Germany accounted for about 13% (41.3 GWp) of the cumulative PV capacity installed worldwide (320 GWp) with about 1.6 million PV systems installed in Germany. Moreover, the cost of production PV is significantly reduced, Figure 1 shows the global cumulative PV installation until 2016 (includes off-grid) and Figure 2 represented global cumulative PV installation by region. In this summarized overview, selected type of solar cells articles growth at Elsevier journals is addressed. Elsevier is the information and analytics Company and one of the world's major providers of scientific, technical, and medical information. Its products include journals such as the Lancet and Cell, the ScienceDirect collection of electronic journals, the Trends and Current Opinion series of journals, the online citation database Elsevier and the clinical key solution for clinicians. Elsevier publishes around 420,000 articles annually in 2,500 journals and archives contain over 13 million documents and 30,000 e-books.

The solar cells articles that published in Elsevier are increased from about 7000 at year 2009 to around 18900 at 2017 as presented in Figure 3.

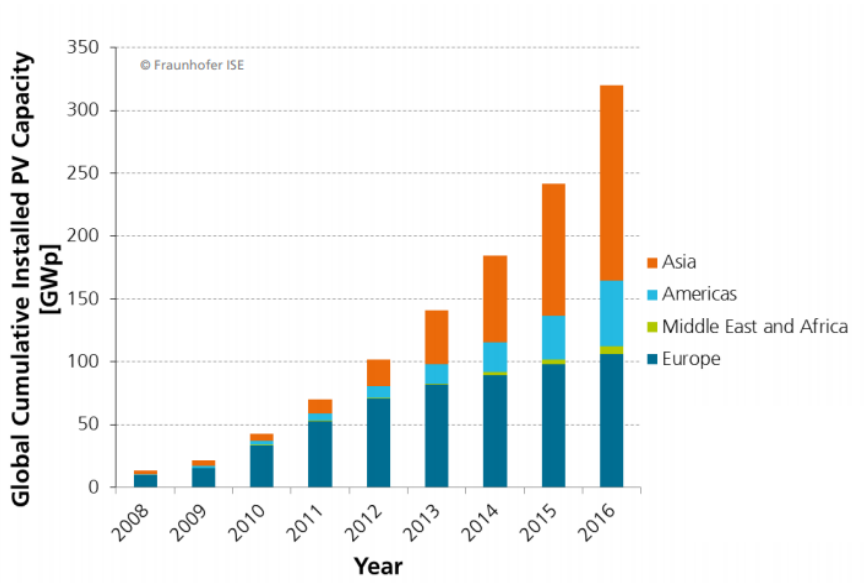

Figure (1): Global cumulative PV installation until 2016 (includes off-grid)

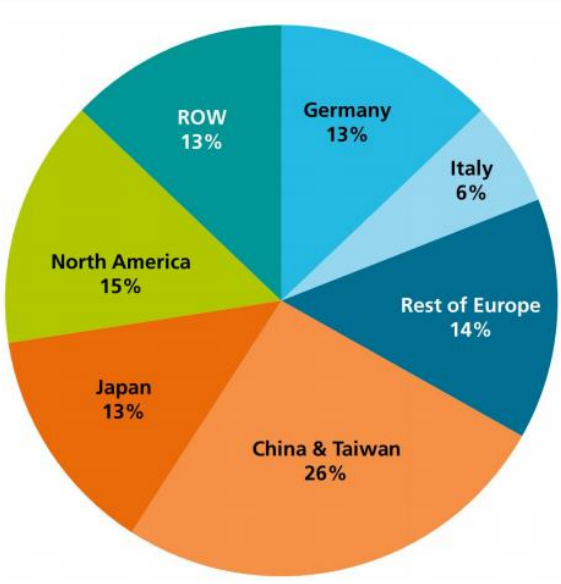

Figure (2): The total cumulative installations amounted to 320 GWp at the end of 2016. All percentages are related to total global installations, including off-grid systems

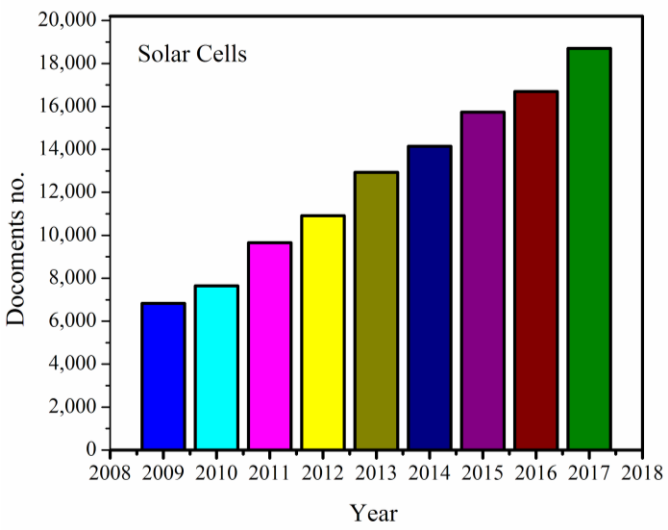

Figure (3): The solar cells articles published in Elsevier from 2009-2017

2. Results and Discussion

In this section, we will review the published articles statistics on selected types of solar cells throughout the period 2009-2017 and analyze their results.

2.1 Silicon Solar Cells

Silicon crystal (wafer) based PV technology accounted for about 94% of the total production solar cells in 2016. However, the share of multi-crystalline technology is now about 70% of total production [2]. The Silicon with crystalline or amorphous structure is the famous material that used to fabricate solar [3, 4] also the articles are tripled annually between 2009 and 2017. The published articles increased from about 1500 at year 2009 to around 4300 at 2017 as seen in Figure 4.

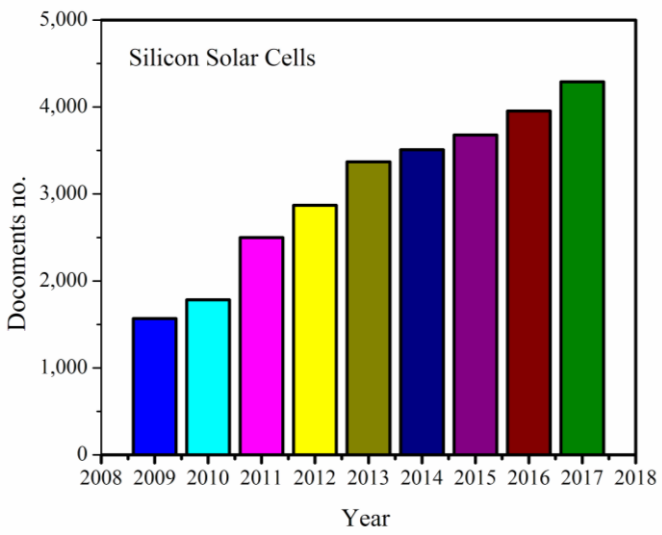

Figure (4): The number of published articles versus years for silicon solar cells

2.2 Organic Solar Cells

Organic solar cells have provided a unique opportunity and gained extensive attention as a next-generation photovoltaic technology due to their lightweight, mechanical flexibility, and solution-based cost-effective processing. However, organic solar cells still suffer from low efficiency and short lifetime. Polythiophenes and specifically poly (3-hexylthiophene) (P3HT) became frontrunners in the research on conjugated polymers. Conversion efficiency (PCE) is grown quickly with the development of new organic materials and has surpassed 12% recently [5].

Total documents in ScienceDirect reached to 8300 articles as shown in Figure 5.

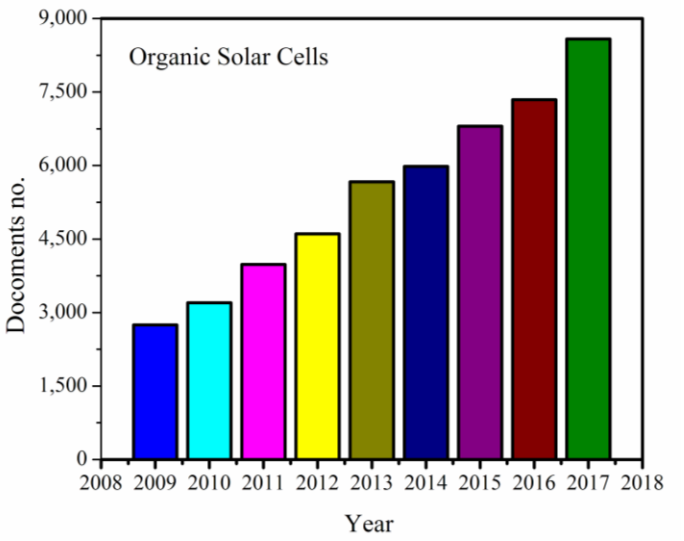

Figure (5): The number of published articles versus years for organic solar cells

2.3 Nano crystalline Solar Cells

A nanocrystal is a crystalline particle with at least one dimension measuring less than 100 nanometers (nm) (quantum dot, quantum wire, quantum well). Nanocrystals lead to novel quantum-mechanical effects due to the quantum confinement or quantization [6, 7]. In nanocrystalline semiconductor the relaxation time can be dramatically reduced. This is because in small systems in nanoscale with decreasing size the difference between the energy levels is increasing (this is obtained from the Schrödinger equation). Due to the large band gap hot electrons cannot relax quickly to initial state, because the Coulomb interaction will be very weak, and these electrons can contribute to the current [6]. Further, the very high surface-to-volume ratio of nanomaterials is the most remarkable and could lead to new atomic arrangements that affect the optical properties of this material [8].

Figures 5-9 explained the growth in the article's numbers of different nanocrystalline types solar cells that published by Elsevier from 2009 to 2017. All Figures shows increasing in the

documents number indicating the increase in the interest of the researchers for the nano-solar cells. Different types of quantum dot materials and structures are used to fabricate solar cells [9-11]. “One-dimensional (1D) nanocrystalline semiconductors such as nanowires, nanotubes, nanorods, etc have received attention in recent years because its exhibit multifunctional unique properties such as high crystallinity, high surface-to volume ratio, quantum confinement effects as well high lifetime electron-hole recombination.”"One of the most important 1D nanostructure is silicon nanowires (SiNWs). Silicon nanowires have many splendid properties depending on the surface morphology such as diameter, length, direction of growth and crystallization. In addition, the density of the grown nanowires also affects the characteristics such as optical and electrical properties. The optical band gap of SiNWs turns from indirect into direct due to the quantum confinement effect and the band gap increases with the decrease of the wire diameter; therefore, they are potentially more suitable in optoelectronics applications compared with bulk Si” [12, 13]. Thus, silicon nanowies recently is widely used to fabricate solar cells and other optoelectronic devices [14].

Dye-Sensitized Solar Cells (DSSCs) are one of the types of solar cells that show promising properties such as high conversion efficiency, use of environmentally friendly materials, ease of preparation, and low-cost of production [12, 13]. Further, recently carbon nanotube is used for organic/inorganic hybrid solar cells to enhance the output [15, 16]. “Graphene has been played the role of conductive transparent devices indebted to its unique two dimensional (2D) structures and gained an exceptional opportunity to be employed in energy industry”. In the past two decades, graphene “has been merged with the concept of photovoltaic (PV) material and exhibited a significant role as a transparent electrode, hole/electron transport material and interfacial buffer layer in solar cell devices”[17-19].

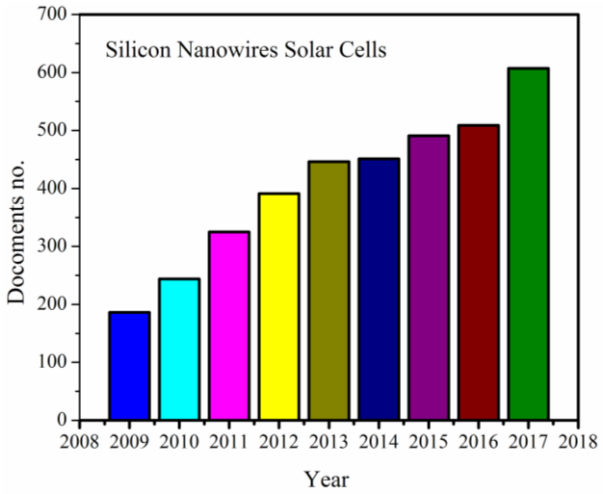

Figure (6): The number of published articles versus years for silicon nanowires solar cells

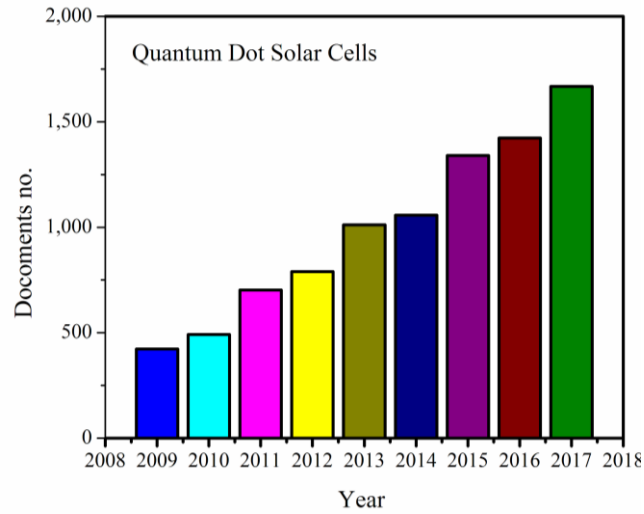

Figure (7): The number of published articles versus years for quantum dot silicon solar cells

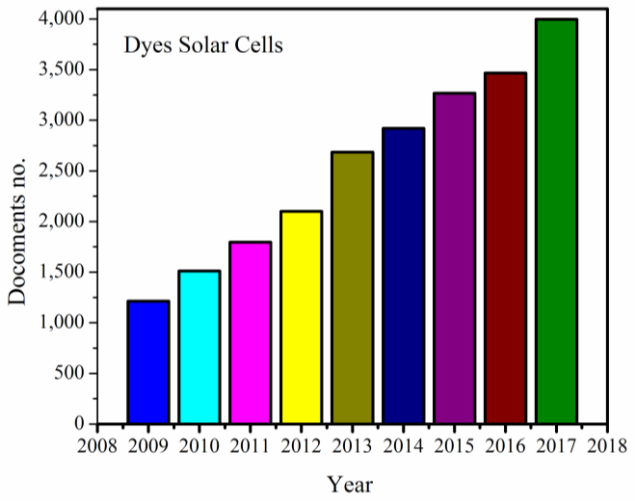

Figure (8): The number of published articles versus years for dyes solar cells

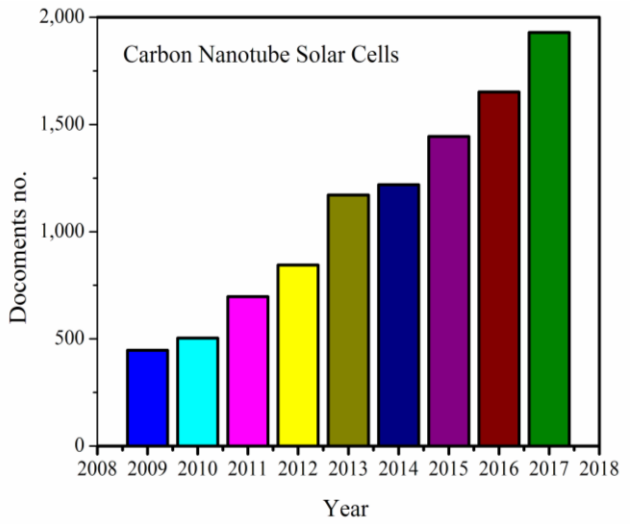

Figure (9): The number of published articles versus years for carbon nanotube solar cells

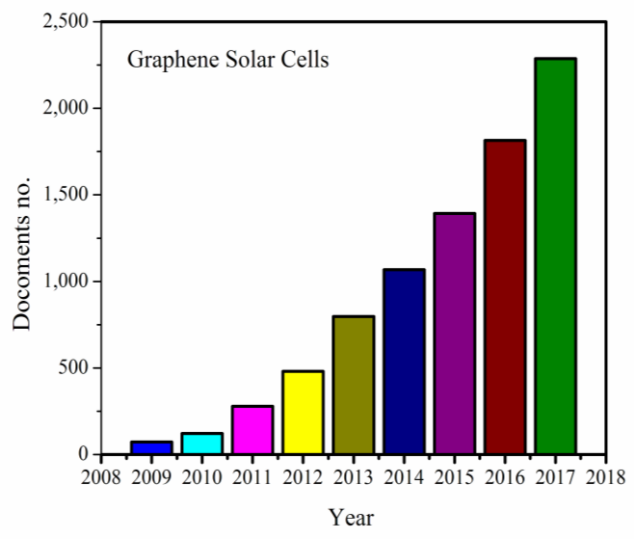

Figure (10): The number of published articles versus years for graphene solar cells

The ratio of solar cells types is presented in Figure 11 where the organic cells have the highest ratio and both silicon and dyes cells come second.

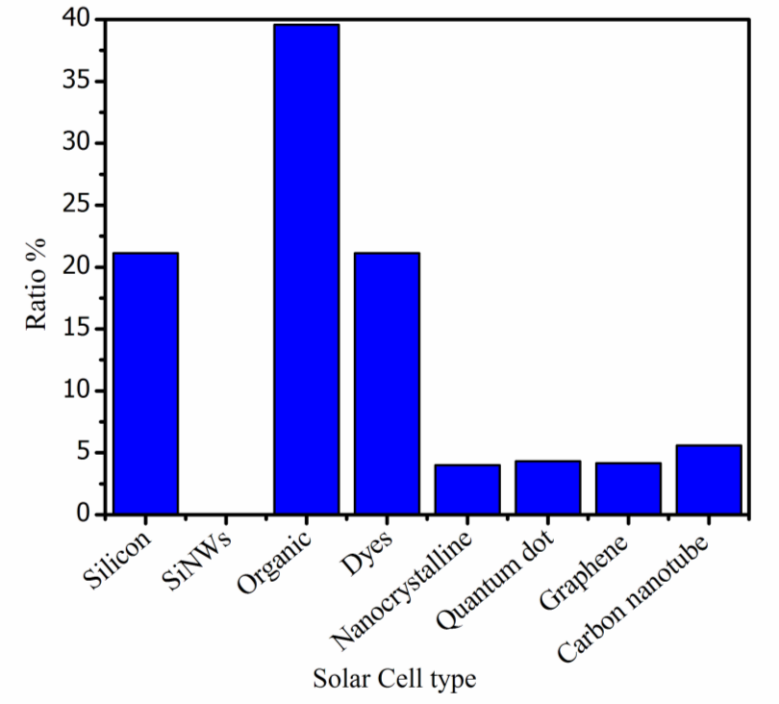

Figure (11): The ratio of different solar cells types articles that published in Elsevier from 2009 to 2017

Table 1 summarizes the number of the published documents from 2009 to 2017 compared to the total publication of articles for different types of solar cells. We can note that the number of graphene solar cell articles that published in the period time represented around 97% of the total articles of graphene solar cells. Moreover, other types such as silicon nanowires, carbon nanotube, as well as dyes solar cell are also showed high publishing ratio in the period of 2009 to 2017. However, we can note that some types of solar cell are grown more than others and the reason of this could be related to the cost production, easy to fabricate, or environmental factors.

Table1: The number of documents from 2009 to 2017 compared by the total number of documents of different solar cells type and nanomaterials.

Types of solar cell	The total no. of documents	The no. of documents in 2009-2017	The ratio (%)
Total Solar Cells Documents	202.468	113253	55.93625
Organic	75394	48413	64.21333
Dyes	33450	27523	82.28102
Silicon nanowires	4187	3650	87.17459
Nanocrystalline	11374	8122	71.40848
Silicon	51206	27523	53.74956
Carbon nanotube	11466	9907	86.40328
Graphene	8560	8313	97.11449

2. Conclusions

The Compound Annual Growth Rate (CAGR) of PV installations was 40% between 2010 to 2016. The solar cell articles that published in Elsevier from 2009 to 2017 period increased for the different types. Solar cell articles that published by Elsevier are increased by a ratio of 170% for the period from 2009 to 2017. However, the articles types are tripled in the same period. Organic solar cells articles were the highest ratio that represented around 40% compared by other solar cells types. We can conclude that nanostructures solar cells articles will grow in the next years specially graphene, dyes, as well silicon nanowires structures.

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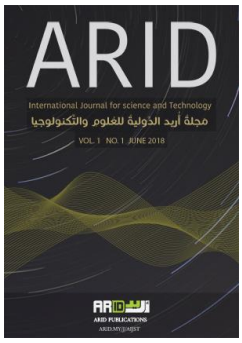

مَجلةُ أُريد الدَّوليةُ للعُلومِ والتِّكنولوجيا

العدد 1 ، المجلد 1 ، حزيران 2018 م

HONEY NATURALLY FORTIFIED WITH ACTIVE INGREDIENTS FOR DATES

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العَسل المُدعَّم طبيعيا بالمكونات الفعَّالة للتمر

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ABSTRACT

The goal of this research is to produce a new fortified natural honey produced from Zahdi Dates (*Phoenix dactylifera*), this study consider to be the first that have made in this type of dates in Iraq (according to the search I made in libraries and research centers), after testing and analyze and experiments on the new product (and comparing with pairings) and after using instrumental analysis apparatuses like Gas Chromatography - Mass Spectroscopy (GC-Mass) and others, it was found that the quantity of the product was multiplied by 4 and also it was found that the fortified honey is non-toxic for human being consumption (according to the study that was made on rats) and has anti-oxidant activity in addition to its anti-inflammatory activity and also can be used as food and treatment due to its dates composition specially the "Amide Compounds" like Oleic Acid Amide in addition to Nona Decane Amide and Bis-Dodcan Amide. Also, the new honey contains "Ester Compounds" like Tetra Decyl Ester, the fortified honey also contains acids and other compounds, the analysis results shows it contains a very active compound that has medical importance (comparing with the control) like:

- 4-H-pyran-4-one,2,3dihydro-3,5dihydroxy-3,5-dihydroxy-6- methyl
- 3,5-dihydroxy-2,3-dihydro-4*H*-pyran-4-one,
- 3-*tert*-butyl-1,3-oxazolidin-2-one

The results also shows the fortified honey contain a very active compounds to free radicals like 2,2-diphenyl-1-picrylhydrazyl (DPPH) followed by non-fortified honey and date extracts in a percentage 98.34%, 76.25% and 60.47% consequently. Also, it was found an increase in the

activity against carbon tetrachloride (CCl_4) for both enzymes Glutathione peroxidase (GPx) and Superoxide dismutase (SOD)

Keywords: Zahdi Dates, fortified honey, GC-Mass Specroscopy, DPPH, CCl_4

الملخص

يهدف البحث إلى إنتاج العسل المدعم بشكل طبيعي بالمكونات الفعالة لثمرة التمر الزهدي Zahdi Dates (*Phoenix dactylifera)* حيث تعدُّ هذه الدراسة هي الأولى من نوعها في العراق (وحسب البحث الذي أجريته في المكتبات والمراكز البحثية العلمية)، وبعد إجراء الفحوصات والتحاليل والتجارب على المنتج الجديد (وبالمقارنة مع السيطرة)، باستخدام أجهزة التحليل الآلي مثل مطياف الكتلة Gas Chromatography - Mass Spectroscopy (GC-Mass) وغيرها. أظهرت نتائج البحث بأن كمية إنتاج العسل قد تضاعفت إلى أربعة أضعاف، وكذلك فإن العسل غير سام وصالح للاستهلاك البشري (وحسب الدراسة التجريبية التي اجريت على الجرذان) وأن له خاصية المضادة للاكسدة Anti-Oxidant activity بالإضافة إلى فعاليته ضد الالتهابات Anti-inflammatory activity , هذا بالإضافة إلى استخدامه كغذاء و كعلاج لاحتوائه على نفس المكونات الغذائية الموجودة في التمر وخاصة مركبات الأميد مثل أميد حامض الأوليك Oleic Acid Amide وكذلك أميد النونا ديكان Nona Decane Amide بالإضافة الى Bis-Dodcan Amide ، ويحتوي العسل الجديد أيضا على مركبات الإسترات مثل Tetra Decyl Ester وغيرها من الحوامض والمركبات الاخرى. من خلال التحليلات لمكونات العسل الجديد, وجد أن هناك مكونات فعالة جديدة ظهرت في العسل المدعم مقارنة بالمكونات الفعالة لكل من التمر الزهدي وعسل السيطرة Control Honey اذ ظهرت مكونات ذات أمية طبية مثل :

- 4-H-pyran-4-one,2,3dihydro-3,5dihydroxy-3,5-dihydroxy-6- methyl
- 3,5-dihydroxy-2,3-dihydro-4*H*-pyran-4-one,
- 3-*tert*-butyl-1,3-oxazolidin-2-one

وغيرها, كما أظهرت النتائج أن العسل المدعم يحتوي على مكونات فعالة للتمر ذي فعالية عالية جدا في إزاحة الجذور الحرة 2,2-diphenyl-1-picrylhydrazyl (DPPH) يليه العسل غير المدعم، وأخيرا مستخلص التمر 98.34% ، 76.25 %، 60.47 % على التوالي , كما تبين أن هناك زيادة في فعالية التأثير السمي لمادة رابع كلوريد الكاربون CCl_4 للانزيمين Glutathione peroxidase (GPx) وSuperoxide dismutase (SOD) .

الكلمات المفتاحية: تمر الزهدي , العسل المدعم, مطياف الكتلة, CCl_4, DPPH

1- المقدمـــة

عرف الفراعنة والرومان والعرب القدماء فوائد التمر الطبية، حيث استعمل التمر في الطب القديم كمنشط للكبد، وفي معالجة البواسير، وكملين طبيعي لمن اعتاد على تناوله يومياً لاحتوائه على الألياف. والتمر منشط للقدرة الجنسية، ومرمم للأعصاب، ومؤخر لمظاهر الشيخوخة، ومهدئ للسعال طارد للبلغم، ومنظف للكلى والحصى والرمال [1].

تعد فاكهة التمر (*Phoenix dactylifera* L.) من المحاصيل التجارية المهمة في بلدان الشرق الاوسط إذ يوجد اكثر من 2000صنف من اصناف التمور في مختلف انحاء العالم. التمور فاكهة من عائلة Palmaceae تحوي نسبة عالية من السكريات (44-88)%، الدهون (0.2-0.5)%، البروتين (2.3-5.6)% و15 نوع من الاملاح والمعادن و الفيتامينات ونسبة عالية من الالياف (6.4-11.5) % ، كما تحتوي التمور على الاصباغ مثل الكلوروفيل وصبغة الكاروتين وصبغة الانثوسيانين، وتحوي التمور على نسبة عالية من مضادات الاكسدة المهمة والضرورية للجسم فمن بين المدى الواسع من المركبات الفينولية تحتوي التمور على P-Coumaric acid, Ferulic acid , Sinapic acid كمركبات اساسية في التمور[2] .

حظيتْ مضادات الاكسدة باهتمام واسع عند المهتمين بعلوم الاغذية والباحثين في مجال الطب لتاثيرها المباشر في اختزال خطر الاصابة بالامراض المزمنة مثل مرض السرطان وامراض القلب والشيخوخة والصدمات [3]. كما انها تقلل من اكسدة وتحطم ال DNA في جسم الانسان و تؤخر بداية التزنخ التأكسدي oxidative rancidity المسؤول عن الطعم و النكهة المتزنخة غير المرغوب فيها و التغير في اللون الذي ينجم عنه فقدان القيمة الغذائية للاغذية وتاثيرة على الصحة العامة بتكوين مركبات سمية لذا يتطلب اضافة المواد المضادة للاكسدة لعرقلة او منع اكسدة الجزيئات الحيوية كالدهون و البروتينات و الكاربوهيدرات ومنعها من هدم الفيتامينات والتي تزيد من مناعة الجسم [4] .

والعسل معروف لمعظم الناس كمادة غذائية مهمة لجسم الإنسان وصحته، كما أقر العلم الحديث المتوارث الحضاري حول كون عسل النحل مضاد حيوي طبيعي ومقوى لجسم الإنسان (يقوى جهاز المناعة الذي يتولى مقاومة جميع الأمراض التي تهاجمه [5]

الهدف من البحث:

التوصـــل الـــى تقنيـــة حديثـــة ولاول مـــرة فـــي العـــراق لانتـــاج عســـل نحـــل بمكونـــات فعالـــة للتمـــر الزهـــدي ذات الاهمية الطبية ودراسة الفعالية المضادة للاكسدة والمضادة للاحياء المجهرية والمضادة للالتهابات.

2- المواد وطرائق العمل

تحضير مستخلص التمر المائي

تم نقع 700 غم من التمر الزهدي الطري في لترين ونصف من الماء المقطر المعقم البارد ويوضع في الثلاجة لمدة 24 ساعة وبعدها يخلط في الخلاط ويرشح ثم يتم تركيزه باستخدام المبخر الدوار

تحضير مركزات تغذية النحل

تم تحضير ثلاث تراكيز من المستخلص المائي للتمر الزهدي. وخصصت ثلاث خلايا نحل لتغذيتها لكل تركيز ووضع برنامج بشكل جدول لتحديد التركيز الافضل . استخدمت ثلاث خلايا لكل معاملة وحرصنا على ان تكون الخلايا بنفس القوة لكي نحصل على نتائج بعيدة عن الخطأ بالاضافة الى ثلاث خلايا سيطرة .

دراسة السمية للعسل المدعم طبيعيا

تم استخدام 39 جرذ مختبري تم تقسيمها الى مجموعتين المجموعة الاولى تم تجريعها بالتراكيز الاتية بالانبوب الخاص بالتجريع (1000,100,10) ملغم / كغم اما المجموعة الاخرى تم تجريعها بتراكيز مختلفة. بعد التجريع لمدة 24 ساعة تم انتخاب ثلاثة جرذان من كل مجموعة عشوائيا يتم تشريحها والثلاثة الباقية من كل مجموعة يتم تشريحها بعد مرور 21 يوم من التجريع اليومي ويتم دراسة السمية من خلال ملاحظة التغيرات النسيجية للكبد والكلى ويتم مقارنتها بالسيطرة

-الكشف عن مكونات للتمر الزهدي وللعسل الطبيعي المدعم بالمكونات الفعالة للتمر الزهدي والغير مدعم.

تقدير الرطوبة والرماد, والسكريات والرقم الهيدروجيني و المعادن : تم التقدير حسب ما ذكر في [6].. فحص اللون: قدر بواسطة جهاز الامتصاص الضوئي على طول موجي 520 نانومتر.

-الكشف عن الفعالية المضادة للاكسدة

اتبعت طريقة [7] في الكشف عن الفعالية المضادة للاكسدة باستخدام الجذور الحرة المتولدة من diphenylpicrylhydrazyl (DPPH) لكل من للتمر الزهدي وللعسل الطبيعي المدعم بالمكونات الفعالة للتمر الزهدي والغير مدعم.

-الكشف عن قابلية العسل المدعم في ازالة الجذور الحرة في داخل جسم الكائن الحي وتقييم فعالية الانزيمين انزيم الكلوكاثايون بيروكسيديز و انزيم السوبر اوكساید ديسميوتيز. Glutathione peroxidase (GPx) و Superoxide dismutase (SOD).

اتبعت طريقة [8] للكشف عن قابلية العسل المدعم بالمكونات الفعالة للتمر الزهدي اذ تم استخدام مادة رابع كلوريد الكاربون كمادة سامة مولدة للجذور الحرة في داخل جسم الكائن الحي. وقد استخدم في هذه التجربة خمسة وعشرون جرذ قسمت الى خمس مجاميع كالاتي :

المجموعة الاولى

(a) (السيطرة) تم تجريعها جرعة ماء بتركيز (1مل/كغم) فموياً.

(b) (السيطرة) جرعت (1:1) البارافين السائل: رابع كلوريد الكاربون

المجموعة الثانية

(a): جرعت (200) ملغم/ كغم) من مستخلص التمر الزهدي

(b) جرعت من مستخلص التمر + رابع كلوريد الكاربون

المجموعة الثالثة

(a) جرعت (200 ملغم/كغم) من العسل الغير مدعم.

(b) جرعت من العسل الغير مدعم + رابع كلوريد الكاربون

المجموعة الرابعة

(a) تم تجريعها بالعسل المدعم (200 ملغم/كغم)

(b) جرعت بالعسل المدعم + رابع كلوريد الكاربون

قياس فعالية الانزيمات المضادة للاكسدة في داخل جسم الكائن الحي

تم قياس فعالية انزيم الكلوكاثايون بيروكسيديز (GPX) وفعالية انزيم السوبر اوكساييد ديسميوتيز (SOD، استخدمت العدة التشخيصية (Randox Laboratories, Ireland).

- ***تقدير المكونات الكيميائية للعسل***

اتبعت طريقة (9) في تقييم المكونات الفعالة للعسل المدعم بالمكونات الفعالة للتمر الزهدي. استخدام تقنية ال GC–Mass في الكشف عن مكونات العسل المدعم.

- ***فحص الفعالية المضادة للالتهابات***

تم اذابة العسل المدعم والدواء القياسي بمادة الداي مثيل فورمامايد وذلك لاذابة المادة الفعالة للدواء القياسي البرفين ويتم تخفيفه في بفر الفوسفات باس هيدروجيني 7.4 ويكون تركيز الداي مثيل فورمامايد 2.5% في كل التخفيفات ويضاف امل من املي مولار من الالبومين المحضر ببفر الفوسفات ويحضن بدرجة 27 درجة مئوية ولمدة ربع ساعة ويتم استحثاث دنترة الالبومين بتعريض الانابيب الحاوية على تراكيز مختلفة من العسل المدعم مع الدواء القياسي البروفين ويتم احتساب تثبيط عملية الدنترة مقارنة بفحص السيطرة الخالية من العسل ومن دواء البروفين باستخدام القانون :

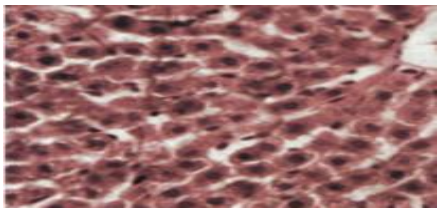
$$inhibition= 100x \{ Vt/Vc -1\}$$

3-النتائج والمناقشة :

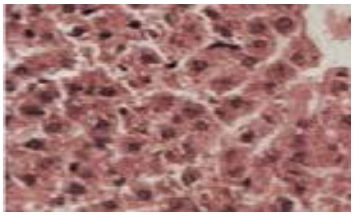
بعد تجريع الحيوانات بالمستخلص المائي ولمدة 21 يوم تم متابعة السلوك الفيزياوي كل الحيوانات تحت التجربة وقد اظهرت تصرفات طبيعية كما اظهرت الفحوصات النسيجية للكبد والكلى للحيوانات المختبرية المعاملة باستخدام المستخلص المائي بعد مرور 21 يوم مقارنة بالحيوانات السيطرة باستخدام الفحص المجهري اذ تبين بانه لاتوجد اي تغيرات نسيجية عند تجريع

الحيوانات ولمدة 21 يوم، كما وجد ان الحيوانات المختبرية ذات تحمل جيد للعسل المدعم وتبين ذلك من خلال عدم وجود التغيرات النسيجية وعدم وجود وفيات من الحيوانات تحت التجربة.

ويوضح الشكل (1) و (2)مقطع نسيجي لاعلى تركيز مستخدم تحت التجربة 3000 ملغم / كغم للكبد والكلى مقارنة بالسيطرة



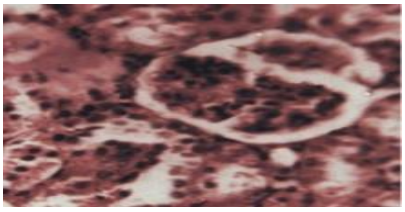
أ- مقطع نسيجي لكبد جرذ سيطرة غير معامل على قوة تكبير Mag X 250



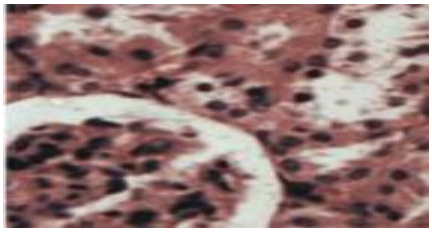
ب- مقطع نسيجي لجرذ معامل ب3000 ملغم / كغم على قوة تكبير Mag X 250

شكل (1): مقاطع نسيجية لكبد جرذ

أ- سيطرة ب- معامل ب 3000 ملغم/كغم



أ- مقطع نسيجية لكلى جرذ معامل ب 3000 ملغم/كغم



ب- مقطع نسيجية لكلى جرذ السيطرة

شكل (2): مقاطع نسيجية لكلى جرذ على قوة تكبير Mag X 250

أ- معامل ب 3000 ملغم/كغم ب- سيطرة

يبين جدول رقم (1) المحتوى السكري والتركيب الكيمياوي للتمر الزهدي. اذ وجد ان النسبة المئوية للرطوبة والسكريات الكلية والمختزلة السكروز ، الكلوكوز، الفركتوز، المواد الصلبة الذائبة ، المواد الصلبة الغير ذائبة ، الحموضة النشطة، البروتين، الدهون، الرماد الالياف ، 80، 74، 5.9، 38، 35، 82، 12، 6، 2.2، 0.37، 1.7، 1.9 %، على التوالي, وهذا يتفق مع نتائج [9].

جدول (1): المحتوى السكري والتركيب الكيمياوي للتمر الزهدي

Chemical content of *Phoenix dactylifera L.*	
Content	%
Moister	8
Total Sugar	80
Reducing Sugar	74
Sucrose	5.9
Glucose	38
Fructose	35
Soluble material	82
Non Soluble material	12
Active Acidity	6
Protein	2.2
Lipids	0.37
Ash	1.7
Fiber	1.9

يبين جدول رقم (2) مسح لمكونات الفعالة للمستخلص المائي للتمر الزهدي، العسل الغير المدعم بالمكونات الفعالة للتمر الزهدي ، والعسل المدعم بالمكونات الفعالة للتمر الزهدي، اذ اظهرت النتائج بانه كل النماذج تحت الدراسة المذكورة في اعلاه تحتوي المكونات الفعالة التالية : الفينولات ، الالكلويدات الفلافونات ، السكريات المختزلة, الصابونيات، الستيرويدات، التربينويدات, غير ان تركيز المكونات الفعالة المذكورة كانت اعلى في العسل المدعم بالمكونات الفعالة للتمر الزهدي كما هو واضح في الجدول أدناه.[7] .

جدول (2): يبين مسح للمكونات الفعالة لمستخلص التمر المائي، العسل الغير مدعم والعسل الدعم.

Active phytocomponent	*Phoenix dactylifera* Fruit water extract	Honey non supported with Date fruit active component	Honey supported with Date fruit active component
Phenolics	++	++	+++
Alkaloids	+++	+++	++++
Flavonoids	++	++	++++
Reducing sugars	+++	+++	+++
Saponins	++	++	+++
Steroids	++	++	++
Terpenoids	+++	+++	+++

كما بين جدول (3) الفينولات الكلية والفلافونات لمستخلص التمر المائي، العسل الغير مدعم والعسل المدعم بمكونات التمر الفعالة . اذ وجد ان تركيز الفينولات في النماذج تحت الدراسة 12.33 ، 15.25، 19.25على التوالي. اما تركيز الفلافونات 17.83،20.88، 27.68 على التوالي. واوضحت النتائج ان العسل المدعم بالمكونت الفعالة للتمر الزهدي يحتوي على اعلى تركيز من المكونات الفعالة المذكورة [8,9].

جدول (3): تحديد الفينولات الكلية والفلافونات لمستخلص التمر المائي، العسل الغير مدعم والعسل الدعم بمكونات التمر الفعالة

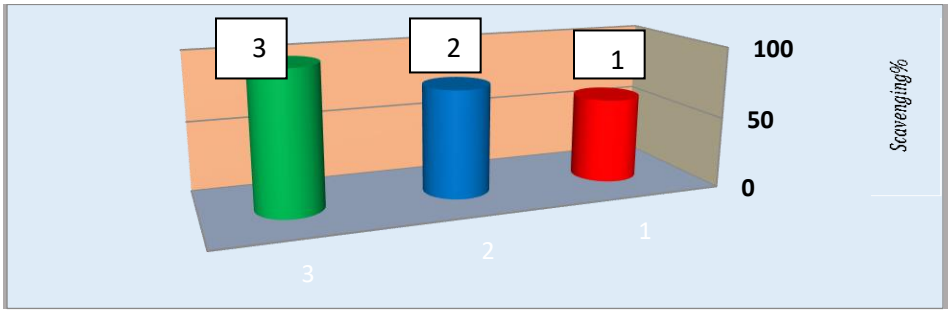
Material	**Total Phenols (mg of GAE/g dw)**	**Total Flavonoids**
Phoenix dactylifera Fruit water extract	12.33± .0.031	17.83± .0.07
Honey non supported with Date fruit active component	15.25± .0.058	20.88± .0.064
supported with Date fruit active component	19.25± .0.042	27.68±0.08

يبين جدول (4) النسب المئوية لمكونات العسل كالاتي: الفركتوز، الكلوكوز، الماء، المالتوز، الكاربوهيدرات العليا، السكروز، المعادن. . .37.93، 30.9، 16.95، 6.94، 3.9، 1.5، 0.49%، على التوالي هذا دليل ان المكونات السكرية والمعادن الموجودة في العسل المدعم بمستخلص التمر الزهدي تقع ضمن الحدود الطبيعية دليل على جودة العسل المنتج وتطابق نسبة السكريات مع المعادن بالنسب الطبيعية للعسل الطبيعي [10].

جدول (4): النسب المئوية لمكونات العسل

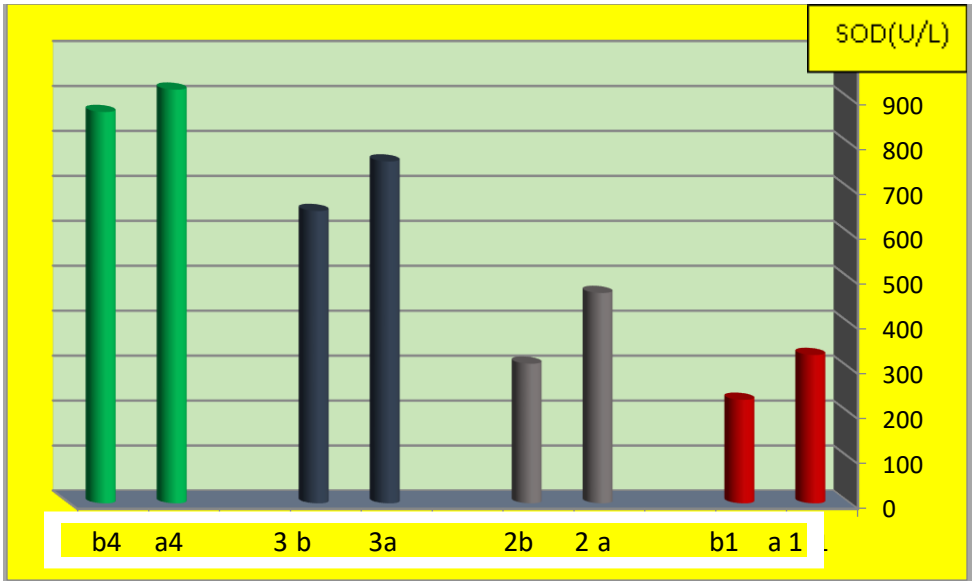
No	*Honey component	%
1	Fructose	37.93
2	Glucose	30.9
3	Water	16.95
4	Maltose	6.94
5	Higher Carbohydrates	3.9
6	Sucrose	1.5
7	Minerals	0.49

يبين شكل (3) الكشف السريع عن ازالة الجذور الحرة, اذ وجد ان العسل المدعم بمكونات فعالة للتمر ذو فعالية عالية جدا في ازاحة الجذور الحرة يليه العسل الغير مدعم واخيرا مستخلص التمر 98.34، 76.25، 60.47 % على التوالي اذ ان . وجد عند الكشف عن المكونات الفعالة في العسل المدعم طبيعيا زيادة في تركيز الفينولات والفلافونات والتي لها دور كبير في ازاحة الجذور الحرة [11,12].



شكل (3): يبين قابلية مستخلص التمر المائي، العسل الغير مدعم والعسل الدعم بمكونات التمر الفعالة في ازاحة الجذور الحرة 1- مستخلص التمر، 2- عسل الغير مدعم ، 3 - العسل المدعم .

يبين شكل رقم (4) فيه دراسة فعالية الانزيمات (SOD) في داخل جسم الحيوانات المختبرية, اذ وجد عند اجراء المعاملة بمادة CCl_4 انخفضت فعالية الانزيم (SOD) ، اذ ان المجموعة الرابعة من الحيوانات المختبرية اعطت اعلى فعالية 920.31U/Lعند تجربة (a) اي فعالية انزيم (SOD) بدون اي معاملة ولكن عند معاملة الحيوانات المختبرية بمادة CCL_4 كانت 870.6 U/L مقارنة بالمعاملات الاخرى اذ كانت المجموعة الاولى (a) 330، 230.3(b) ، المجموعة الثانية : 468 (a)، 310.54(b)، المجموعة الثالثة: 760.25(a)، 645(b)، على التوالي.

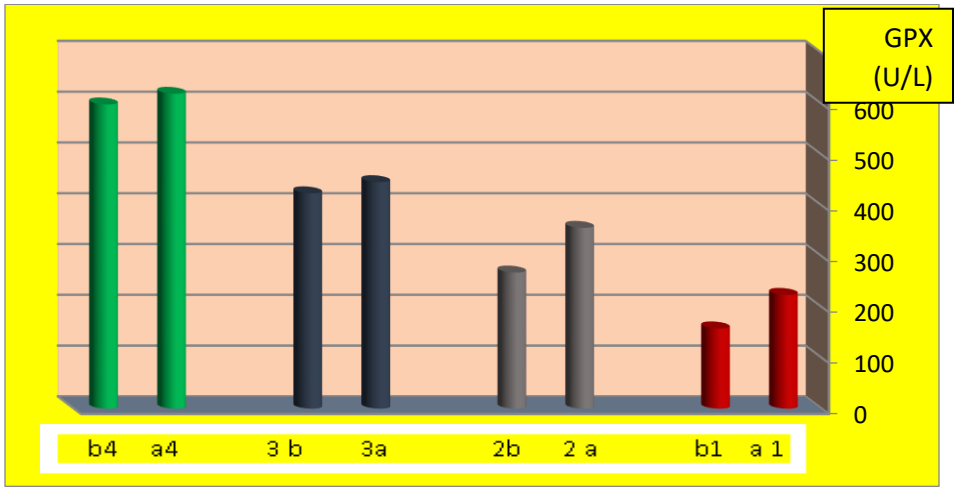


شكل (4): فعالية انزيم سوبر اوكساید دسميوتيز (Super oxide Dismutase)

كما يبين الشكل (5) فيه دراسة فعالية الانزيمات (GPX) في داخل جسم الحيوانات المختبرية, وجد عند اجراء المعاملة بـ CCl_4 انخفضت فعالية الانزيم (GPX) . أذ وجد ان المجموعة الرابعة عسل مدعم بالمكونات الفعالة للتمر الزهدي من الحيوانات المختبري اعطت اعلى فعالية 920.31U/Lعند تجربة (a) اي فعالية انزيم (SOD) بدون اي معاملة ولكن عند معاملة الحيوانات المختبرية بمادة CCL_4 كانت 870.6 U/L مقارنة بالمعاملات الاخرى اذ كانت المجموعة الاولى (a) 330، 230.3 (b) ، المجموعة الثانية : 468 (a)، 310.54(b)، المجموعة الثالثة: 760.25 (a)، 645(b)، على التوالي . تم قياس SOD و GST كمؤشرحالة مضادات الأكسدة في الأنسجة, ان انخفاض فعالية انزيمات الكبد بشكل كبير في الفئران المعاملة بمادة CCl4 بالمقارنة مع مجموعة السيطرة الطبيعية والمعاملة بالعسل المدعم بمكونات التمر الزهدي اذ اظهر ت اعلى قراءات

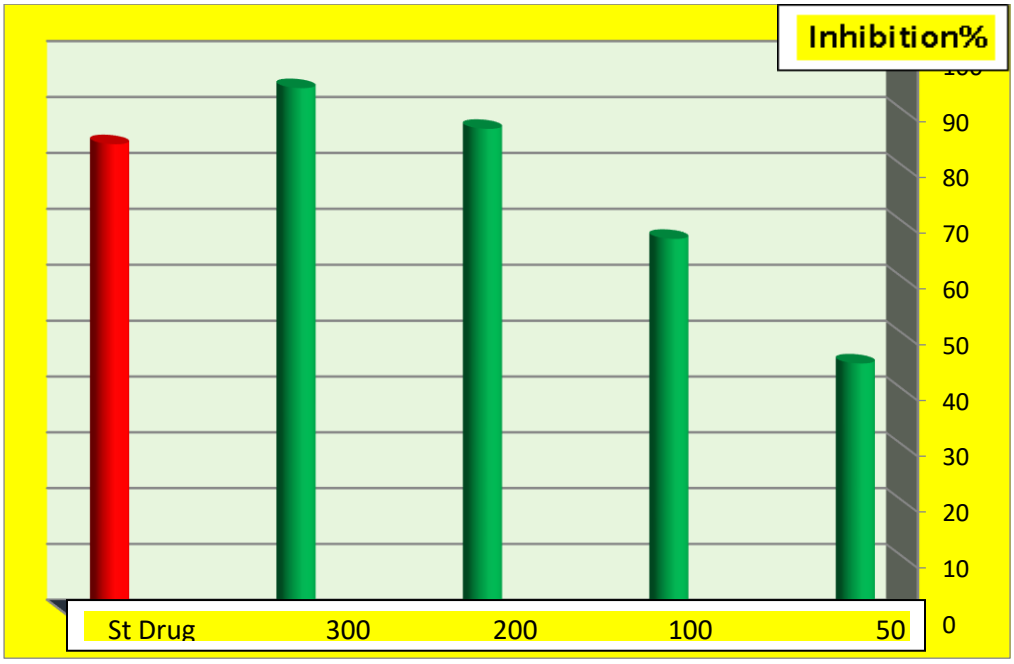
. نتيجة للجذور الحرة التي ادت تلف الكبد [11].

وقد أفيد أن اكسدة اللبيدات في الاغشية البلازمية للخلايا هو المصدر الرئيسي لسمية الكبد الناجم عن CCl4 والذي يؤدي الى تولد الجذور الحرة تؤدي الى زيادة كبيرة في كمية Thiobarbituric acid reactive substances (TBARS) ، ولكن اظهر العسل المدعم بمكونات التمر الزهدي فعالية عالية جدا في زيادة فعالية الانزيمين ال SOD و GPX وهذا دليل الى اصلاح انسجة الكبد من المحتمل ان يعود ذلك لوجود المواد المضادة للاكسدة التي كان لها الدور الكبير في ازاحة الجذور الحرة المتكونة بسب مادة ال CCl_4 [12] ، واثبتت الدراسات ان الانزيمين (GPX)و (SOD) مهمين لحماية الكبد [13,14].



شكل (5): فعالية انزيم Glutathione peroxidase (GPX)

يبين شكل (6) فعالية العسل المدعم بالمكونات الفعالة للتمر الزهدي كمضاد للالتهابات مقارنة بالعقار القياسي البروفين اذ وجد ان تركيز 200 ملغم /مل من العسل المدعم اعطى فعالية تثبيط 94.6% مقارنة بالعقار القياسي البروفين المستخدم قيد التجربة84.57%. كما اشارت نتائج تثبيط دنترة الالبومين تزداد بزيادة تراكيز العسل المدعم . من المحتمل ان يعود ذلك لوجود تراكيز عالية من الفينولات والفلافونات التي يكون لها دور في تثبيط دنترة الالبومين وهذا يتفق مع المصدر رقم [15].



شكل (6): يبين فعالية العسل المدعم بالمكونات الفعالة للتمر الزهدي والبروفين كمضاد للالتهابات

No	Chemical Component	Control Honey	Date Pame Fruit	Supported Honey
1	3-tet-butyl-2-oxo-1,3oxazolidin			+
2	Docosanoic Acid		+	
3	Pyridine	+		
4	4-H-pyran-4-one,2,3dihydro-3,5dihydroxy-3,5-dihydroxy-6-methyl			+
5	2-Furancarboxaldehde,5-(hydroxymethyl)			+
6	3-Methyl-2-buten-1-	+		
7	Eicosanoic Acid		+	
8	Alpha-D-Glucopyranoside,			+
9	3,4-Anhydro-d-galactosan			+
10	2-Oxabicyclo[2.20]hex-5-en-3-one			+
11	n-Hexanal	+		
12	Alpha-D-Glucopyranoside			+
13	Aspargine		+	
14	2-Furanmethanamine			+
15	Aspartic Acid		+	
16	Cis-4-Decenal			+

17	Octane	+		
18	13-Docosenamide			+
19	2-Furaldehyde	+		
20	Glucose Glutamic Acid		+	
21	Furfurylalcohol	+		
22	1,2-Benzendicarboxylic acid,diisooctyl ester			+
23	Hexadecanoic Acid		+	
24	Linolenic Acid			
25	n-Hexanol	+		
26	Heptadecanoic Acid		+	
27	n-Nonane	+		
28	Benzylalcohol	+		
29	Phenylacetaldehyde	+		
30	Cadeonic Acid		+	
31	Heptanoic acid		+	
32	n-Nonanal	+		
33	2-Phenylethanol	+		
34	Coumarin	+		

جدول (5): يمثل نتائج فحوصات المكونات الفعالة للعسل المدعم بالتمر باستخدام جهاز الـ GC-Mass

يبين جدول (5) نتائج فحوصات المكونات الفعالة للعسل المدعم بالتمر باستخدام جهاز الـ GC-Mass . اذ وجد ان هناك مكونات فعالة جديدة ظهرت في العسل المدعم باستخدام جهاز الـ GC-Mass مقارنة بالمكونات الفعالة لكل من التمر الزهدي وعسل السيطرة كما مبين في جدول (5) اذ ظهرت مكونات ذات اهمية طبية وتضمنت

3-tert- butyl-2-oxo-1,3Oxazolidine, Alanine, N, allyloxycarbonyl- butyl ester, 4. 4, 6-Trimethyl/ tetrahydro-1,3- Oxazine-2, one, 4H-pyran, dihydrox-6- methyl, 2 propyl-tetra hydro pyran-3-One

تبين, هذه الدراسة بأنه قد تم التوصل الى طريقة ذات جدوى اقتصادية لكونه يمكن الاستفادة من التمر الزهدي لانتاج حصيلة عالية من العسل ذو الاهمية الطبية مقارنة لما قد ثبت في الدراسات السابقة ولاهميته الطبية تم استكمال دراستنا في دراسة فعالية مضادات الاكسدة ووجد انها فعالة جداً في ازالة السمية الناتجة عن الجذور الحرة وذلك يعود لاحتواء تركيبه الكيميائي على عدد كبير جداً من الاواصر المزدوجة وبذا سوف يكون هذا البحث ذا جدوى لانتاج مادة فعالة مهمة للوقاية من السرطانات والامراض المزمنة الاخرى بالاضافة الى خفض الكولسترول وحماية الكبد والقلب من الجهد التأكسدي الذي يتولد عن وجود الجذور الحرة في جسم الانسان [15].

يبين جدول (6) المكونات الفعالة في العسل المدعم بالمستخلص المائي للتمر الزهدي اذ ان معظم المكونات ذات اهمية طبية اذ وجد ان هناك العديد من المواد الطبية التي ظهرت في المنتج الجديد ولم توجد في مستخلص التمر او العسل الطبيعي ومن المحتمل يعود ذلك لتغذية النحل على المكونات الفعالة للتمر الزهدي مما ادى الى زيادة الفعالية المضادة للاكسدة للعسل المنتج وفائدته العلاجية [16-20].

يبين جدول (6) المكونات الفعالة المشخصة باستخدام جهاز ال GC- MASS للتمر الزهدي وعسل السيطرة والعسل المدعم بالمكونات الفعالة للتمر الزهدي

جدول (6): المكونات الفعالة في العسل المدعم بالمستخلص المائي للتمر الزهدي

Peak No.	R.Time	Compound Name	Formula	Mol. Weight
1	7.756	3-tet-butyl-2-oxo-1,3oxazolidin	$C_7H_{13}NO_2$	143
2	8.975	4-H-pyran-4-one,2,3dihydro-3,5dihydroxy-3,5-dihydroxy-6-methyl	$C_6H_8O_4$	144
3	10.742	2-Furancarboxaldehde,5-(hydroxymethyl)	$C_6H_6O_3$	126
4	12.042	Maltotriose	$C_{18}H_{32}O_{16}$	504
5	13.375	3,4-Anhydro-d-galactosan	$C_6H_8O_4$	144
6	15.842	2-Oxabicyclo[2.2.0]hex-5-en-3-one	$C_5H_4O_2$	96
7	19.392	Alpha-D-Glucopyranoside	$C_6H_{12}O_5$	164
8	19.783	2-Furanmethanamine	C_6H_9NO	111
9	21.233	Cis-4-Decenal	$C_{10}H_{18}O$	154
10	23.383	13-Docosenamide	$C_{22}H_{43}NO$	337
11	24.958	1,2-Benzendicarboxylic acid, diisooctyl ester	$C_{24}H_{38}O_4$	390

4- الاستنتاجات :

تم تحضير منتج جديد من العسل المدعم بالمكونات الفعالة للتمر الزهدي , وجودة عالية وذلك لكون نسب السكريات والمعادن مطابقة للمواصفات القياسية ذو فعالية عالية في ازاحة الجذور الحرة المتولدة من مادة الDPPH بالاضافة الى ذلك وجد ان له دور في زيادة فعالية انزيمات الكبد SOD و GPX في اعادة بناء انسجة الكبد وازاحة التاثير المتسبب من مادة CCl_4 المولدة للجذور الحرة في داخل حسم الكائن الحي بالاضافة لذلك وجد ان العسل المدعم له دور في خفض نسبة الدنترة للالبومين وهذا من المحتمل ان يدل على فعالية العسل في خفض نسبة اللالتهابات. وجد ان العسل المنتج يحتوي على مكونات جديدة تختلف عن المكونات الموجودة في عسل السيطرة ومستخلص التمر وذات فعالية دوائية مثل:

3-tet-butyl-2-oxo-1,3 oxazolidine, 4-H-pyran-4-one,2,3dihydro-3,5dihydroxy-3,5-dihydroxy -6-methyl, 2-Furancarboxaldehde,5- (hydroxymethyl), Maltotriose, 3,4-Anhydro-d-galactosan, 2-Furanmethanamine, Cis-4-Decenal, 1,2-Benzendicarboxylic acid, diisooctyl ester, Alpha-D-Glucopyranoside

جدول بالمختصرات

ت	الاسم العلمي	المختصرات
1	Gas Chromatography - Mass Spectroscopy	GC-Mass
2	Diphynel Picryl Hydrazine	DPPH
3	Tetra Carbone Chloride	CCL4
4	Super Oxide Dismutase	SOD
5	Glutathione peroxidase	GPx
6	Unit per liter	U/L
7	Thiobarbituric Acid reactive Substances	TBARS

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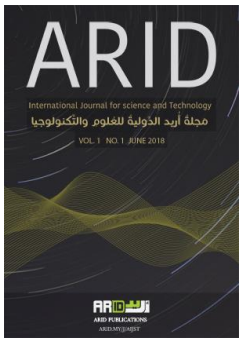

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THE EFFECT OF *CUMINUM CYMINUM* SEEDS IN INCREASING PRODUCTION AND IMPROVING THE QUALITATIVE AND QUANTITATIVE PROPERTIES OF IRAQI FUNGI *PLEUROTUS OSTREATUS*

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تاثير بذور الكمون *Cuminum Cyminum* في زيادة الكفاءة الإنتاجية وتحسين الخواص الكمية و النوعية للفطر المحلي العراقي *Pleurotus ostreatus*

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ABSTRACT

In this research, three different experiments were conducted to identify the effect of Cumin seeds water extraction on Iraqi local oyster mushroom *Pleurotus ostreatus* (ID: MF065714.1) regarding growth, production efficiency, and shelf life. The study found that improving antioxidant properties of the fungi played a positive role in raising production efficiency and prolonging storage age.

The first experiment was performed to identify the effect of different levels of water extraction from Cumin seeds powder (at concentrations of 5%, 10%, and 20%) on the oyster mushroom productivity. In the second experiment, storage capability for the fungi fruiting bodies was examined. The last experiment was done to study the effect of nutrition at the previous levels labeled (S0, S1, S2, and S3) in improving the antioxidant properties on the fruiting bodies before and after storage process.

The results of this research showed that nutrition content of cumin seeds water extraction (at a concentration of 20%) was the best in improving many properties such as wet weight (560.89 gm/ kg), dry weight (56.74gm/ kg), bioefficiency (56,08%), protein (30.60%), carbohydrates (38.20%) and phenolic substances percentage (0.424mg/g). In addition, nutrition content led to reduce the loss of weight percentage, protein percentage and carbohydrates percentage, as well as elongation fungus storage age by increasing its antioxidant capacity.

Keywords : Iraqi Fungi, *Pleurotus ostreatus,* , antioxidant , production efficiency, storage age.

الملخص

تم إجراء عدة تجارب للتعرف على تأثير المســـتخلص المائى لبذور الكمون في نمو وإنتاج الفطر المحاري المحلي العراقي *Pleurotus ostreatus* (ID:MF065714.1) . وقد تبين بشكل واضح الدور الإيجابي الذى يلعبه المستخلص المائي لبذور الكمون فى رفع كفاءة الإنتاج، وإطالة العمر الخزني للفطر المحاري في العراق من خلال تحسين فعلها المضاد للاكسدة.

في هذا البحث تم إجراء ثلاث تجارب مختلفة . التجربة الأولى : شملت دراسة تأثير التغذيه بمستويات مختلفة من المستخلص المائى لمســحوق بذور الكمون (5% , 10%, 20%) في القابلية الإنتاجية للفطر المحاري، والقابلية الخزنية للأجســام الثمرية للفطر كتجربة ثانية. بينما تناولت التجربة الثالثة تأثير التغذية بالمســتويات الســابقة والتى رمز لها(S3,S2,S1) في تحســين الفعالية المضادة للاكسدة للأجسام الثمرية الناتجة قبل وبعد عملية الخزن.

ومن خلال تلك التجارب تم التوصل إلى أن التغذية بالمستخلص المائي للكمون (في مستوى 20%) ساعد على تحسين العديد من الخصـــائص بدءًا من الزيادة الملحوظة فى كل من: الوزن الرطب (560,89 غم/كغم) , الوزن الجاف (56,74 غم/كغم), الكفاءة الحيوية (56,08%) , النســبة المئوية للبروتين (30,60%) الكاربوهيدرات (38,20%) والمواد الفينولية (0,42 ملغم/غم) . إضافة إلى تقليل نسبة الفقد فى الوزن و البروتين والكاربوهيدرات وصولاً إلى اطالة العمر الخزنى للفطر المحارى من خلال رفع قابليته المضادة للاكسدة.

1. Introduction

Pleurotus species are edible mushrooms, commonly known as oyster mushrooms with excellent flavor and taste [1]. Usually, they are not attacked by both diseases and pests, and their cultivation does not require sophisticated control at the growing environment. However, they are cultivated in a cheap and easy way. In addition, the mushroom can be used for livestock feed, extraction of enzymes, and medicinal compounds [2].

Oyster mushroom grows widely in the tropical and subtropical rainforests, and its cultivation has increased tremendously throughout the world during the last few decades [3]. It contains a number of nonspecific lignocellulosic enzymes [4] which have a major impact on the development and growth of the mushroom. The nature and nutrient constituent of the mushroom substrate also have an effect on the mycelium growth, mushroom quality and crop yield. That means, the existence of useful substrates is essential to promote satisfactory yield of the mushrooms [5].The useful substrates should consist of nitrogen supplement and carbohydrates in order to promote rapid growth of the mushroom [6]. In most cases, the substrates do not have nitrogen which is required by the mushroom to grow optimally. Hence the need for nitrogen supplementation is important to achieve ideal growth [7].

Cumin Cyminum is considered an effective supplement in improving mushroom's productivity and nutritional value of (carbohydrates, protein, fat, fiber, vitamins and mineral elements) [8]. Extracts that are obtained from Cumin seeds are also of medicinal importance due to their content of inhibitory substance of bacteria such as Limonene, α- ,β pinenes and methyl eugenol. On the other hand, Cumin water extracts are considered as antioxidants [8], [9].

Therefore, the aim of this study was to highlight the utilizing of Cumin Cyminum as a supplement to improve quantity and quality of the Iraqi oyster mushroom *(Pleurotus ostreatus*).

2. Material and Method

1- The research was carried out at the Mushroom Laboratory of Medical and Aromatic plant unit and Food Sciences Department, University of Baghdad.

2- *Pleurotus ostreatus* (ID: MF065714.1) spawn were activated using tissue culture method [10],[11]. Fungal spawn was grown on solid wheat seeds.

3- Disinfectants were prepared using 2% commercial formaldehyde (concentration 37%) and Bavistin fungicide in a concentration of 100 ppm were added to water.

4- Wheat straw was prepared after soaking it in water and used as a medium contained 1g/L nitrogen from urea and 0.3g/l potassium from potassium sulphate as nutrients.

Soaking process of the wheat straw was continued (about 20 hours), next day the wheat straw was spread in a clean place to remove formaldehyde by evaporation. The straw was packed in transparent plastic bags with dimensions of 30 x 51 cm. Each bag contained one kilogram of sterile wet straw (moisture about 50%). The pre-prepared fungal spawn were added (5% to each bag). After fastening the incubation bags, they were placed on dedicated shelves in an incubation chamber. The temperature of the incubation chamber was fixed at 2 ± 25 ° C until the growth of fungal tissue was completed on all the wheat straw bags (3 weeks). After that, the following experiments were performed:

Experiment (1): Effect of different levels of nutrition substrates of water extraction on potential production of oyster mushroom:

Cumin water extraction was prepared by mixing 1 kg cumin seeds with 4 litters of distilled water in a glass beaker, and then placed in an ultrasound device for 60 minutes with frequencies 40 khz / min at 40°C[12].

The water extraction was filtered through Watman filtration paper No. 1, the filtered water extraction was concentrated using a rotary evaporator device. Three concentrates were prepared 5, 10, and 20%, indicated by S1, S2 and S3, respectively, as well as the control (comparison) which is indicated as S0.

These concentrations were used and added to the mushrooms production medium in the plastic bags (completed fungal Mycelium growth). The additive process of the concentrations above was done by injecting the medium with 50 ml of the extract from four sides to ensure homogeneous distribution of the extract in the medium. This experiment was compared with an experiment of the production of mushrooms without treatment. Fruiting bodies were harvested whenever a reasonable amount of them were formed.

Experiment (2): Effect of nutrition substrates of the cumin seeds water extraction at different levels on the reservation capability of the oyster mushroom fruiting bodies:

100 g of homogeneous fruiting bodies obtained from the first experiment were taken and placed in plastic containers prepared for this purpose and sealed with transparent plastic films. Then, plastic films were stored in temperate incubators prepared for this purpose for two weeks at a temperature of 1 ± 2 ° C to determine the fruiting bodies storage ability. The required measurements were taken at the end of the storage period.

Experiment (3): Effect of nutrition substrates of the Cumin seeds water extraction at different levels in improving fruiting bodies antioxidant action before storage (experiment1) and after storage (experiment 2) by following the steps bellow:

a- Drying of Fruiting bodies: Fresh and stocked mushrooms fruiting bodies (from experiment 1 and 2) were cut into small pieces, and placed in perforated paper bags, then dried using thermal

ovens with air fan at 50°C till reaching weight stability. After that, the dried fruiting bodies were crushed using an electric mill. The powder was saved in sealed plastic bags.

b- Preparation of Water extraction: the method of Chechan and others [10] were followed by mixing 10 g of oyster mushrooms powder with 200 ml of distilled water and put in a shaker incubator for 24 hours at a temperature of 52°C. The solution was filtered through Watman NO 4 filter paper using funnel with discharge. The extraction was concentrated using rotary evaporator, and the obtained extraction was dried in a petri dish and put in an electric oven at 37 °C. Dried powder was scrapped and collected in clean and dry bottles and refrigerated.

c- Performance evaluation of dried extracts of oyster mushroom as an antioxidant:

Thiobarbituric acid (TBA) was estimated before and during storage according to the Abood method and others [13],[14]. The incubated mixture was prepared by mixing 100 ml of ethanol at a concentration of 95%, fatty acid linolenic at a concentration of 0.042 molar, 100 ml of phosphate buffer (PH 7), and 50 ml of distilled water. The mixture was placed in an incubator at 50 ° C for 15 days. This mixture represented zero experimental mixture.

The incubated mixture of the four extracts of the oyster mushrooms S1, S2, S3 and S0 obtained from (Experiment 1 and Experiment 2) consisted of the same previous content by adding 2 ml of each to 50 ml of distilled water.

Mononaldehyde concentration was estimated by mixing 5 ml of incubated mixture with 5 ml of TBA reagent (prepared by dissolving 0.2883 g TBA in 100 ml acetic acid in a test tube with stirring and heating in boiled water bath for 35 min). Optical absorption was read on a wavelength 538 nm, and the concentration was calculated using following mathematical equation:

Mononaldehyde concentration (ml/kg) = Optical absorption× 7.8

Characteristics studied:

1- Total fresh wet of fruiting bodies g/kg: This was done by collecting all the fruit bodies produced from one plastic bag containing half a kilogram of dry hay (1kg wet) and it was expressed on the basis of a gm / kg medium.

2- Percentage of dry material %: The dry material ratio was extracted using the following equation [15]:

% dry material = dry weight of fruiting bodies / fresh weight of Fruiting bodies × 100

3-Biological Efficiency %: This was measured according to the following [6]:

Biological Efficiency= fresh weight of Fruiting bodies / dry weight average × 100

4-Total dry weight (gm/kg) = Total fresh weight × percentage of dry material / 100

5-Harvesting number: Fruiting bodies were harvested whenever they were ready to be harvested. It was indicated as (number of harvesting per each duplicate).

6- Weight of fruiting bodies (gm): it was measured according to the following equation:

Weight average of a fruiting body = the total weight of fruiting bodies (gm)/ number of total fruiting bodies per each duplicate.

7-**Average of one harvesting yield (gm):** this was measured according to the following equation:

Average of one harvesting yield= the total of harvestings produced from one kg medium/ number of harvesting.

8-Production cycle (day) = number of the days from the first harvesting until the last harvesting per bag.

9- Percentage of protein%: The percentage of protein was estimated according to the method mentioned in [16]

10- Phenolic substances content of Fruiting bodies before and after storage: Phenols were estimated according to the method mentioned in [11].

11- Carbohydrate substances content of Fruiting bodies before and after storage: Total carbohydrates were estimated in the fruiting bodies according to the method mentioned in [16].

12- Weight loss after storage%: This was calculated according to the following formula:

Weight loss = the weight of fruiting bodies before storage - the weight of fruiting bodies after storage / the weight of fruiting bodies before storage x 100.

13- Damage after storage %: it consisted of the percentage of fruiting bodies that are not suitable for marketing; these damages were calculated according to the following equation:

% damage after storage= the weight of damaged fruiting bodies / Total fruiting bodies weight x 100.

14-The loss of dry materials after storage% = dry material percentage before storage - dry material percentage after storage.

15 Average weights of fruiting bodies (gm): This was calculated using the following equation:

Average weight of fruiting bodies (gm)= total weight of fruiting bodies / the number of fruiting bodies.

16- Protein loss after storage % = Percentage of protein before storage - Percentage of protein after storage.

17-Phenolic materials loss after storage = Fruiting bodies content of phenolic materials before storage - Fruiting bodies content of phenolic materials after storage.

18- Colour Change of fruiting bodies after storage: The change in the colour of the fruiting bodies was observed apparently by naked eye, the colours were divided into six degrees as follow:

1/ white, 2/ yellowish - white, 3/ creamy- yellow, 4/ creamy -brown, 5/ brown, 6/ dark brown. The fruiting bodies were considered physically damaged by the effect of undesirable coloration when its grade was more than 5 to 6 degrees.

19- The loss of carbohydrate content of the f**ruiting bodies** = carbohydrate Content of fruiting bodies before storage - carbohydrate Content of fruiting bodies after storage.

Experimental Design:

Experiments 1, 2 and 3 were analyzed according to the Completely Randomized Design (CRD) using five replicates for the first experiment, and three replicates for both second and third experiments. The averages were measured by least significant difference test (LSD) Significance level was considered as 5% for the tests using the SAS.

3. Results and discussion:

Results on wet and dry total weight, biological efficiency, and dry material percentage are illustrated in table (1). It was found that the total yield based on wet and dry weight increased by increasing the concentration of the water extraction of cumin seeds which reached 560.8, 56.74 g / kg medium in a concentration of 20% (S3). Due to the natural components of the cumin seeds, the increase did not reach saturation level. Also, an increase in the concentration of more than 20% was shown to cause difficulty in cumin seeds powder extraction by ultrasound. The result of the values of biological efficiency and dry material percentage showed continuous increase to 56.08 and 10.18% respectively in a concentration of 20%. This happened after mycelium growth at the end of the incubation stage and the beginning of the fruiting bodies formation, while the control treatment (S0) reached 37.22% and 6.50% respectively at the same concentration. Generally, the increase in the values of dry material and dry yield is an important issue for market needs when the product becomes dry, in this case it is sold as a dry product. This is how many farmers act when the production is increasing comparing with the market needs [5].

Table (1): Effect of nutrition at different levels of cumin seeds water extraction in improving the total yield of the oyster mushroom fruiting bodies before storage

Treatments	Total wet weight gm/kg medium	Total dry weight gm/kg medium	Biological Efficiency B.E%	Dry Material %
Control (S0)	372.2	33.18	37.22	6.50
Concentration 5% (S1)	372.8	25.34	37.28	8.72
Concentration 10%(S2)	416.8	32.98	41.68	8.02
Concentration 20%(S3)	560.8	56.74	56.08	10.18
L.S.D 0.05	150.07	14.332	15.007	1.313

The increase in the values of total wet and dry weight, biological efficiency, and dry material percentage were attributed to several factors; firstly, the nutrient content of cumin seed water extraction. The nutritional content is generally necessary for growth; this content includes protein, carbohydrate and mineral constituents, flavonoids, and alkaloids [8]. It has been detected by several researchers that organic nitrogen-based supplementations had a role in raising overall yield values based on the values of wet and dry weight, biological efficiency, and dry material percentage [16].

Secondly, effective absorption ability of organic supplements helped the fungi to have larger energy used in the growth and fruiting bodies synthesis [17]. Lastly, enzymatic system activity that is responsible for Mycelium growth on the medium was not affected negatively due to its content of organic supplements which did not cause any differential of the medium pH [6].

Table (2): The effect of nutrition at different levels of Cumin seed extract in the improvement of the harvesting, average of one harvesting yield, the number and average weight of fruiting bodies, and the production cycle before storage.

Treatments	No. of Harvestings (Harvestin)	Average of One Harvesting Yield (g)	Number of Fruiting Bodies (Body)	Fruiting Bodies Average Weight (g)	Production Cycle (Day)
Control (S0)	3.6	107.1	36.4	10.24	91
Concentration 5%(S1)	3.0	154.4	30.6	16.14	79
Concentration 10%(S2)	2.4	188.74	26.0	18.36	76
Concentration 20% (S3)	2.0	230.54	15.8	23.18	66
L.S.D 0.05	1.1803	65.922	9.0051	2.7339	6.3526

It can be observed from Table (2) that harvesting number decreased with the increase of the concentration of cumin seeds water extracts. At a concentration of 10% and 20%, the increase reached 2.4 and 2.0 harvestings respectively. While the harvestings number reached 3.6 in the control treatment. It was also observed that the use of high concentrations of cumin seed water extraction led to decrease of fruiting bodies number reached to 15.8 bodies at a concentration of 20%. On the other hand, the control treatment recorded a highest number of fruiting bodies reached to 36.4.

Table (2) also shows that the average of harvesting yield and fruiting bodies weight were increased by increasing the concentration of cumin seeds water extraction reached to 230.34 and 23.18 gm g respectively. While the previous values in the control treatment decreased to 10.24 and 107.1gm respectively. Moreover, the production cycle recorded a positive decrease by increasing the

concentration of cumin extract reached to 66 days at a concentration of 20%. Conversely, the production cycle was higher and recorded to be 91 days in the control treatment.

The above results can be explained according to the action of the important nutritional compounds of cumin seeds content including protein, carbohydrates and mineral elements [8]. In addition, these compounds played an important role in increasing the wheat straw medium decomposition process and exhausting its contents in a short time comparing to the control treatment.

The results in Table (2) are consistent with the findings of [18]. As these results confirmed that nutritional supplements added to the wheat straw medium had a positive role in raising the average of fruiting bodies weight and one harvesting yield, shortening the production cycle time, and reducing production costs. Carbon and nitrogen sources were variant, like molasses, crushed kernel dates, wheat bran, soybean meal, sugarcane, and consumed and none consumed licorice roots.

Table (3): The effect of different levels of nutrition of the Cumin seeds water extraction in improving the percentage of protein, carbohydrates and phenolic substances in the oyster mushroom fruiting bodies before storage

Treatments	Protein%	Carbohydrates%	Phenolic Substances mg/gm
Control (S0)	22.60	27.78	0.196
Concentration 5% (S1)	27.74	34.02	0.212
Concentration 10%(S2)	29.00	38.02	0.388
Concentration 20% (S3)	30.60	38.20	0.424
L.S.D 0.05	0.514	0.511	0.0095

In table (3), it is obvious that there was a significant increase in the nutrition content of the fruiting bodies; protein, carbohydrate and phenolic substances by the increase of the concentration of the Cumin seeds water extraction before storage. The values reached to 30.60, 38.20% and 0.424 mg / gm dry weight respectively in a concentration of 20%.

The above results were found by many researchers. On another word, the high nitrogen content obtained from wheat straw, crushed date kernel, soybean, and Bean seeds water extract, led to increase in the protein proportion in the fruiting bodies of the oyster mushroom [19].

Carbohydrates were found in fruiting bodies in various forms such as Chitin and hemicelluloses like mannans, xylans and Glucan. Carbohydrates played an important role in forming fruiting bodies which are very important to health and many treatments in humans [20]. Besides, the proportion of carbohydrates in fruiting bodies was found to be affected by the ratio and type of nutrients added to the medium. This also explained the reason for the increase in these components when using Cumin seeds.

Phenolic compounds are the most complex chemical compounds in fruits and they are important components of the fungus. These components are of medical benefits as antioxidants, antimicrobial agents, and antiviral drugs [12]. A group of researchers concluded that Cumin seeds water extraction also contained clicosides group. This explains the results obtained in this study that the increase in phenolic substances in the fruiting bodies was correlated to the increase of the concentration of Cumin seeds water extraction when it was used for the fungus nutrition.

Table (4) shows that different levels of Cumin seeds water extraction treatments recorded a significant decrease in the weight loss rate, dry material loss rate, protein loss rate, percentage of damage, phenolic materials loss, fruiting bodies change colour, and carbohydrate loss after storage: This was inversely proportional to the increased levels of Cumin seeds water extraction compared

to control treatment. The decrease in the studied traits was noticeable in the treatment with Cumin seeds water extraction at a concentration of 10 % and 20%, with a decrease in weight loss rate of 14.3% and 13.8 % respectively.

(S3) treatment with Cumin seeds water extraction showed lowest percentage of dry material loss after storage which reached to 2.2% compared to the control treatment, which recorded a significant increase in dry material loss after storage reached to 3.8%. (S3) treatment was significant among the other treatments as it helped to reduce the percentage of protein loss after storage reached to 1.53%. This treatment also contributed in reducing the damage rate of the fruiting bodies after storage to 0.3%. Also, the treatment with concentration of 20% Cumin seeds water extraction significantly exceeded the remaining levels of nutrition with Cumin seeds water extraction in preventing colour change of the fruiting bodies (Figure 1) after the process of storage which reached to 1.3. That means, fruiting bodies' white colour survived after storage process, while, control treatment showed a noticeable variation in the fruiting bodies colour (3.7 Creamy Brown) after storage.

Table (4): Effect of nutrition at different levels of Cumin seeds water extraction in weight loss percentage, dry material loss percentage, protein loss percentage, damage percentage, phenolic substances loss, change in body colour, and carbohydrates loss in the oyster mushroom fruiting bodies after storage.

Treatments	weight loss after storage %	dry material loss after storage %	protein loss after storage %	fruiting bodies damage after storage%	phenolic substances loss after storage %	colour change after storage	fruiting bodies carbohydrates loss after storage
Control (S0)	21.0	3.8	3.27	11.7	0.122	3.7	8.00
Concentration5%(S1)	15.1	3.3	2.43	4.3	0.080	2.7	3.8
Concentration10%(S2)	14.3	3.0	2.17	1.0	0.067	1.7	2.0
Concentration20%(S3)	13.8	2.2	1.53	0.3	0.047	1.3	1.8
L.S.D0.05	6.48	0.62	0.54	3.12	0.021	1.09	0.13

Figure (1): the colour of the oyster mushroom' fruiting bodies

It was also noticed that the value of phenolic materials in the treatment with a concentration of 20% was 0.047 mg / g dry weight. This value was significantly lower than the other nutritional treatments included control treatment after storage.

As for shelf life of the edible fungi, including *Pleurotus ostreatus*, it is considered short comparing to the other vegetables. The short shelf life of the fungi is due to many reasons; high rate of respiration, inability of the fungi to tolerate the high temperature after harvest, and lack of a waxy layer which usually protects fungi from physiological or microbial changes or water loss [21]. After storage process, major changes occurred for the following; weight loss, dry material, protein, fruiting bodies' colour change, phenolic substances, and damage. Evaporation and dry material consumption during breathing were the main cause of weight loss after storage. However, it can be confirmed that increasing in the concentration let to reduce the loss in dry material, weight, and protein after storage. As a result, chitin concentration of the oyster mushroom cells walls was increased [8]. This happened because of the positive correlation between the low percentage of weight loss and the increase in the nutrition concentration of Cumin seed extraction.

The decrease in protein loss was attributed to the content of cumin seeds of nutrition components [9] which were positively reflected on the fruiting bodies content of protein before storage. In general, the crop is considered damaged after storage if there is an apparent microbial or phylogenetic agent, such as cracking, secondary growth, colour change, or water collapse [10]. The treatment of 20% exceeded other treatment in reducing the fruiting bodies 'damage. This happened because of the substance content of cumin seed extract that inhibits the action of the bacteria responsible for damage during storage process.

After storage, the decline in phenolic materials was due to two reasons. Firstly, an enzyme which is responsible for coloration, this enzyme formed melanines by phenol oxidation through combining O-quinones. Secondly, brown colouring in the fruiting bodies led to a decrease in Phenolic substances content, the appearance of browning was thought to be caused by Polyphenol oxidase [22]. Other studies suggested that Tyrosinase was responsible for fruiting bodies browning after storage.

The results above might also due to the inhibitory substances for the oxidation enzymes action. Cumin seeds water extraction is commonly considered an antioxidant substance, because of the direct correlation between the content of the seeds of vitamin A, C, E and cumin seeds extracts capability as an antioxidant to reduce the activity of electrolytes or known as free radicals that causing browning. This led to a reduction in colour change by reducing phenolic materials loss ratio during storage [8].

In figure (2) the effect of the pre-storage samples for the treatments S0,S1,S2,S3 as antioxidants is shown, by estimating the value of thiobarbituric (melonaldehyde (mg) / of linoleic acid (kg). Generally, TBA method is a common method to measure and follow the progress of oxidation and the formation of Malonaldehyde compound. The estimation was done based on a complex composition between mononaldehyde and TBA, in which the red color increased with the increase of oxidation [14].

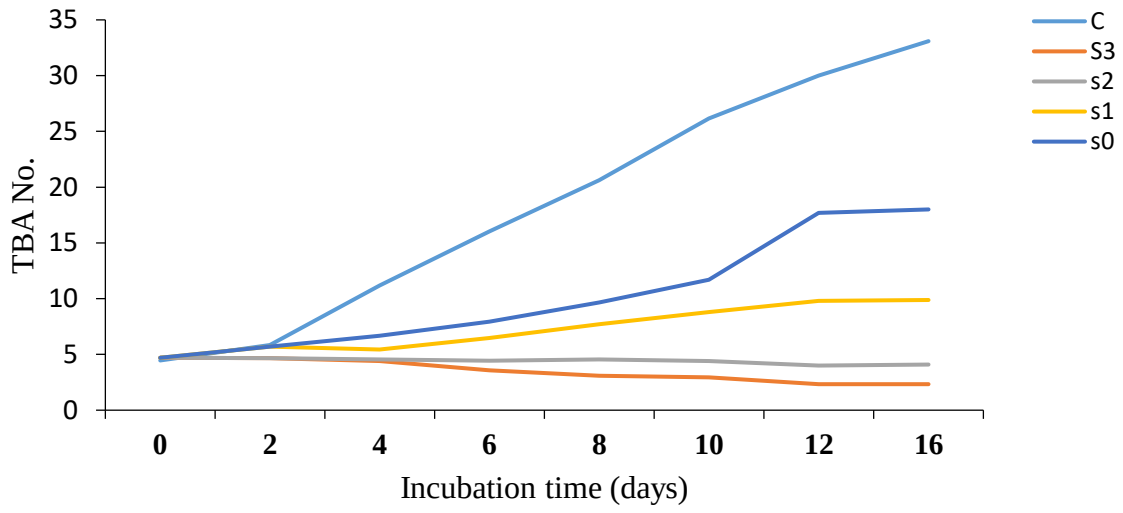

Figure (2): Values of thiobarbituric acid in linolenic acid, added to oyster mushroom sample Pre-storage treatment (S0, S1, S2, S3) (under study)

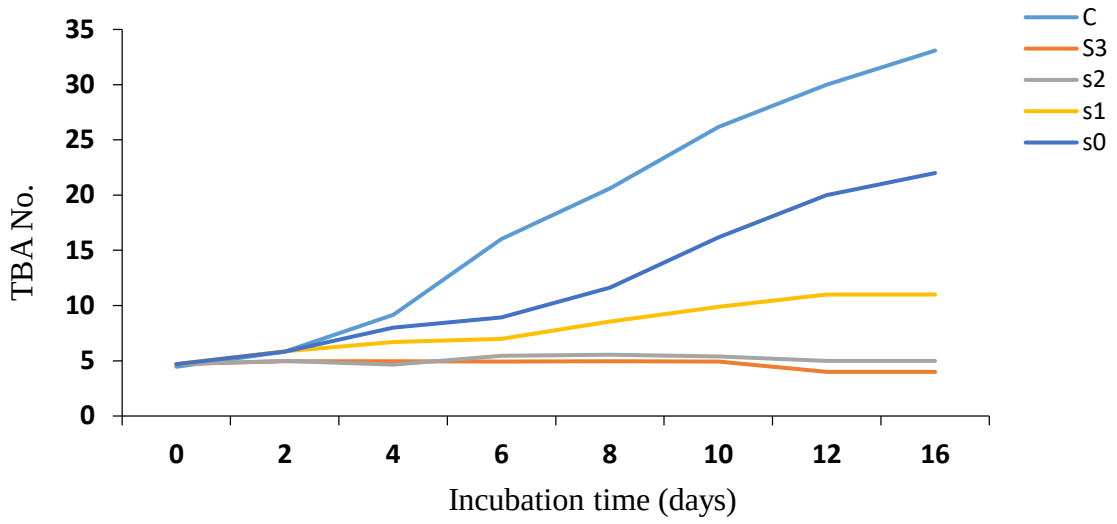

Figure (3): Values of thiobarbituric acid in linolenic acid, added to oyster mushroom samples After storage treatment (S0, S1, S2, S3) (under study)

The oxidation process of unsaturated fatty acids was done by incubating the sample in a suitable temperature (high heat) of 50°C.To study the resistance of the incubated mixture and their ability to prevent oxidation, the incubation process continued for 16 days at the temperature above. It can be also seen from the figure a reduction in TBA for the fatty acid mixture and the S3 treatment with 3.32melonaldehyde (mg) /fatty acid (kg) during 6 days of incubation. Before incubation, the value was 4.7melonaldehyde (mg) / fatty acid (kg). The reduction in TBA continued to reach 2.22Malunaldehyde (mg) / fatty acid (kg) after 16 days of incubation compared to control treatment(C), which showed a continuous increase in the value of thiobarbituric acid amounted to 32.22 melonaldehyde (mg) / fatty acid (kg) in day 16.

(S3) treatment was found to be a superior treatment compared to the control treatment in reducing the TBA value of the fatty acid with the same samples of the fungus (Experiment No. 2), in which the fungus was subjected to storage. (S2) treatment reached to 3.88 melonaldehyde/ (kg) after 16

day of incubation. TBA value of the control treatment after the same incubation period was 32.22melonaldehyde (mg) / fatty acid (kg).

In conclusion, the results obtained from this study indicated that nutrition with cumin seeds water extraction at a concentration of 20% for oyster mushroom raised its antioxidant action. The cumin seeds were characterized by its high content of antioxidant properties, and many phenols which enriched the fruiting bodies. Phenols usually act as materials for hydrogen electron, which works to curb the free radicals, as well as its role as substances corrosive to minerals (9). These were the characteristics of the mushroom samples, which were fed with cumin seeds water extraction in a concentration of 20% to be a natural source in effective antioxidants

4. Conclusions:

Our study suggests using Cumin seeds water extract at level 20% and its role on the growth and production of Iraqi local oyster mushroom *Pleurotus ostreatus.* was helpful with improving many properties such as wet weight, dry weight, bioefficiency, protein,carbohydrates and phenolic substances percentage. In addition, nutrition content led to loss reduction in weight percentage, protein percentage and carbohydrates percentage, as well as elongation fungus storage age by increasing its antioxidant capacity.

List of Abbreviations

Thiobarbituric acid	TBA
Completely Randomized Design	CRD
least significant difference test	LSD
Control	(S0)
Concentration 5%	(S1)
Concentration 10%	(S2)
Concentration 20%	(S3)

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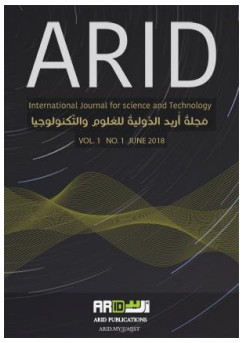

مَجلةُ أُريد الدَّوليةُ للعُلومِ والتِّكنولوجيا

العدد 1 ، المجلد 1 ، حزيران 2018 م

GENOTYPING OF SEROTONIN TRANSPORTER GENE (*SLC6A4*) OF AUTISTIC CHILDREN IN IRAQI POPULATION

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التنميط الجيني للجين المشفر للناقل السيروتونين (SLC6A4)عندأطفال التوحد في المجتمع العراقي

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ABSTRACT

In present study, the blood samples were collected from 145 children (95 autistic children and 50 healthy children), autistic children were attended to autism unit at Disabled Hospital in Thi-Qar province, Iraq during the period from January to November 2016. The results showed males (81%) more than female (19%) with ratio 4:1 and also results explain the age group of 3-5 years recorded the highest percentage (41.05%). Distribution of autistic children according to sibling showed six were brotherly with occurrence rate (6/95) 6.3%.

The genetic study included using polymerase chain reaction (PCR) for amplification of 5-HTTLPR region in *SLC6A4* gene. The results revealed that seven patients (7.36%) gave positive results for amplification of *SLC6A4* gene by using a specific primer. The results of genotype distribution of the 5-HTTLPR polymorphism in autistic children were L/L, L/S, and S/S with percentage 28.57%, 14.28% and 57.14% respectively. Significant differences were noticed in the distribution of allele frequency among patients were 35.71% for the L allele and 64.28% for the S allele ($p \leq 0.05$). The mutant patients showed significant difference with gender ($p \leq 0.05$), they were 5 male (71.42%) and 2 female (28.57%) children.

الملخص

تم جمع عينات الدم في الدراسة الحالية من 145 طفل (95 طفل مصاب بالتوحد و 50 طفلاً سليما) ، كان أطفال التوحد يراجعون وحدة التوحد في مستشفى المعاقين في محافظة ذي قار خلال الفترة من كانون الثاني إلى تشرين الثاني 2016. أظهرت النتائج أن الذكور (81٪) أكثر من الإناث (19٪) بنسبة 4: 1 وسجلت الفئة العمرية 3-5 سنوات أعلى نسبة أصابة (41.05٪). أظهر توزيع الأطفال المصابين بالتوحد وفقا للأخوة أن ستة منهم كانوا أخوة بمعدل تردد (95/6) 6.3٪.شمات الدراسة الوراثية استخدام تفاعل البلمرة المتسلسل لتضخيم منطقة 5-HTTLPR في جين *SLC6A4* باستخدام بادئ متخصص للطفرة. أوضحت النتائج أن سبعة مرضى (7.36٪) يعانون طفرة. كانت نتائج التنميط الوراثي لتعدد الأشكال L/Lو L/Sو S/S بنسبة 28.57٪ و 14.28٪ و57.14٪ على التوالي. لوحظ وجود اختلاف معنوي($p\leq0.05$) في توزيع التردد الاليلي بين المرضى حيث كانت 35.71% للاليل L و64.28% للاليلS. أظهرالمرضى الذين يعانون طفرة اختلافا معنويا مع الجنس ($p\leq0.05$) كان خمسة أطفال ذكور (71.42%)K واثنتان إناث(28.57%). الدراسة الحالية اقترحت أن اطفال التوحد الحاملين للطراز الوراثيS/S ربما لديهم تحسس لظهور علامات مرض التوحد.

1. Introduction:

Autism is neurodevelopmental disorder known as a spectrum of phenotypes that characterized by difficulties in three domains: deviant language, development of social deficits and a restricted range of stereotyped repetitive behaviors, usually happening within the first 3 years of life [1]. The prevalence was significantly higher in boys (23.6 per 1,000) than that in girls 5.3 per 1,000 [2]. Autism disorder known as multi factorial causes, genetic and epigenetic variants, environmental and hormonal factors, contribute to autism risk and phenotypic variability [3]. Family and twines studies explained the repetition rate among siblings with autism is ~3%, the risk is 50–100 times higher than in the general population, that illuminate genetic role in causes of autism disorder [4].

Role several genes in psychiatric behavior and mental disorders, extensively studied by many researchers, such as serotonin transporter gene. Serotonin transporter (5-HTT) is coded by a single gene (*SLC6A4*), which is located in human chromosome 17, this protein responsible for the reuptake of serotonin from the synaptic cleft to presynaptic nerve terminals [5]. The promoter region of the 5-HTT gene (5-HTTLPR polymorphism) undergo polymorphism. That, it consists of two common alleles a short (S) allele with 14 copies and a long (L) allele with 16 copies [6]. The polymorphism due to a 44-base pair (bp) insertion or deletion was linked to different protein expression. The S allele (SS or SL genotypes) is associated with lower 5-HTexpression, in this manner resulting in reduced 5-HT reuptake and release capability, whereas the L allele is associated with higher 5-HT transporter expression and threefold increase in gene transcription [7]. 5-HTTLPR is one of the functional polymorphism sites of the 5-HTT gene [8] and it has been implicated in some psychiatric behavioral and mental disorders [9]. The abnormalities in serotonergic systems including an altered developmental trajectory of 5-HT turnover and reduced binding of 5-HT receptors and serotonin transports in autistic individual [10].

So far, the association between 5-HTTLPRgene polymorphism and autistic disorder has not been completely recognized, and there are few studies concentrating on the association between the genetic polymorphism and the clinical characteristics. In the present study, the 5-HTTLPRstatus in the 5-HTT gene was evaluated in order to establish whether it had an association with autism pathogenesis in Thi-Qar populations.

2.Methodology:

2.1 Blood sample collection:

The diagnosed children with an autism were submitted by pediatrician (Dr. NaamaGludKazar Al-Tamimi) manager of the Thi-Qar Center for Autism in the Disabled Hospital in Thi-Qar province/Iraq. The diagnosis of ASD was made in accordance with the standardized criteria provided in the American Psychiatric Association's Diagnostic and Statistical Manual-IV.

Two ml peripheral blood samples were collected from 145children (95 autistic children and 50 healthy children), for both the sexes during the period from January to November 2016, in a sterile K_2EDTA tube and these blood samples were stored at -80˚C until use.

2.2 DNA extraction and polymerase chain reaction (PCR) analysis:

Genomic DNA was isolated from whole blood by using kit gSYNC™ DNA Extraction Kit 100Preps Cat.No.GS100 according to manufacturer's protocol. The quantity and quality of DNA was checked using Nano drop technique and agarose gel electrophoresis:

2.2.1Nano drop spectrophotometer

Nano drop technology performed for masseur of DNA and reveal the potential error rate in the sample from the standard readings of nucleic acid (DNA = ~ 1.8).

2.2.2 Agarose gel electrophoresis

Electrophoresis performed by mixing 5µl from DNA with 2µl of loading dye (bromothymol blue) and loaded into the dedicated wells, then exposed to an electric field 70V for 45-60 min. Amplification primers for the promoter region of the 5-HTT gene that using in current study were in table (1):

Table (1): Primers sequences used for *SLC6A4* gene amplification.

Primer Sequences (5´- 3´)	Product	Reference
F: TCCTCCGCTTTGGCGCCTCTTCC R: TGGGGGTTGCAGGGGAGATCCTG	S(469) bp L(512) bp	[11]

The final volume of reaction tubes is 20µl, consist of 5µl Master Mix, 1.25µl of each forward and reverse of the primers specific for the this gene, 5µl of DNA template and the volume was completed by adding nuclease free water. The thermo cycling program of PCR was mentioned in table (2).

Table (2): Program of amplification *SLC6A4* gene according to [11] with modification.

Step	Temperature(°C)	Time	Cycle
Initial denaturatio	95	5 min	1
Denaturation	94	30 sec	35
Annealing	65.5	90 sec	
Extension	72	60 sec	
Final extension	72	10 min	1

The PCR products were separated by 2% agarose gel electrophoresis, and the product were examined under the UV light spread through the gel [12].

Two different allelic fragments with the lengths of L and S alleles corresponded to 512bp and 469bp fragments, respectively were detected among the PCR products.

2.3 Statistical analysis: Statistical analysis was performed using SPSS 13.0. $P<0.05$ was considered to indicate a statistically significant difference.

3. Results:

3.1Distributionchildren according to gender, age and sibling

The present study was included 145 children divided on 95autistic children involved 77males (81%) and 18 females (19%), and 50 healthy children as control (28 males and 22 female). Statistically, there were significant differences ($P\leq0.05$) among children according to gender distribution, table (4).

Table (3): Distribution and percentages of autistic children and control according to gender.

Gender	Patient		Control	
	No.	%	No.	%
Male	77	81	28	56
Female	18	19	22	44
Total	95	100	50	100

$X^2=15.802$, df=1, P.value =.000

All the children whom infected with autism divided according to age as shown in table (5). The age group of 3-5 years recorded the highest percentage (41.05%), followed by age group of 6-8 years (35.78%), less than 3 years group (11.6%), 9-11 years (7.36%), 12-14 years (4.21%) with significant differences ($P \leq 0.05$) between the age groups.

Table (4): Distribution and percentages of autistic children and control according to age group.

Age group (Years)	Patients No.(%)	ControlNo.(%)
Lessthan 3	11(11.6)	1(2)
3 – 5	39(41.05)	11(22)
6 – 8	34(35.78)	13(26)
9 – 11	7(7.36)	13(26)
12 – 14	4(4.21)	12(24)
Total	95(100)	50(100)

X^2=41.543,df=4, P-value = 000

To investigate genetic role in autism, disorder the autistic children distribution according to sibling, the result showed six from 95 patients were brotherly with occurrence rate 6.3%.

3.2 (5-HTTLPR) region in SLC6A4 gene

The results of PCR assay revealed that seven patients (7.36%) gave positive results for amplification of *SLC6A4* gene by using specific primer, the bands showed in fig. (1) illuminate the size of band which was appear in approximately 569 bp corresponding to the long allele of 5-HTTLPR. While, band was appearing in approximately 412 bp revealed the short allele.

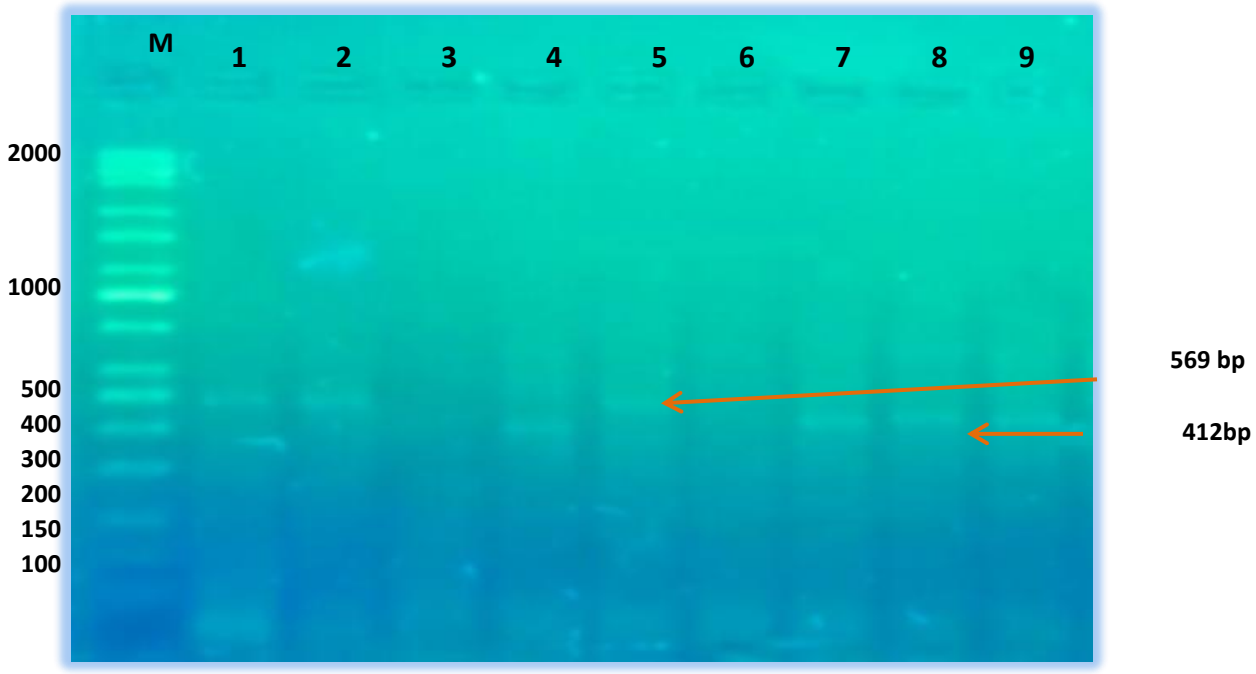

Figure (1): Agarose gel electrophoresis of *SLC6A4* gene amplicon on 2% agarose gel at 70 voltages for one hour, where M:DNA ladder (100bp) (150-2000bp). 1,2 (L/L); 5 (L/S) ; 4,7,8,9 (S/S); patients : 3,6 negative control.

The genotype distribution of the 5-HTTLPR polymorphism in autistic children were L/L, L/S, and S/S with percentage 28.57%,14.28% and 57.14% respectively. While the distribution of allele frequency among patients were 35.71% for the L allele and 64.28% for the S allele with significant difference ($p \leq 0.05$), as presented in table (6).

The mutant patients showed significant difference with gender ($p \leq 0.05$), they were 5 male (71.42%) and 2 female (28.57%) children.

Table (5): 5- HTTLPR genotype and allele frequencies among autistic children**.**

Marker	Autistic children	%
5- HTTLPR genotype		
S/S	4/7	57.14%
L/S	1/7	14.28%
L/L	2/7	28.57%
5- HTTLPR allele frequency		
L	5/14	35.71%
S	9/14	64.28

5-HTTLPR: Serotonin transporter linked polymorphic region; S: short allele ; L: long allele

4. Discussion:

4.1Distribution of autistic children according to sex, age and sibling:

In present study, the results had shown that males (81%) were more likely to had autism symptoms than females (19%) with a prevalence ratio of 4:1 this result agree with many previous studies [13; 14; 15], the cause for this difference is not well understood but several theories had been suggested. Molecular evidence confirm of sex-biased genetic effects by displaying highly significant association driven by families with only affected males, and abnormalities of the sex chromosomes are associated with ASD as X-linked intellectual disability (XLID) as etiology of ASD [16]. Additional, possibility of sex-differences belong to degree of genetic abnormality that associated with autism [17]. This gave initial evidence of abnormalities and sex-specific

differences in the brain structure of females with autism disorder [18]. Moreover, sex differences in symptom stages may contribute to gap in identification of autism traits for both sexes [19].

In the current study, data associated with distributing of the autistic children according to age documented that the age group 3-5 years had the highest percentage (41.05%), followed by the age group of 6-8 years (27.05%) when compared with other groups.

Comparison the present study with other studies was difficult because varied in design and circumstance-ascertainment strategies, but data from a Centers for Disease Control (CDC) pilot project, suggest that progress has been made in identifying autistic children at younger ages. Preschool-aged children identified with ASD were more likely to have an intellectual disability than school-aged children with ASD [20].

In current study, distribution of autistic children according to sibling explain six children were brothers with percentage 6.3%.

The risk of developing autism can now be estimated for family members and siblings were 6 to 8% [21], the danger increased about 25-fold in general population [22]. This supporting the evidence for an increased frequency of autism among siblings and showing heritable role in autism as etiology according to many studies that proven an average autism inheritance of 90% [23 ; 24] indicates that autism is among the most genetic of neuropsychiatric diseases [25]. It is now well known that the same genetic lesion can lead to different behavioral and mental phenotypes within the same family [26]. And the possibility to infection, increased in families have more than one autistic child, because the presence of above one older affected sibling causes a two-fold rise in the risk of autism in the next children [27].

4.2 Polymorphism in (5-HTTLPR) of SLC6A4 gene

In the recent study, genomic analysis for the long and short allele variants of the 5-HTTLPR polymorphism of *SLC6A4* gene showed three genotypes: L/L, L/S, and S/S with percentage 28.57%,14.28% and 57.14% respectively. Statistically, 5-HTTLPR alleles showed significantly increased S allele in autistic children compared to controls ($P \leq 0.05$). The obtained results indicate an association between autism and S/S genotype as a risk factor.

Despite, serotonin transporter gene polymorphism is one of the most extensively studied in psychiatric behavioral genetics [28]. The present study considers the first study that demonstrated a link between the 5-HTTLPR polymorphism and autism in Thi-Qar province /Iraq.

The genes that involved in early neural development could contain polymorphisms or mutations contributing to the disease development. The polymorphisms phenomenon in *SLC6A4* gene consider as the striking risk of autism [29].

The role of S allele of 5-HTTLPR as a risk factor for autism supported by many studies [30; 31]. But, the absence of successful association between studies and small sizes of samples has reduced estimation of the role that genetic variation that plays in causing autism [32]. Generally, S allele associated with reduction of gene expression [33], anxiety-related behavior [34], hopeless behavior [35] and enhanced neural mechanisms [36] in autistic individuals.

However, other studies support preferential transmission of the L allele [37]. Another hand, some studies found no association of the short or long allele with autistic disorder [38; 39; 40].

The variation of genotype in current study, when compare to other studies, may belong to differences in geographical diversity, population size, and ethnic background. Such as L/L genotype were observed with higher rates among Caucasian. While, S/L and S/S genotypes were higher frequencies in east populations [41]. The negative association could also be the result of a

practical mistake of comparing the L/L and S/L genotypes together, with S/S genotype subgroup allele [42].

The evidence on the interactions between genotype and phenotype variations, was found the L/L genotype being valued as more severe on the stereotyped and repetitive motor activities and on an aggression degree [43], and the S/L or S/S genotypes being valued as more severe on the failure to use nonverbal communication to control social interaction [44].

In current study, application of PCR assay by using specific primer proved seven (7.36%) from autistic children suffer mutation. This result similar to study by [45] whom were detected *de novo* mutation in 7% of autistic individuals. Genomic differences that related to *de novo* mutation can be detected in 7–10% of idiopathic autism individuals [46].

So that, the risk of autism could contribute to the point mutations in protein-coding regions of gene, such as fragile X syndrome and tuberous sclerosis complex and identified metabolic conditions [46; 47; 48].

Five from this mutant child were male 5/7 (71.42%), this gave evidence for male-biased genetic effects at chromosome17q that found a nearby the *SLC6A4* locus [29].

The negative results were acquired in the present study could mainly be attributed to the fact that autism is a complex difference with a multifactorial trigger. Signs of the disease in some individuals could be due to some environmental factors during their embryogenesis or during their development. Patient samples also reflect on difference in selection of patients and etiological heterogeneity.

As well as, the gene-environment interaction between 5-HTTLPR and exposure to environmental difficulty were involved [49], and increased activity of genotypes are associated with environmental interference [50].

A series of studies have shown that the 5-HTTLPR consistently interacts with mistreatment in the childhood and medical disorder to believe depression [51].

5. Conclusions:

The results revealed that seven patients (7.36%) gave positive results for amplification of *SLC6A4*. The Significant differences in the distribution of allele frequency among patients were 35.71% for the L allele and 64.28% for the S allele ($p \leq 0.05$). The mutant patients showed significant difference with gender ($p \leq 0.05$), they were 5 males (71.42%) and 2 females (28.57%) children. The results suggest that patients with autism carrying the homozygous S/S genotype may be susceptible to autism symptoms.

List of abbreviation

Abbreviation	Meaning
5-HTT	Serotonin transporter
5-HTTLPR	Transporter linked polymorphic region
DNA	Deoxi ribonuclelotid nucleic acid
L	Long allele
PCR	polymerase chain reaction
S	Short allele
Ultra violet	UV light

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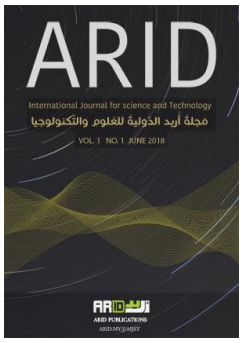

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SEROLOGICAL COMPARISON STUDY FOR DIAGNOSIS OF TORCH PROFILE AGENTS OF PREGNANT WOMEN IN IRAQ

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دراسة مصلية مقارنة لتشخيص إصابات الـ TORCH للنساء الحوامل في العراق

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ABSTRACT

This study reports the prevalence of *Toxoplasma gondii* (*T.gondii*), *Rubella virus*, *Cytomegalovirus* (CMV), and *Herpes simplex virus* (HSV), infections in 1500 serum samples from women with Bad Obstetric History (BOH) like abortion and dead fetuses from Mosul and Baghdad hospitals. These Samples taken as serum, to used it in ELISA (IgM ,IgG) , EUROLINE immunoblot (IgM, IgG) and the indirect immunofluorescence test for BIOCHIPs TORCH-Profile IgG to detect the presence of the TORCH agents, for two years. Three hundred positive samples demonstrating the presence of immunoglobulin IgM and IgG antibodies using ELISA test. IgM antibodies were positive in 44 patients (14.7%) *T.gondii*, 146 (48.7%) CMV, 37 (12.3%) Rubella, and 177 (59%) HSV II and IgG antibodies were positive in 75 patients (25%) *T.gondii*, 189 (63%) for CMV, 60 (20%) Rubella, and 232 (77.3%) HSV II.

We were selected 30 samples from the 300 which had been shown the presence of IgM antibodies in ELISA kits, to used it in EUROLINE immunoblot. IgM antibodies were positive in 2 patients (6.7%) for CMV, Rubella & HSV I and Nil for *T.gondii* and HSV II. IgG antibodies were positive in 4 patients (13.3%) for *T.gondii*, 29 (96.7%) CMV and HSV I, 28 (93.3%) Rubella, 2 (6.7%) HSV II. Also 45 samples were selected from the 300 samples were used in the indirect immunofluorescence test for BIOCHIPs TORCH-Profile IgG positive in 21 patients (46.7%) *T.gondii*, 45 (100 %) CMV, 31(68.9%) Rubella and 44 (97.8%) HSV I and II.

Keywords: TORCH Infections, ELISA for TORCH , Immunoblot for TORCH , Indirect immunofluorescence test for TORCH .

الخلاصة

إن العدوى التي تسببها إصابات الـ TORCH المقوسات الغوندية *T.gondii* ، فايروس الحصبة الألمانية Rubella ، الفايروس المضخم للخلايا CMV وفايروس العقبولة HSV ، في النساء الحوامل المعرضات لخطر العدوى، أو الأجنة، أو لديهم تشوهات خلقية. عادة ما تكون إصابات الـ TORCH قليلة الضرر في الأم ، ولكن يمكن أن تكون ذات تاثير قوي، أو مميتة في الجنين. درجة الخطورة تعتمد على مدة الحمل . ويمكن عند الإصابة لضراوة الإصابة أن تؤثر في الجنين أثناء فترة النمو، وتزيد من شدة الإصابة للأمهات. تشير الدراسة إلى انتشار إصابات المقوسات الغوندية *T.Gondii*، فايروس الحصبة الألمانية Rubella ، الفايروس المضخم للخلايا CMV وفايروس العقبولة HSV في 1500 عينة مصلية من النساء اللواتي لديهن تاريخ ولادات مضطرب كالإجهاض والأجنة الميتة ، المراجِعات لمستشفيات مدينتي الموصل وبغداد، . تم أخذ هذه العينات كمصل لاستخدامها في تقنية المقايسة الامتصاصية المناعية للإنزيم المرتبط (ELISA) للكوبيولينات المناعية نوع IgG,IgM ، وتقنية اللطخة المناعية (immunoblot) للكوبيولينات المناعية نوع IgG,IgM ، واختبار التألق المناعي غير المباشر (Indirect Immunofluorescence) للكلوبيولين المناعي غير المباشر IgG للكشف عن إصابات الـ TORCH ولمدة عامين.

أظهرت النتائج أن ثلاثمائة عينة موجبة لتواجد الأجسام المضادة للكلوبيولين المناعي IgM و IgG باستخدام اختبار تقنية المقايسة الامتصاصية المناعية للانزيم المرتبط (ELISA). كانت الأجسام المضادة IgM إيجابية في 44 مريضا وبنسبة (14.7٪) للـمقوسات الغوندية *T. gondii*،146(48.7%) للفايروس المضخم للخلايا CMV ، 37(12.3%) لفايروس الحصبة الألمانية Rubella و177(59%) لفايروس العقبولة النوع الثاني HSV II ، اما الأجسام المضادة IgG فكانت إيجابية في 75 مريضا بنسبة (25%) في الـمقوسات الغوندية *T. gondii*، 189(63%) للفايروس المضخم للخلايا CMV ، 60 (20%) لفايروس الحصبة الألمانية Rubella و 232 (77.3%) لفايروس العقبولة النوع الثاني HSV II . انتخب ثلاثون عينة إيجابية من العينات الـ 300 التي أثبتت تواجد الأجسام المضادة للكلوبيولين المناعي نوع IgM في تقنية المقايسة الامتصاصية المناعية للانزيم المرتبط (ELISA) ، لاستخدامها في تقنية اللطخة المناعية (immunoblot) للكوبيولينات المناعية نوعي IgG,IgM على التوالي . حيث تواجدت الأجسام المضادة للـ IgM في مريضين (6.7%) في الفايروس المضخم للخلايا CMV ، الحصبة الألمانية Rubella و فايروس العقبولة النوع الاول HSV I ولم يتواجد في الـمقوسات الغوندية *T. gondii*وفايروس العقبولة النوع الثاني HSV II . الأجسام المضادة للـ IgG تواجدت في 4 مرضى (13.3%) في الـمقوسات الغوندية *T. gondii* ، 29 (96.7%) في الفايروس المضخم للخلايا CMV و فايروس العقبولة النوع الاول HSV I ، 28 (93.3%) الحصبة الألمانية Rubella ، 2 (6.7%) لفايروس العقبولة النوع الثاني HSV II . كما تم انتخاب خمس وأربعين عينة إيجابية من العينات الـ

300 والتي أثبتت تواجد الأجسام المضادة للكلوبيولين المناعي نوع IgG في تقنية التألق المناعي غير المباشر Indirect Immunofluorescence للكلوبيولين IgG (الرقاقة الحيوية) في 21 مريضا (46.7%) للـمقوسات الغوندية *T. gondii* ، 45 (100%) في الفايروس المضخم للخلايا CMV ، 31 (68.9%) للحصبة الألمانية Rubella و فايروس العقبولة النوع الأول والثاني كانت 44 (97.8%) .إن دراسة إصابات الـ TORCH في النساء الحوامل اللواتي لديهن تاريخ ولادات مضطرب كالإجهاض والأجنة الميتة باستخدام الطرق المصلية لتحديد خطر الكائنات الممرضة في الـ TORCH (الـمقوسات الغوندية *T. gondii*، فايروس الحصبة الألمانية Rubella، الفايروس المضخم للخلايا CMV و فايروس العقبولة النوع الأول والثاني HSV I&II) .

الكلمات المفتاحية: إصابات **الـ** TORCH ، تقنية المقايسة الامتصاصية المناعية للانزيم المرتبط (ELISA) للـ TORCH ، تقنية اللطخة المناعية (Immunoblot) للـ TORCH ، اختبار التألق المناعي غير المباشر (Indirect Immunofluorescence) للـ TORCH.

1- INTRODUCTION

Infections known to produce congenital defects have been described with the acronym TORCH (***T****.gondii*, **O**thers, **R**ubella, **C**ytomegalovirus **H**erpes). The "others" category has rapidly expanded to include several viruses known to cause neonatal disease. Traditionally, only viral infections of concern during pregnancy were those caused by Rubella virus, CMV, and Herpes simplex virus (HSV). Other viruses now known to cause congenital infections include parvovirus B19 (B19V), Varicella-Zoster virus (VZV), West Nile virus, Measles virus, Enteroviruses, Adenovirus, Human Immunodeficiency Virus (HIV), and Zika Virus [1].

Perinatal outcomes from viral infections during pregnancy can range from no effect to pregnancy loss by spontaneous abortion to fetal infection with resulting congenital viral syndromes. Prenatal care currently holds no true standard for antenatal management of viral infections during pregnancy, aside from those as TORCH agents, and while these guidelines allow for a diagnosis of infection, no treatment or preventative strategy is available to prevent adverse pregnancy outcomes [2]. The antibodies produced immediately after invasion of a foreign substance can inform on primary infection, reinfection or a reactivation state. Therefore, measuring the level of Immunoglobulins is a widely considered approach for the diagnosis of viral infections [3].

Automated immunoassay-based methods are among the most frequently used for testing and are effective because of the high specificity and binding affinity between antigen and antibody. Therefore, the principle of the test relies in the formation of an immuno-complex between antibody present in the patient sample and synthetic antigen present in the reagent or vice versa, to generate a measurable signal [4]. ELISA provides highly reproducible, quantitative data that makes it an advantageous biotechnological tool in scientific research and clinical diagnosis [5].

Western blotting or immunoblotting refers to the separation of proteins by polyacrylamide gel electrophoresis (PAGE) based on size, their subsequent transfer and immobilization to a membrane support, and their selective detection using an antibody-mediated reporter system, This technique is routinely used to qualitatively identify a specific protein from a complex biological sample and provide information about, molecular weight [6].Immunofluorescent test for recognition the Fc fragment of antibodies in patient sera. Known antigen was added to the test serum of unknown antibody content. Binding of the fluorescent- tagged antibodies are visualized through fluorescence microscopy. Fluorescing aggregates or cells indicate that the Fabs have complexed with the microbe- specific antibodies in the test serum [7].

The aim of this study was to evaluate the incidence of TORCH agents by serological comparison ELISA, EUROLINE Immunoblot test and indirect immunofluorescence test for BIOCHIPs, in pregnant women at risk of threats or have embryos suffer from congenital defect in Iraq.

2- Methodology

Three hundred positive serum samples for TORCH out of 1500 samples from pregnant women were collected from Mosul and Baghdad hospitals for two year. Three hospitals in Mosul City: AL-Salam Teaching Hospital, Al Khansaa Teaching Hospital for Maternity & Children and Al- Batool Hospital for Gynaecology & Obstetrics and Three hospitals in Baghdad City: Al Alwaiya Maternity Teaching Hospital, Al-Kademia Hospital for Children, AlYarmuk Teaching Hospital.These Samples were taken as serum, used in ELISA (IgM,IgG), EUROLINE immunoblot (IgM, IgG) and the indirect immunofluorescence test for BIOCHIPs TORCH-Profile IgG to detect the presence of the TORCH agents.

Enzyme Immunoassay IgM, IgG for TORCH (Toxoplasma gondii, Rubella, CMV, HSV)

Purified TORCH antigen is coated on the surface of microwells according to manufacturer procedure from BioCheck,Inc , Germany. Diluted patients' serum were added to the wells, Horseradish Peroxidase Enzyme conjugate (HRP-conjugate) is added, which binds to the antibody-antigen complex. Excess HRP-conjugate is washed off and a solution of 3,3',5,5'-Tetramethylbenzidine (TMB) Reagent is added. The enzyme conjugate catalytic reaction is stopped at a specific time for 10 Sec. The intensity of the color enerated is proportional to the amount of IgM or IgG -specific antibodies in the samples. The results were observed by a microwell reader compared in a parallel manner with calibrator and controls.

Antibodies against TORCH antigens (IgM or IgG) using TORCH Profile EUROLINE

The EUROLINE test Kit according to manufacturer procedure from EUROIMMUN, Germany, provides a qualitative *in-vitro*-assay for human antibodies of the IgM or IgG class to five different TORCH antigens. In the first reaction step, diluted patient samples were incubated with the immunoblot strips. In the case of positive samples, the specific IgM or IgG antibodies (also IgA) will bind to the corresponding antigenic site. To detect the bound antibodies, a second incubation was carried out using an enzyme-labelled antihuman IgM or IgG (enzyme conjugate) catalyzing a colour reaction depending manufactures instructions.

Detection of TORCH IgG antibody using indirect immunofluorescence test (EUROIMMUN BIOCHIP Mosaic)

This test kit according to manufacturer procedure from EUROIMMUN, Germany was designed exclusively for *in vitro* determination of human antibodies in serum or plasma. The determination can be performed qualitatively or quantitatively. Combinations of different substrates are incubated with diluted patient samples. If the reaction is positive, Specific antibodies

of classes IgA, IgG and IgM attached and were stained with fluorescein-labelled anti-human antibodies and made visible with a fluorescent microscopy.

The **TITERPLANE Technique** was developed by EUROIMMUN to standardize immunological analyses according to manufacturer procedure from EUROIMMUN, Germany for **(EUROIMMUN BIOCHIP Mosaic)**.

3- Results

The current study showed out of 300 serum samples of BOH at ages groups (Under 20, 20-29, 30-39 and Above 39) years in ELISA compared with TORCH Profile EUROLINE (Immunoblot) and indirect immunofluorescence test (EUROIMMUN Biochip) in the same age groups and the rate of infections for ELISA IgM and IgG were (59%,77.3%) for HSV, (48.7%,63%) for CMV, (14.7%,25%) for *T.gondii* and (12.3%,20%) for Rubella respectively. The rate of infections for TORCH Profile IgM and IgG EUROLINE were (6.7%,95.7%) for HSV I, (zero %,6.7%) HSV II, (6.7%,96.7%) CMV, (zero%, 13.3%) *T.gondii* and (6.7%, 93.3%) for Rubella respectively.

Overall seropositivity for IgM antibodies against *T. gondii*, Rubella, CMV, and HSV for either a single organism or in combination, in the present study, Seropositivity for *T. gondii* was found to be 14.7% (n=44), CMV 48.7% (n=146), Rubella 12.3% (n=37) and 59% (n=177) were seropositive for combined HSV II infections (Table 1). On the whole, highest seropositivity (63%) was seen in the age group of (20–29) years and the mean age was (26±6.1).

Table (1): Prevalence of Mixed Etiology of TORCH Infection IgM According to the age groups (Years) by ELISA.

AGE / Year	No.	ELISA IgM																
		T.gondii				CMV					Rubella			Herpes				
		A^+	B^+	AB^+	O^+	A^+	B^+	AB^+	O^+	O^-	B^+	AB^+	O^+	A^+	B^+	AB^+	O^+	O^-
Under 20	29			3	3		2		4	5			5	1		5	8	5
20 - 29	189	3	1	9	12	15	16	16	34	5	2	8	17	19	20	18	40	15
30 - 39	69		3	6	2	10	5	7	25			2	3	6	2	9	18	
Above 39	13				2	2								2			4	5
Total	300	3	4	18	19	27	23	23	63	10	2	10	25	28	22	32	70	25
	Sum	44				146					37			177				
	%	14.7				48.7					12.3			59				

While the seropositivity for IgG antibodies against *T. gondii*, Rubella, CMV, and HSV for either a single organism or in combination, Seropositivity for *T. gondii* was found to be 25% (n=75), CMV 63% (n=189), Rubella 20% (n=60) and 77.3% (n=232) were seropositive for combined HSV II infections (Table 2). overall, highest seropositivity (63%) was seen in the age group of (20–29) years and the mean age was (26±6.1).

Table (2): Prevalence of Mixed Etiology of TORCH Infection IgG According to the age groups (Years) by ELISA.

AGE / Year	No.	ELISA IgG																
		T.gondii				CMV					Rubella			Herpes				
		A^+	B^+	AB^+	O^+	A^+	B^+	AB^+	O^+	O^-	B^+	AB^+	O^+	A^+	B^+	AB^+	O^+	O^-
Under 20	29			5	4		2		7	5			8	1		7	10	5
20 - 29	189	5	4	11	15	18	21	19	42	7	6	12	19	23	29	24	52	15
30 - 39	69		5	11	9	13	7	13	33			8	7	11	7	12	23	
Above 39	13				6	2								2			6	5
Total	300	5	9	27	34	33	30	32	82	12	6	20	34	37	36	43	91	25
	Sum	75				189					60			232				
	%	25				63					20			77.3				

While the antibodies against TORCH antigens (IgM or IgG) test instructions for TORCH Profile EUROLINE evaluation of incubated test strips, we were generally recommend using the EUROLineScan software. After we stopped the reaction using deionized, we were placed the incubated test strips onto the adhesive foil of the green work protocol using a pair of tweezers. The position of the test strips can be corrected while they were wet. As soon as all test strips had been placed onto the protocol, they should be pressed hard using filter paper and left to air-dry. After were dried, the test strips were stuck to the adhesive foil. The dry test strips are then scanned using a flatbed scanner (EUROIMMUN AG) or (any Scanner read it) and evaluated with EUROLineScan. The code for entering the test into EUROLineScan was, T.O.R.C.H.IgM. or

T.O.R.C.H.IgG. There was a control band on the strips. The incubation was performed correctly if a strong color reaction was visible on this control band.

The seropositivity for IgM antibodies in TORCH profile EUROLINE against *T. gondii*, Rubella, CMV, and HSV for either a single organism or in combination, seropositivity negative for *T. gondii* and HSV II, CMV, Rubella and HSV I 6.7% (n=2) Table 3. While overall seropositivity (6.7%) was seen in the age group of (under 20, 20 –29 & 30-39) years and the mean age was (26±5.9).

Table (3): TORCH profile IgM EUROLINE According to the age groups (Years)

AGE / Year	No.	TORCH Profile EUROLINE IgM				
		T.gondii	CMV	Rubella	Herpes	
					HSV I	HSV II
			AB^+	AB^+	O^-	
Under 20	2				2	
20 - 29	18		2			
30 - 39	10			2		
Above 39						
Total	30	zero	2	2	2	zero
	%	zero	6.7	6.7	6.7	zero

Table 4 Explains the seropositivity for IgG antibodies in TORCH profile EUROLINE against *T. gondii*, Rubella, CMV, and HSV for either a single organism or in combination, Seropositivity for *T. gondii* was found to be 13.3% (n=4), CMV & HSV I 96.7% (n=29), Rubella 93.3% (n=28) and 6.7% (n=2) were seropositive for combined HSV II infections. overall, highest seropositivity (63.3%) was seen in the age group of 20–29 years and the mean age was (26±5.4).

Table (4): TORCH profile IgG EUROLINE According to the age groups (Years)

AGE / Year	No.	TORCH Profile EUROLINE IgG																				
		T.gondii			CMV					Rubella					Herpes							
															HSV I					HSV II	
		A^+	AB^+	O^+	A^+	B^+	AB^+	O^+	O^-	A^+	B^+	AB^+	O^+	O^-	A^+	B^+	AB^+	O^+	O^-	AB^+	O^+
Under 20	3							2	1				2	1				2	1		
20 - 29	19	1	2	1	2	1	7	12		2	1	7	11		2	1	7	12		1	1
30 - 39	8				2		1	1		2		1	1		2		1	1			
Above 39	zero																				
Total	30	1	2	1	4	1	8	15	1	4	1	8	14	1	4	1	8	15	1	1	1
	Sum	4			29					28					29					2	
	%	13.3			96.7					93.3					96.7					6.7	

(Table 5) Explain the seropositivity for IgG of the indirect immunofluorescence test antibodies in TORCH profile EUROLINE for either a single organism or in combination, Seropositivity for *T. gondii* was found to be 46.7% (n=21), CMV 100% (n=45), Rubella 68.9% (n=31) and 97.8% (n=44) were seropositive for combined HSV II infections (Table 5). On the whole, highest seropositivity (62.2%) was seen in the age group of 20–29 years and the mean age was (23±5.6).

All results of TORCH-Profile Instructions for the indirect immunofluorescent test BIOCHIP Mosaic Test were show in figure 9.

Table (5): TORCH Profile IgG Of the Indirect Immunofluorescence test According to the age groups (Years) According to age (Years)

AGE / Year	No.	the indirect immunofluorescence test IgG																			
		T.gondii				CMV					Rubella					Herpes					
		A^+	B^+	AB^+	O^+	A^+	B^+	AB^+	O^+	O^-	A^+	B^+	AB^+	O^+	O^-	A^+	B^+	AB^+	O^+	O^-
Under 20	4				2				3	1				2	1				3	1
20 - 29	28	3	1	2	8	5	3	5	14	1	3	1	4	10	1	5	2	5	14	1
30 - 39	11	2		1	2	3	1	3	4		3	1	3	2		3	1	3	4	
Above 39	2								1	1									1	1
Total	45	5	1	3	12	8	4	8	22	3	6	2	7	14	2	8	3	8	22	3
	Sum	21				45					31					44				
	%	46.7				100					68.9					97.8				

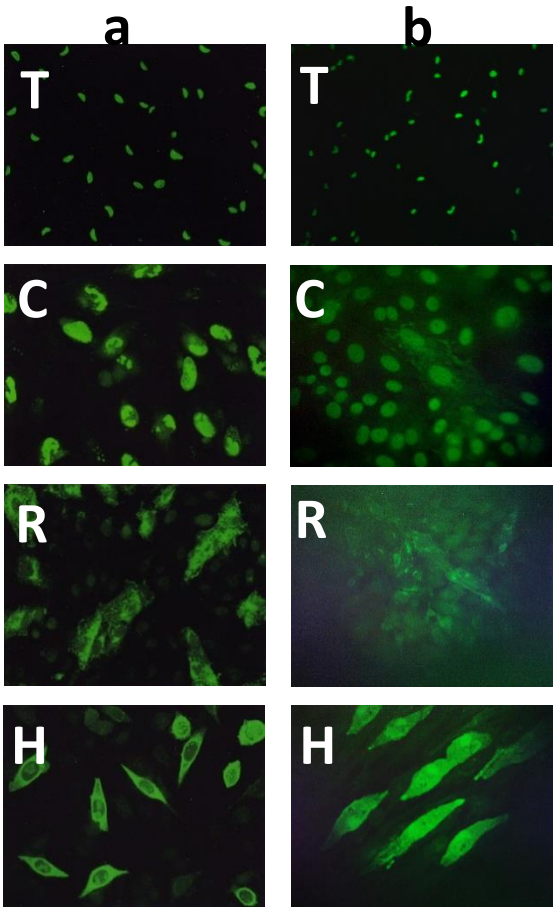

Figure (9): TORCH-Profile Instructions for the indirect immunofluorescent test (BIOCHIP Mosaic Test). a: Positive Control b: TORCH Infection (T= *T. gondii*, C= CMV, R= Rubella, H= HSV I&II)

4- Discussions

The current study showed out of 300 serum samples of BOH at ages groups (Under 20, 20-29, 30-39 and Above 39) years in ELISA compared with TORCH Profile EUROLINE (Immunoblot) and indirect immunofluorescence test (EUROIMMUN BIOCHIP Mosaic Test).

In the present study, seroprevalence of TORCH IgM& IgG infections in pregnant women at BOH from congenital defect were found to be high percentage was CMV & HSV which contrasting with the seroprevalence reported by Kumari and other 2018 [8]. which show high percentage in *T.gondii* & Rubella. However, Sadik and other 2012 [9] reported conformed high

prevalence of IgM in CMV & HSV and contrasted in IgG, and the study contrasted that the high percentage infection present in O^+ blood group that which contrasted Franchini and other 2016 [10] indicated that the ABO blood type not only plays a role in transfusion and transplantation medicine, but is implicated in the pathogenesis of a kaleidoscope of human disorders, The results of this systematic review support for the first time the existence of a consistent influence of ABO status on the risk of developing preeclampsia. Specifically, women with a non-O blood type were found to have a moderately increased risk of this condition compared with the risk in those with O blood type. The systematic analysis of the literature data also suggests that non-O pregnant women have an increased incidence of Venous ThromboEmbolism (VTE) compared with that in pregnant women with O blood type. Less evidence is available for the association with other adverse pregnancy outcomes, reflecting the paucity of published clinical data. Thus, further prospective studies including large populations of patients are warranted to assess the role of ABO blood group in identifying women at risk of developing pre-eclampsia or other pregnancy-related complications. Experimental investigations are also needed to unravel the underlying pathogenic mechanisms of these interactions [8,9,10].

Seroprevalence of TORCH infections was more common in (21–30) years age group analogous with a study of many research probably because this is the most common childbearing age group and that which confirm by Poudyal and other 2018 [11] which they reported that the age of women ranged from (21-30) were (57.7%) that the sane in our study, more that the percentage of their in CMV and HSV of both IgM & IgG is the same higher results compare with *T.gondii* and Rubella under study [11,12].

Infection with one of the TORCH pathogens contracted during pregnancy may be passed through placenta to the fetus affecting the fetus and newborn potentially causing serious birth defects. Asymptomatic infants may develop abnormalities later in life, The infections caused by TORCH organisms are grouped together because they all result in serious birth defects when

transmitted from an infected mother to her foetus during pregnancy [9,13]. Maternal infections play a critical role in pregnancy wastage and their occurrence in patients with BOH or complicated pregnancy is a significant risk factor,These infections cause fetal and neonatal mortality and an important contributor to early and later childhood morbidity [13]. Previous history of pregnancy wastage and the serological reactions for TORCH infections during current pregnancy must be considered while managing BOH cases to reduce the adverse foetal outcome [8,13].

This study was brought to light that the important of serological tests to determined the type of infections if a short-term infection is an acute infection or a long-term infection is a chronic infection. Infections can be further classified by causative agent (bacterial, viral, fungal, parasitic), and by the presence or absence of systemic symptoms [14].

BOH implies previous unfavorable fetal outcome in terms of two or more consecutive spontaneous abortions, history of intrauterine fetal death, intrauterine growth retardation, stillbirth, early neonatal death and /or congenital anomalies. Cause of BOH may be genetic, hormonal, abnormal maternal immune response, and maternal infection. Primary infections caused by TORCH is the major cause of BOH abortion [8,15]. The prevalence of these infections varies from one geographical area to another. These maternal infections are initially unapparent or asymptomatic and thus, were difficult to diagnose on clinical grounds [16].

The conventional single serum assays do not make a clear distinction between a recent primary and chronic infection. The tendency of specific IgM to persist for a long time even at high levels has been verified in several studies. After, introduction in serodiagnosis of Toxoplasma-associated infections, the measurement of IgG avidity has proved to be a highly-useful procedure, especially in combination with conventional serological assays [17,18].

Viral infections in pregnancy are major causes of maternal and fetal morbidity and mortality. Infections can develop in the neonate transplacentally, perinatally (from vaginal

secretions or blood), or post-natally (from breast milk or other sources). The clinical manifestations of neonatal infections vary depending on the viral agent and gestational age at exposure. The risk of infection is usually inversely related to gestational age at acquisition, some resulting in a congenital malformation syndrome [19].

Varies rates of seropositive of TORCH Abs using different serological tests had been reported among different age groups in Iraq and in some of them high rate were reported. This might be due to sample size, method of calculate, residency, age and type of test or other factors.

5- Conclusion:

It was evident that among the TORCH pathogens CMV and HSV to larger extent in compared with Toxoplasma and Rubella virus. All cases of BOH should be routinely screened for TORCH by ELISA test for early diagnosis so that appropriate intervention at early stages can help in proper management of these cases. EUROLINE immunoblot test can be used effectively to determined IgM and IgG in BOH samples. But the indirect immunofluorescence test can be used for IgG determination only.

6-List of Abbreviation

Toxoplasma gondii (*T.gondii*), Cytomegalovirus (CMV) , Herpes simplex virus (HSV) , Bad Obstetric History (BOH) .

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