

Detection of antioxidants in some types of local dates in Tikrit city and selection of the best extraction method

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Abstract

This research dealt with the detection of the active and antioxidant substances in five types of dates, namely (Zuhdi, Al-Khashtawi, Al-Barhi, Al-Khaddawi, Al-Halani), and determining the ratio of the kernels to the flesh of the dates. The percentage of kernels was 10%, and in Al-Khadrawy, Al-Barhi and Al-Hellani, the proportion of kernels was 11% to the date flesh, while in Al-Khashtawi, the ratio of the kernels to the date flesh was 12%, and after extraction with different solvents, all of which gave a positive response to the used reagents, as they contained Alkaloids, glycosides, tannins, flavones, resins and saponins, and therefore it can be said that they contain antioxidants according to the results of other research that proved that tannins, flavones and resins are antioxidants

Keywords: palm tree, dates, extraction methods, solvents, antioxidants.

الكشف عن مضادات الأكسدة في بعض أنواع التمر المحلي في مدينة تكريت وانتخاب افضل طريقة للاستخلاص

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مستخلص

تناول هذا البحث الكشف عن المواد الفعالة والمضادة للأكسدة في خمسة أنواع من التمر المحلي في مدينة تكريت وهي (الزهدي، الخستاوي، البرحي، الخضراوي، الحلاني)، وتحديد نسبة النوى إلى لحمية التمر وكانت نسبة اللحمية أكبر من النوى في كل أنواع التمور حيث أنه في التمر الزهدي وكانت نسبة النوى 10٪ وفي الخضراوي والبرحي والحلاني كانت نسبة النوى 11٪ إلى لحمية التمر، أما في الخستاوي فإن نسبة النوى إلى لحمية التمر كانت 12٪، وبعد أستخلاصها بالمذيبات مختلفة حيث أن جميعها أعطت استجابة ايجابية للكواشف المستخدمة حيث احتوت على القلويدات، الجليكوسيدات، التانينات، الفلافونات، الراتنجات و الصابونيات، وبالتالي يمكن القول أنها احتوت على مضادات أكسدة وفق نتائج لأبحاث أخرى أثبتت أن التانينات و الفلافونات و الراتنجات من المواد المضادة للأكسدة الكلمات المفتاحية: شجرة النخيل، التمور، طرق الاستخلاص المذيبات، مضادات أكسدة.

Introduction

Dates contain a high nutritional value and are considered the basic sustenance of man since ancient times, and the components of dates vary according to the nature of the fruit, whether it is wet, semi-dry or dry, as well as according to the environmental conditions surrounding the trees. (1) It is characterized by its containing low percentages of proteins, and as some research has shown that some types of dates contain a number of antioxidant enzymes such as the enzyme catalase (2) and the researchers were interested in studying the chemical composition of dates, as (3) a study concluded from During which the fruits of the Iraqi palm tree contain many active substances, such as tannins, flavonoids, alkaloids, glycosides, and others. In 2005, (4) studied the effectiveness of the invertase enzyme and the content of sugars in some types of Iraqi dates. Which is not only important in the pharmaceutical industry, but also of great importance in the food industry. In the year 2010, he (2) diagnosed the effectiveness and activity of some enzymes with an antioxidant effect in some types of Iraqi dates, Chemistry

on some active substances, examples (alkaloids, glycosides, tannins, saponins, resins, flavones) in some types of local dates in the markets of the city of Tikrit and the selection of the best extraction method

Materials and Methods

The study was conducted in the laboratories of the Department of Chemistry Sciences \ College of Science \ University of Baghdad, using five varieties of dates (Zuhdi, Al-Khashtawi, Al-Barhi, Al-Khaddawi, Al-Halani). The samples were collected during the harvest season of 2022 in the city of Tikrit from healthy trees. In polyethylene bags and using the fleshy part of these fruits to study their antioxidant activity. and (6) estimated the antioxidant activity of some enzymes extracted from some types of Iraqi dates, including the catalase enzyme (5). Thus, this study aimed to conduct a survey

Determination of the ratio of kernel to fruit

Using a sensitive scale, the sample of 10 dates was weighed, then the date kernels were separated from the fruit, and the weight of the kernels was calculated for the same sample, and the ratio of the kernel to the fruit was de-

terminated according to the following equation:

(The weight of the stones / the total weight of the fruit)(100× . (7)

Detection of active substances

The active substances in dates differ in their chemical composition from each other, so to detect them we need to prepare extracts or boil the dates with the solvent or soak the dates in the medium of the solvent according to each type of active substances to be detected (8)

Prepare the aqueous extract of the plants under study

Mix 30 gm of the vegetable form with 150 ml of distilled water, then stir well with a glass stick, then leave the mixture in the refrigerator for 24 hours for the purpose of soaking, filter the mixture through several layers of gauze, then filter again using filter paper to get rid of the non-pulverized plant parts and remaining fibers Then, the extract was placed in a heating device until all the liquid was evaporated and the extract remained at the bottom of the cup. These extracts were placed in glass tubes with a tight-fitting lid and kept in refrigeration until use (9).

Detection of alkaloids: method (10) was followed, **Detection of gly-**

cosides: according to method (11), **Detection of tanins:** according to method (12), **Detection of saponins:** as stated in (13), **Detection of resins:** The method (14) was used to **Detect flavones** as in the method (15).

Results and discussion

The ratio of kernels to dates was set according to the above equation. In the types of dates used in this study, the date kernel was larger than the kernels, as shown in Table (1), as in the Barhi type, the proportion of kernels was 10%, and in the Zuhdi, Halani and Khadrawi dates, it was The proportion of kernels is 11% to the fleshy dates, while in the type of Al-Khashtawi dates the percentage was 12%, and this is consistent with what he found (5) as in a study on Algerian local dates he found that the proportion of kernels of dates is greater than the proportion of kernels in the types of dates that he studied

Table (1): The ratio of the weight of the pits to the total weight of the dates

Date type	Total weight of dates	cores weight	The ratio of seeds to dates
Ascetic	132,2gm	14,4gm	%11
Al-Khashtawi	115gm	14.2gm	%12.28
Barhi	124,9 gm	12.5gm	%10
Khadrawi	123gm	14gm	%11.38
Halani	1357gm	16.gm	%11.85

Detection of Alkaloids

First, the appearance of an orange precipitate with the addition of Dragendrov's reagent as evidence for the presence of alkaloids (14) in all types of dates. Second, the appearance of a white precipitate using Meyer's reagent is also evidence of the presence of alkaloids. A white precipitate has been formed in all types of dates, and this is evidence of the presence of alkaloids (13). Alkaloids are nitrogenous compounds that are colorless and odorless and have a bitter taste. The plants containing them are considered one of the most important groups of medicinal plants because of their therapeutic efficiency. Even if they are found in small quantities in plants, they are also natural organic nitrogenous compounds. Morphine is the first example of the use of alkaloids in medical field if this alkaloid was isolated in 1817 from the

poppy plant(16).

Detection of glycosides

In a water bath, part of Fehlnic's reagent was mixed with plant extracts for ten minutes, and a red precipitate appeared, which is evidence of the presence of glycosides. So, where the appearance of the red color was an indication of the presence of glycosides. Glycosides, which are important compounds in the plant and are considered one of the sources of sugars, which in turn are involved in the process of regulating osmotic pressure and the transfer of some substances to complete the plant's metabolism, and they also play a defensive role against some pests and insects that infect the plant (17).

Detection of "tanners" tannins:

Two types of reagents were used Detection of tannins using lead acetate, as the appearance of a white, gelatinous precipitate is evidence of the presence

of tannins (18), and all the fruits under study gave a response to this test. Using ferric chloride, as the appearance of a bluish-green color in solutions is evidence of the presence of tannins (19). It is believed that tannins have a role in absorbing water, as is the case in colloids, and thus have a role in protecting the plant from dehydration. It is also believed that some of its compounds have a role Antioxidant, thus protecting the plant from infection with microorganisms, known as compounds with a complex chemical composition that is difficult to separate and purify it, which are non-nitrogenous and amorphous organic compounds (18). These materials have many anti-microbial properties, so they are present in different parts of plants such as bark, wood, leaves, fruits and roots. The ability to stop bleeding and has an antiseptic effect because of its ability to kill bacteria and fungi, as it works to inhibit enzymes and transport proteins present in the microbial cell membrane (19).

Detection of saponins :

After preparing the aqueous extracts of five dates and shaking the test tubes containing the date extracts, it gave a response to shaking and the foam appeared as an indication of the presence

of saponins in all types of dates under study, as in, and this was confirmed by (20), as the saponins are among the important compounds in the chemical composition of the plant, which Its function is to protect the plant from insects and microorganisms, and it is involved in the manufacture of cortisone, which has various therapeutic uses

Detection of resins

Turbidity is evidence of the presence of resins in dates, and all types of dates used in this research gave a response to this test, as explained by (11) when he proved that the appearance of turbidity in the extracts is one of the evidences that they contain resins, which are substances produced from the oxidation of different types of Essential oils and resins are also used as a pain reliever and in the treatment of hysteria and nervous disorders

Detection of flavones

The appearance of the yellow color is evidence of the presence of flavones, according to what he reported (19), and the date extracts gave a positive response to the detection (flavones are widespread in nature, especially in higher plants (19) and are found either in free form or as a glycosidic derivative, and flavones are distinguished by

their medicinal effects, including As a stimulant for the immune system and works to inhibit cancer cells in humans and also has anti-microbial properties- By destroying the cell membrane because of its ability to dissolve proteins and in the medical field, it is antiviral, antibacterial, antifungal, anticancer, an increase in antitumor activity, and the treatment of side effects of diabetes, as it works to strengthen the immune system. These therapeutic advantages gave it great importance in the pharmaceutical industry (21) . Through the results of this research, we note that it agrees with (7), which explained the fruits of the Iraqi date palm It contains effective groups, such as saponins, tannins, flavonoids, alkaloids, phenols, and glycosides. It can be said that the types of local dates used in this study, Al-Zuhdi, Al-Khashtawi, Al-Khaddawi, Al-Barhi, Al-Halawi, contained many active substances and some substances with antioxidant activity such as tannins and flavones, in agreement with (11) who said that these compounds are classified within Natural antioxidants and the least side effects, and in a research he conducted (3) on some types of dates, through which he was able to extract phenols and determine

their antioxidant effectiveness. He confirmed (5) that phenols and tannins are considered antioxidants

Determining the optimal conditions for the extraction of antioxidants: Effect of extraction temperature: The effect of four temperatures (20, 25, 30, and 35 ° C) was studied on the activity of tannins, phenols, and other compounds in selected dates using 50% methanol as an extraction solvent, while the temperature was 25 ° C. And 30 °C is the best for extracting it from dates, as shown in the figure, when the concentrations of the compounds studied in the extract of dates decrease when the extraction temperature rises, as in Figure (1).

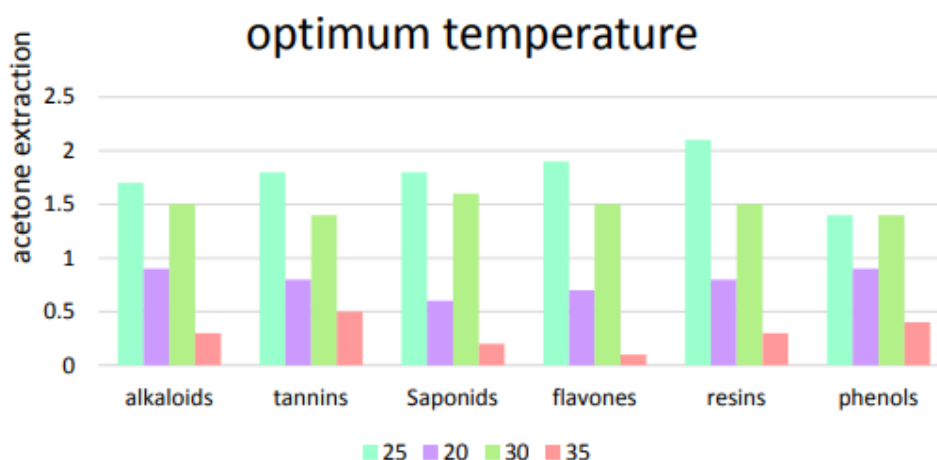


Figure (1). The effect of optimum temperature for extraction

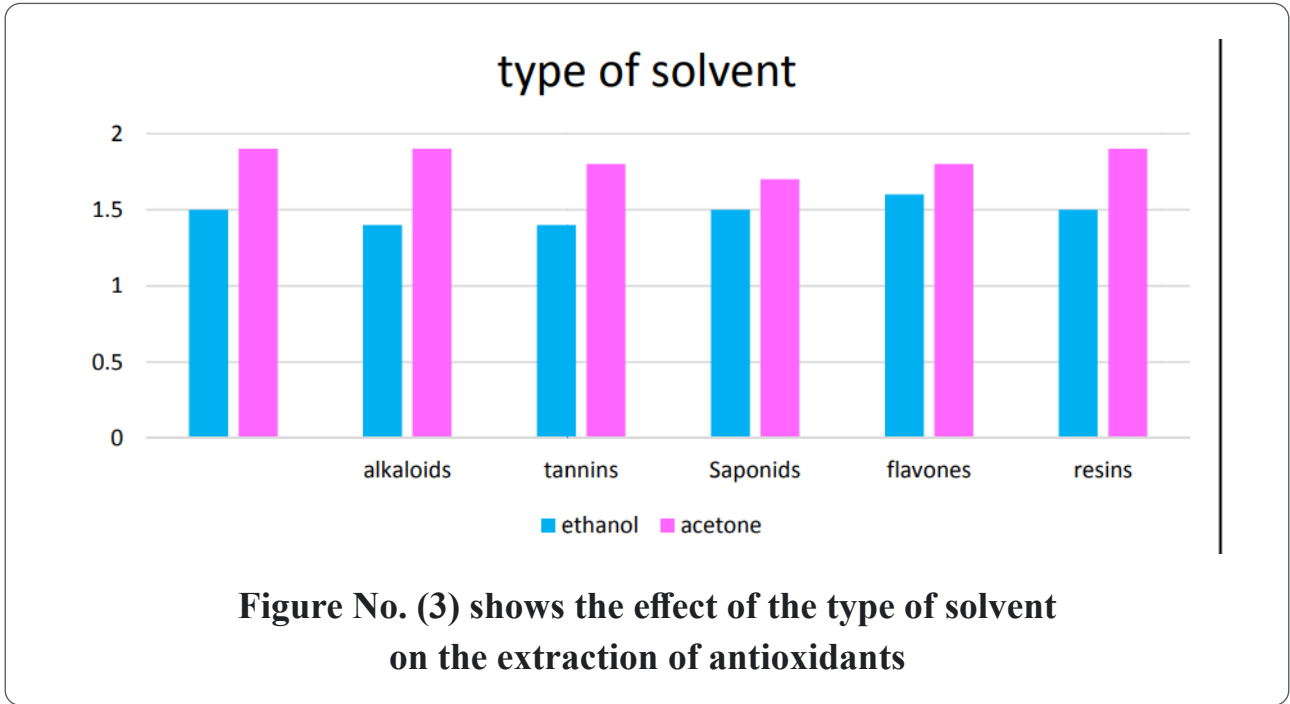
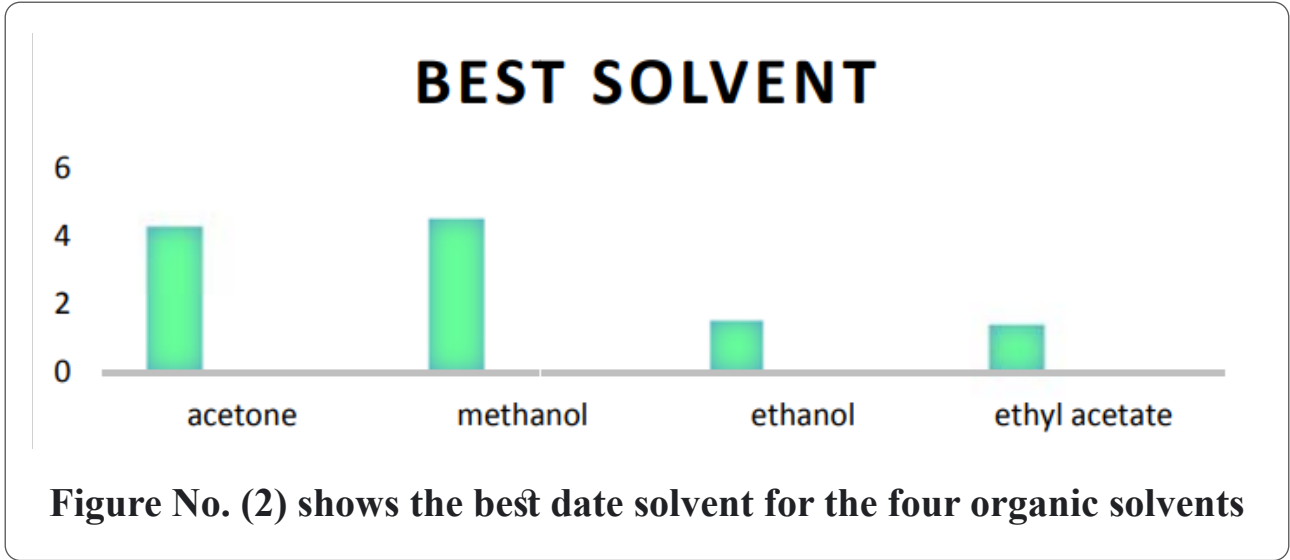
The increase in temperature stimulates the melting of the materials to be analyzed, and at high temperatures the viscosity and surface tension of the solvents decrease, which helps the solvent to reach the plant tissue and improve the extraction rate (22). The optimum temperature that we obtained in our study is close to what was found by (23), where it was The optimum temperature (25) and in the extraction of phenolic compounds from *Avicennia marina* plant. The high temperature stimulates the oxidation of multiple phenols and between (24) that at the temperature of 50-60 °C it works to activate the oxidase enzyme which reduces the antioxidant activity and also reduces the concentration of phenols, and high temperatures act on

the solvent by evaporation, as the boiling point of acetone is close to 55 °m, and this increases the cost of extraction from the industrial point of view, the evaporation process makes the extraction solvent system more concentrated, and high concentrations increase High organic solvent content and reduce polarity and thus confuse the process of extracting antioxidants, so it is preferable to choose medium temperatures

Influence of solvent type

A number of different polar solvents were selected with a concentration of 50% and included four solvents: acetone, ethanol, methanol, ethyl acetate and water to study their effect on extracting antioxidants from dates. The permeability of vegetable tissue (25) and the weakening of hydrogen bonds

(26), as the acetone and methanol extracts of date extracts outperform the rest of the solvents in terms of solubility and give the best extraction results, as in Figure (2).



Effect of extraction period: The extracts of the five types of dates were incubated at the optimum temperature for extraction periods of (6, 12 and 24) hours. (27) (bulk solution) It is noted from Figure (4) that the extraction reaches its maximum during an incubation period that lasted 12 hours, as it is clear from the same figure that the difference in the incubation period has

less effect on the extraction of antioxidants that did not show an increase in the number of incubation hours for the extracts under study, i.e. An increase in the concentrations of the aforemen-

tioned compounds, while the decrease in the concentration was gradual and with a slight difference between the incubation periods, as in Figure (4).

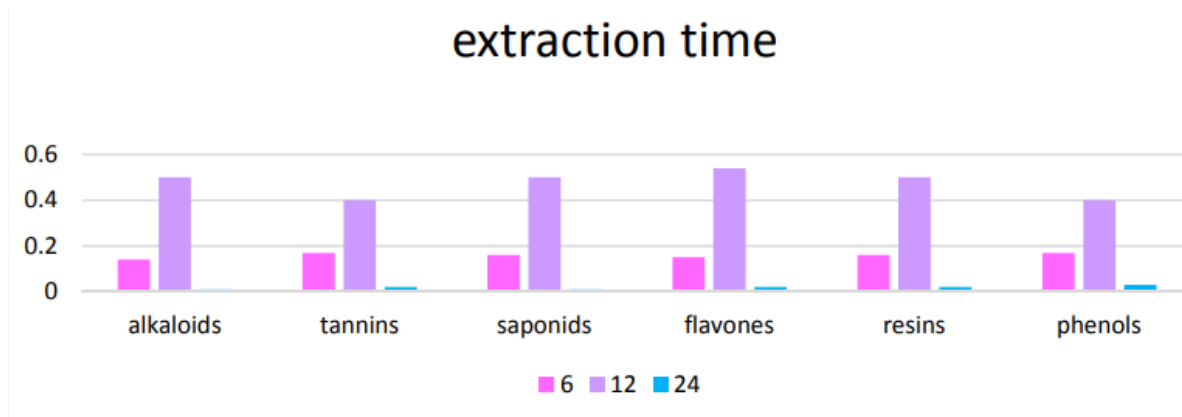


Figure No. (5) shows the effect of extraction duration on concentrations

This phenomenon can be explained by Fick's second law, as the final equilibrium occurs between the dissolved substance in the extract and the solvent, and the increase in the extraction time is not beneficial in the extraction of antioxidants, as the lengthening of the extraction time may lead to oxidation of the compounds through exposure to light or oxygen. (26) In spite of the high concentration of each of the extracted compounds, this could be attributed to the presence of monophenols, which have less efficient antioxidant activity than polyphenols, as well as impurities. (22) The longer period

of time causes an increase in the cost, in addition to the absence of significant differences between the amount of antioxidants extracted in the short periods and incubations compared to the long periods, so the short periods are more practical and inexpensive.

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