



Scientific Research

The impact of temperature and ultrasound on the polyphenols extraction and antioxidant activity of Mozafati, Sayer, and Kabkab date byproduct varieties

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ABSTRACT

In this study, the effect of ultrasound and temperature at three different levels—30, 50, and 70 °C on the amount of phenolic compounds and antioxidant properties of the extract obtained from the byproducts of three date byproducts—Kabkab, Mozafati, and Sayer were evaluated. In order to conduct a comprehensive assessment of antioxidant activities, three methods including DPPH and H₂O₂ radical scavenging activities, and ion chelating ability were employed. The Pierson analysis was used to examine the correlation between polyphenolic compounds and antioxidant activities. According to the results, the use of ultrasound treatment enhanced the amount of extracted polyphenols and flavonoids in all date varieties. Furthermore, the polyphenol and flavonoid contents were found to increase up to 50°C during extraction, but decreased, subsequently. The highest amount of polyphenols and flavonoids was achieved using the ultrasound treatment in 50° C in Sayer variety, 4.64 ± 0.07 mg Gallic acid/g and 0.326 ± 0.0112 mg quercetin/g, respectively. DPPH and H₂O₂ radical scavenging activities were increased after ultrasound treatment at 50°C but then decreased ($P < 0.05$). Maximum H₂O₂ scavenging activity was observed in Mozafati variety. The iron chelating ability decreased after extraction with ultrasound treatment at 30° C and then increased significantly ($P < 0.05$) until reached the maximum amount of $40.433 \pm 0.802\%$ in Sayer variety. Results showed a strong correlation between polyphenols and flavonoids with antioxidant activities. Therefore, the antioxidant properties of the tested date byproducts are likely to derive from their polyphenolic content, making them an economical source of these bioactive compounds.

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1- Introduction

date fruit (*Phoenix dactylifera* L.) is one of the oldest plants cultivated by millions of people around the world, especially in North Africa and the Middle East. In the year In 1990, the annual production of dates was 43.3 million tons. In the last three decades, the global market demand for this product has increased and in 2018, the demand reached 8.52 million tons. Egypt, Iran and Saudi Arabia are the largest producers of this product.

Dates contain various vitamins (including riboflavin, biotin, thiamin, folic acid, and ascorbic acid) Apart from simple sugars like glucose, sucrose and fructose, proteins, salt, minerals like potassium and magnesium and fiber [2], dates are a rich source of compounds with antioxidant and therapeutic properties. Polyphenols¹ There is a group of these compounds that have attracted much attention in recent studies [3]. Analysis of polyphenol compounds in different types of dates shows that these compounds include phenolic acids.², flavonoid glycosides³ and proanthocyanidin oligomers⁴ they are. In addition to the difference, these compounds depend on the amount of dates in other factors such as growth conditions and the stage of development at which the dates are located [4].

Polyphenols are a group of secondary metabolites that serve as inhibitors of free radicals and low density lipoproteins and prevent cholesterol oxidation and DNA damage. Health-promoting and therapeutic effects of polyphenol It stems from their antioxidant properties.[5] These compounds have antioxidant properties due to their ability to donate electrons. It is an oxidant that affects health. There are different parts of the human body. Being a radical polyphenol. It protects against free radicals and has antioxidant properties⁵ They are metals. These oxygen free radicals and other reactive oxygen species with free electrons are formed in many body reactions such as energy production, lipid metabolism, aerobic cell respiration, and inflammatory processes in the body. However, if free radicals remain in tissues, they cause oxidative stress in tissues, which increases cell death and damages tissues. These injuries are associated with various

abnormalities such as cancer, cardiovascular diseases, arteriosclerosis and diabetes. In addition to the above, Poly.Phenol.Ha, me. They act as anti-mutagenic, anti-inflammatory, anti-microbial and anti-cell death agents and may be a risk factor for cancer, diabetes and disease.. Cardiovascular diseases are also reduced. Give [7]

Many studies have shown the relationship between polyphenols and their antioxidant properties in compounds extracted from different types of dates. For example, Ben Madur⁶ and colleagues in 2012, the amount of poly compounds. Phenolic and antioxidant properties in various. Different types of dates are checked. Amount of poly compounds. The obtained phenolics ranged from 167 to 709 mg of gallic acid⁷ It was reported between the amount of polyphenol extracted from one hundred grams of dry sample and the protective properties of DPPH and H radicals.₂oh₂ A high correlation has been observed [8]. David⁸ and colleagues in 2017 polycomposites. The phenolic content of palm tree pollen and the inhibitory effect on myocardial infarction caused by isoproterenol were extracted.⁹ It was investigated in mice. The results showed that the product extracted from the day plant pollen for 7 days before the injection of isoproterenol significantly reduces the effect of heart damage caused by the use of this substance.

Extraction methods with solvents such as ethanol, methanol, and acetone are often used to extract polyphenols. However, most of these compounds found in dates, such as cellulose and proteins, are linked to cell wall components through ether, ester or glycosidic bonds, making extraction difficult using only the mentioned solvents. Therefore, various methods such as ultrasonic waves have been used to improve the extraction of these compounds [10].

Today, the commercial production process of this product, including production, storage, storage and packaging, in various stages Packing the amount of this useful product would be wasteful. Due to various reasons such as improper texture (too soft or too hard), contamination by fungi and insects, as well as production waste during the day process of very low

¹ - Polyphenol

² - Phenolic acid

³ - Flavonoid glycosides

⁴ - oligomeric proanthocyanidins

⁵ - The ability to cheat

⁶ - Benmeddur

⁷ - Gallic acid

⁸ - David

⁹ - isoproterenol

quality. It is not useful for humans and is used as animal feed and even thrown away [11]. Therefore, the aim of this study is to extract polyphenolic compounds using wastes of three types of mozafati dates, kabkab and others as a cheap source and also to investigate the antioxidant properties of these wastes and their relationship with the amount of polyphenolic compounds in them. The plants that came out.

2- Materials and method

1-2- used materials

In this study, wastes obtained from three varieties of dates, Mozafati, Kabkab and others were used. The samples were washed with clean water, dried with a cold dryer and turned into small particles in a household grinder. After that, they were stored in a refrigerator at -20 degrees Celsius.

Introduced by Fulin Sivkalo¹⁰, sodium carbonate, sodium nitrate, aluminum chloride, sodium hydroxide, iron chloride, hydrogen peroxide, gallic acid, quercetin¹¹ and DPPH reagent were purchased from Merck Germany. 96% ethanol and methanol were purchased from Hamon Teb.

2-2- Extraction of polyphenolic compounds

The extraction of polyphenolic compounds was done by two methods. In the first method, 0.5 g of sample is stirred in 25 ml of 70% ethanol for one hour at room temperature. After removing the sample for 10 minutes at 6000 rpm and filtering. After that, the supernatant fluid was placed in a rotary under vacuum at a temperature of 40 degrees. The obtained product was dried with freeze dryer and the obtained powder was stored in refrigerator for further analysis [8].

In the second method, one gram of sample is treated with 20 ml of liquid (70% ethanol) for thirty minutes at three temperatures of 30, 50 and 70 degrees Celsius in an ultrasonic bath (Elmasonic S60H). Then, as in the first method, after extraction, they were filtered and centrifuged, and the liquid evaporated under vacuum.

2-3- measurement of polyphenols

Measurement of polyphenols by Elara method¹² and colleagues were used. Five milligrams of the extract is dissolved in 10 ml of distilled water, then 100 ml

with 500 ml of Folin Ciocalto solution (with distilled water to 10% volume - ratio) and spin for 60 seconds. After 10 minutes, 375 microliters of 7.5% sodium carbonate (weight-volume) was added and the sample was kept in the dark for two hours. After the specified time, the absorbance of the sample was read by a spectrophotometer at a wavelength of 765 nm, and the amount of phenolic compounds was calculated by comparing with the standard curve of gallic acid prepared at a concentration of 0.05-0.2 mg/ml. and the total number of phenolic compounds present in the sample according to the following relationship.

$$TPC = \frac{C \cdot V}{M}$$

TPC is the amount of total phenolic compounds, C is the standard curve of gallic acid in mg/ml, V is the sample volume with Folin Ciocalto reagent in ml and m is the fat content. Same sample size in grams. The results were calculated and reported as milligrams of gallic acid per gram of dry mud [13].

4-2- Measurement of flavonoids¹³

The aluminum chloride color method was used to measure the amount of flavonoids. Two milliliters of the extract was added to a mixture of 0.2 milliliters of sodium nitrate (5% w/w) and 0.2 milliliters of aluminum chloride (2% w/w), then the resulting mixture was added to two milliliters of NaOH. 0.1 m) was mixed. The absorbance of the resulting mixture was read at 510 nm against the blank. Quercetin was used as a standard and the total flavonoid content was calculated as milligrams of quercetin per gram of dry mud [14].

5-2- Size. Taking anti property. Oxidant

1-5-2- DPPH radical scavenging property

In this method, 60 microliters of dried samples were taken at a concentration of 1 mg/ml and then added to 1500 microliters of DPPH solution (0.1 M, methanol solution). After 30 minutes at room temperature and in the dark, the amount of color reduction of the sample was read at 515 nm, and the amount of DPPH radical inhibition was calculated as follows.

$$\text{Radical blocking percentage} = \frac{A_0 - A_1}{A_0} \times 100$$

In the formula above, A₀ Control sample and A₁ Absorbing the sample taken [15].

2-5-2- ability to inhibit hydrogen peroxide

¹⁰ - Fulin Sivkalo

¹¹ - Quercetin

¹² - Healthy

¹³ - Flavonoids

After dilution with 1 mg/ml to 1000 microliters H solution, 0.6 ml of the dried extract₂oh₂ (dissolved in 1 M sodium phosphate buffer, pH=7.4) was added to a concentration of 40 mM and the reaction mixture was kept at room temperature for 10 minutes. The absorbance of the sample was measured at 230 nm and the hydrogen peroxide inhibition capacity was calculated using the following formula:

$$100 \times \frac{A_c - A_{is\ it}}{A_c} = \text{Percentage of ability to inhibit hydrogen peroxide}$$

In the formula above, A_c Control sample and A_{is it} Absorbing the sample taken [16].

3-5-2- metal ion manipulation ability

0.05 ml of fec₂ (two mmol) and 0.5 ml of the dried sample with a concentration of 1 mg / ml was mixed with 1.6 ml of distilled water.. The mixture was kept at room temperature for 5 minutes, then 0.1 ml of ferrozine solution (five ml) is added and it is again kept for 5 minutes at room temperature.. Absorb in 562 nm size is taken and the metal ion elasticity is calculated by the following formula.

$$100 \times \frac{A_c - A_{is\ it}}{A_c} = \text{skill percentage Operation Iron ion}$$

In the above equation, A_c Control absorption, A_{is it} Absorbing the sample taken [17].

6-2- Statistical analysis

All the tests were performed in triplicate and the results are in the form of standard deviation ± The average is shown. A two-way ANOVA test with Tukey's test was used for mean comparison tests in R software. Investigating the relationship between polyphenol compounds and antioxidant properties by Poisson analysis¹ Done.

3- results

1-3- polyphenol compounds and flavonoid levels

The total amount of polyphenolic compounds and flavonoids in the extract from three types of mozafati dates, kabkab and other wastes are given in Table 1. As it is clear in the table, the amount of waste from different dam polyThey have various phenols and flavonoids. P < 0.05).

Table 1 Polyphenol and flavonoid content of three date varieties produced using ultrasound and different temperatures.

Sample	Polyphenol (mg GAE ² /g dry matter)	Flavonoids (mg GAE/g dry matter)
He's expecting more		
without ultrasound	2.11 ± 0.08 ^I	0.113 ± 0.005 ^{is it}
Ultrasound 30° C	2.374 ± 0.0802 ^H	0.12 ± 0.001 ^{of}
Ultrasound 50° C	3.07 ± 0.07 ^{of}	0.193 ± 0.011 ^c
Ultrasound 70° C	2.8 ± 0.0351 ^{fg}	0.133 ± 0.0057 ^{of}
Mozafati		
without ultrasound	2.743 ± 0.0907 ^G	0.12 ± 0.01 ^{of}
Ultrasound 30° C	3.01 ± 0.0953 ^{Def}	0.123 ± 0.0115 ^{of}
Ultrasound 50° C	3.69 ± 0.0721 ^c	0.256 ± 0.011 ^b
Ultrasound 70° C	3.2 ± 0.036 ^d	0.174 ± 0.014 ^c
Seer		
without ultrasound	2.93 ± 0.0953 ^{fg}	0.146 ± 0.115 ^d
Ultrasound 30° C	3.153 ± 0.0862 ^d	0.176 ± 0.005 ^c
Ultrasound 50° C	4.64 ± 0.07 ^A	0.326 ± 0.0112 ^A
Ultrasound 70° C	4.223 ± 0.0351 ^b	0.31 ± 0.01 ^A

Different letters in each column indicate significant differences between mean values (p<0.05).

The diversity of polyphenolic and flavonoid compounds of different date species is based on the diversity of biological compounds found in each species, which also depends on the environment and growth conditions. In fact, different factors such as region and conditions Growth, weather, light, ambient temperature and storage conditions affect the amount of polyphenolic compounds in various date seed wastes [18].

The extraction of polyphenolic compounds from different dates has been investigated in several

¹ - Pearson

² - Gallic acid equivalent

studies. For example Muhammad¹ And his colleagues In 2014, they examined the amount of polyphenolic and antioxidant compounds in Sudan over six days. Total poly size. Phenol. Between 99.34 and 35.82 ml. Grams of gallic acid per 100 grams of sample and amount of poly compounds. Phenolic in the range of 3.39-1.74 ml. Warm cat² per 100 g sample was reported [5]. They also told you³ And his colleagues in 2018, the influence of halal. Different on poly extraction rate. Phenol. Oat dates⁴ check out. Halal. The solvents used in this study were water, ethanol 70% and acetone 50%. The maximum amount of poly extract. Phenol. and flavonoids using 50% acetone as solvent, obtained 7.545 mg of gallic acid per gram of sample and 0.735 mg of rutin per gram of sample, respectively [19].

As shown in Table 1, the extraction rate of polyphenols and flavonoids from all three cultivars, Kabkab and other dates increased significantly ($P < 0.05$) using ultrasound. Among the three cultivars tested, the highest extraction rate corresponds to Sauer cultivar with a value of 0.07 ± 4.64 and then an additional 0.0721 ± 3.69 and cab $0.07 \pm$ It is 3.07 milligrams of gallic acid per gram.

In fact, the use of ultrasound helps to penetrate the solvent into the sample matrix due to the cavitation phenomenon. Slow and changes in the cell wall increase the release of polyphenols. These changes increase the breaking of bonds between polyphenols and cell wall components, which increases the permeability of the cell wall and accelerates the mass transfer between the sample and the solvent. Doing all these things, polyphenols attached to proteins and sugars become free polyphenols. As a result, the extraction rate of these compounds increases [20].

Many studies have used ultrasound to extract polyphenolic compounds. Yezidi Fur (2013) investigated the extraction of polyphenolic compounds using ultrasound from dried wheat grains [21]. The results show that the use of ultrasound increases the efficiency of the extraction of polyphenolic compounds. D Ho n as well as in Another study by Zhong⁵ and colleagues (2022) extraction of poly compounds Phenolic and

antioxidant activity Pitaya fruit set⁶ tested and found that the highest extraction efficiency was obtained using ultrasound within a period of 45 minutes [22].

During the extraction of polyphenolic compounds, in all three cultivars, increasing the temperature from 30 °C to 50 °C increased the extraction of polyphenolic compounds, then increasing the temperature from 50 °C to 70 °C decreased their extraction ($P < 0.05$). In fact, increasing the temperature increases the mobility of the solvent as well as the penetration of the cell wall, which increases the extraction of polyphenols, increasing the temperature causes the decomposition of polyphenolic compounds and consequently the extraction. It decreases in size [10].

2-3- antioxidant property

1-2-3- property of inhibiting DPPH radicals

Figure 1 shows the results of the DPPH free radical scavenging test. As can be seen in the picture, among the different species, Sayar species showed the highest level of inhibition of DPPH radicals, which reached the highest level after being treated with ultrasound at 50 degrees Celsius ($1.201\% \pm 266/43$). This increase is also reflected in other figures.

¹ - Muhammad

² - Catechin

³ - I will tell you

⁴ - Ajwa

⁵ - Zong

⁶ - Pitahaya

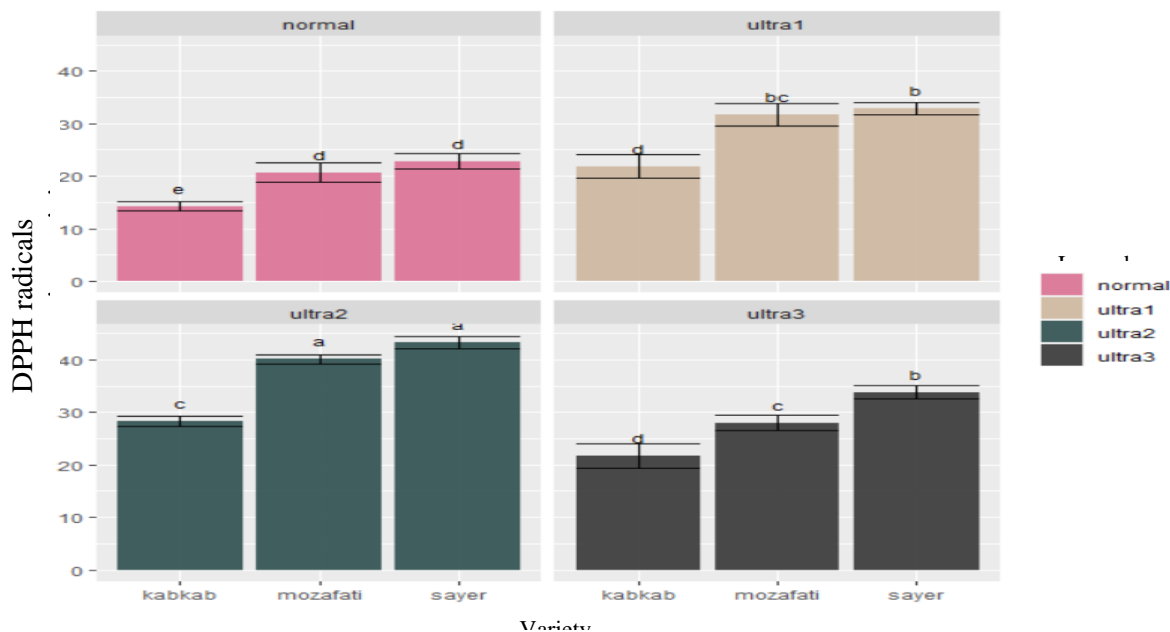


Fig 1 The DPPH radical scavenging activity of the extracts of date byproducts including Kabkab, Mozafati and Sayer after ultrasound extraction at 30, 50 and 70°C ($P < 0.05$). normal: extraction without ultrasound, ultra1: ultrasound at 30°C, ultra2: ultrasound at 50°C, and ultra3: ultrasound at 70°C.

DPPH radical inhibition property has been used in many studies as a method to measure the antioxidant properties of various date seeds. For example, any¹ and others in 2018, examining the amount of polyphenolic compounds extracted and their anti-inflammatory activity. Occidental finds five types of Algerian dates with more. AlshThe amount of polyphenols extracted, the amount of DPPH radical scavenging activity also increases in them. His studies. The maximum extraction rate of polyphenolic compounds was found in 80% methanol with 20.38-69.85 mg of gallic acid per gram of dry sample. However, high levels of antioxidant activity and a high number of polyphenolic compounds can be identified in the extract. Extracted in 70% acetone [24]. Tell them² inter alia Grad) extraction of polyphenols and the amount of antibacterial activity of plants *Hibiscus Sadarifa* L. It has been confirmed that the results show that increasing the temperature increases the extraction rate of polyphenols and the rate of

radical inhibition. DPPH And then it decreases. The maximum temperature resistance is at 52 °C. Because at high temperatures, antioxidants, including polyphenols and flavonoids, decompose. [25]

2-3-2-Ferric ion chelating properties and inhibition of hydrogen peroxide

The direct reaction of a substance from day loss is not the only method to investigate the antioxidant activity of a substance. As compounds of the second type of antioxidants. Although not involved in the conversion of free radicals to stable compounds, it is known to reduce oxidation rates. One of these oxidizing compounds that is effective in scavenging lipids by producing free radicals is the metal ion. Therefore, chelating compounds stabilize these ions and reduce the risk of free radicals [23]. Another one of these methods that indirectly prevents damage to living tissues is to inhibit the property of hydrogen peroxide. Although hydrogen peroxide does not react on its own, it causes the formation of hydroxyl radicals in the cell, which can damage living tissues. Therefore, measuring the protective

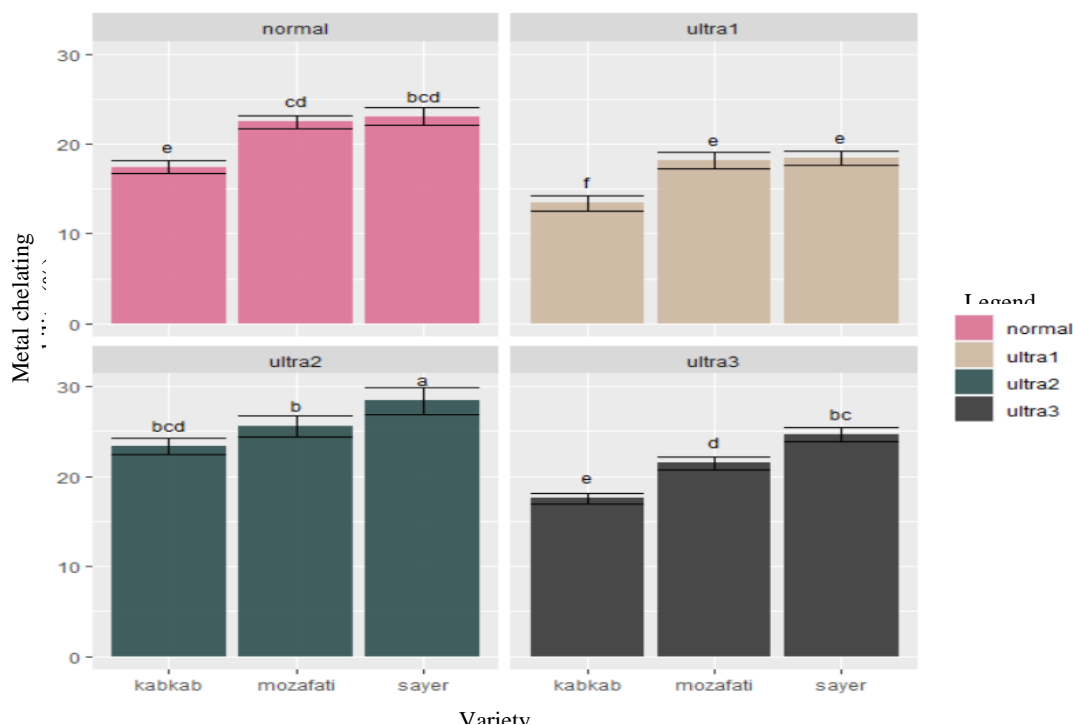
¹ - Hachani

² - Sanu

properties of this compound can indicate the antioxidant properties of the extract (2).

As shown in Figure 2, all the tested species have the characteristics of waste Operation They are metals. After treatment with ultrasound at 30 degrees Celsius, in contrast to the radical scandal propertyhiDPPH, activityOperation The loss of all date species has been significantly reduced. ($P < 0.05$) but it increased again at 50 and 70 °C temperature, and among the species tested, the Sauer variety had the highest property value without ultrasound treatment and with ultrasound treatment. Operation showed iron ion ($1.51\% \pm 4/28$)::

Islam¹ and others in 2016 investigated the antioxidant activity, including iron scavenging properties, of 43 types of edible mushrooms used in China. Their research results show that all studied mushrooms are very rich in polyphenolic and flavonoid compounds and have iron chelating properties, but there is no significant relationship between the concentration of polyphenolic compounds and the level of chelating properties in some species [26].



¹ - Islam

Fig 2 metal chelating ability of the extracts of date byproducts including Kabkab, Mozafati and Sayer after ultrasound extraction at 30, 50 and 70°C (P<0.05). normal: extraction without ultrasound, ultra1: ultrasound at 30°C, ultra2: ultrasound at 50°C, and ultra3: ultrasound at 70°C.

Unlike the DPPH radical scavenging property, the chelating activity depends on the type of polyphenolic compounds present in the tested sample rather than the total amount of polyphenolic compounds. Only polyphenols with a specific chemical structure participate in the chelation reaction of metals such as iron and copper. The presence of hydroxyl, keto and catechol groups²⁵ In the structure of the benzene ring of polyphenolic compounds, the property level. They greatly increase the sedation properties of these compounds. Therefore, despite the increase in the amount of polyphenols and the ability to inhibit radicals, the initial reduction of these compounds at 30 °C. DPPH occurs as a result of applied heat and changes in the structure of polyphenolic compounds.

Figure 3 shows the inhibitory activity of hydrogen peroxide in the tested day species. In the tested species, the inhibitory activity of hydrogen peroxide in the waste was in the range of (23.2 ± 1.276) to (40.433 ± 0.802) . The use of ultrasound and a temperature of up to 50 °C increased the protective property of hydrogen peroxide in all species, and the highest protective property associated with the additional difference was reported when using ultrasound and a temperature of 50 °C in the highest concentration. Polyphenol in the extract.

Nagolandran²⁶ and others in 2007, the properties of the anti-inflammatory properties of the plant *Cypress round*. It was confirmed that the results of their study showed that increasing the amount of the extract from 10 to 100 µg/ml significantly increased the antioxidant activity including hydrogen peroxide activity [28].

²⁵ - Catechol

²⁶ - Nagulendran.

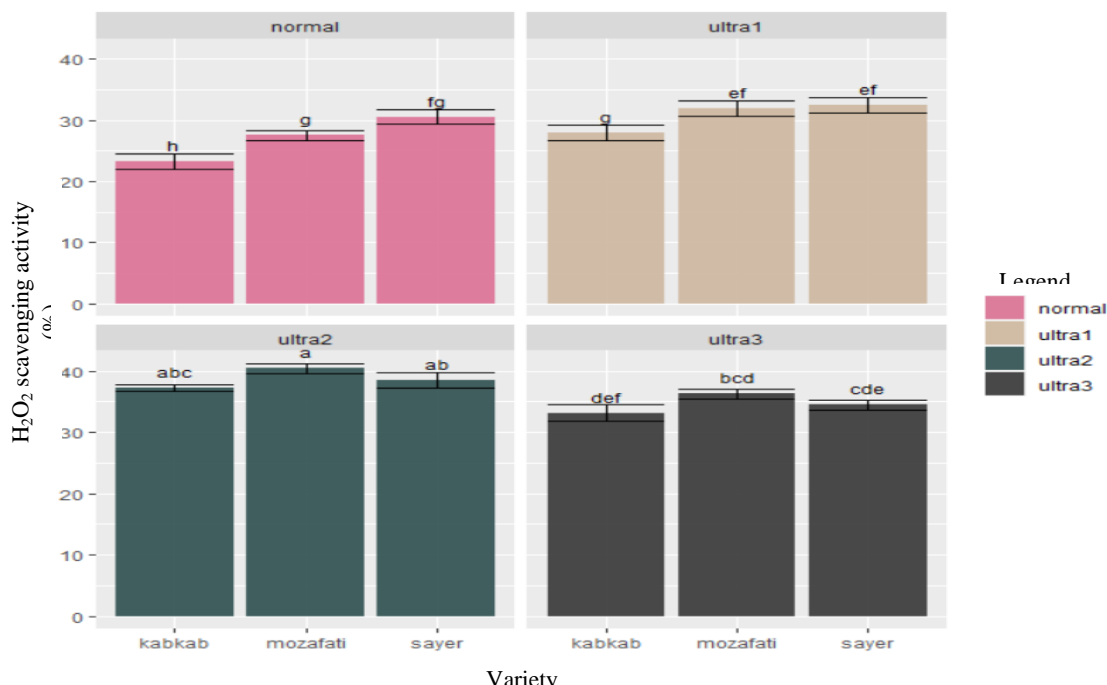


Figure 3 H₂O₂ Kabakab, Mozzafati and Sayer, characterization of day by-products after ultrasonic extraction at 30, 50 and 70°C (P<0.05). Normal: extraction without ultrasound, ultra1: ultrasound at 30°C, ultra2: ultrasound at 50°C and ultra3: ultrasound at 70°C.

3-3- The relationship between polyphenol compounds and antioxidant properties

Table 2 shows the Poisson correlation coefficients between polyphenols, flavonoids, DPPH inhibition property, scavenging property..Metal ionization and hydrogen peroxide inhibiting properties. As shown in the table, there is a very strong relationship between polyphenols and DPPH inhibition property (0.8952698) and also between flavonoids and DPPH inhibition property (0.8340697). Also, there is an accepted relationship between polyphenols and flavonoids with metal ion chelating property and hydrogen peroxide shielding property. These amounts are respectively 0.8153759 and 0.7970916 for the propertyOperation and 0.7710567 and 0.7338833 belong to hydrogen peroxide shielding property.

Table 2 Correlation between polyphenols, flavonoids and antioxidant properties

Measu re	Polyp henol	Flavo noids	DPPH scaven ging ability	The ability to manip ulate	H ₂ oh ₂ Demol ition ability

				metal	
Polyp henol	1.0000 000	0.953 4540	0.895 2698	0.815 3759	0.771 0567
Flavo noids	0.9534 540	1.000 0000	0.834 0697	0.797 0916	0.733 8833
DPPH scaven ging ability	0.8952 698	0.834 0697	1.000 0000	0.664 7386	0.842 9078
The ability to manip ulate metal	0.8153 759	0.797 0916	0.664 7386	1.000 0000	0.669 7844
H ₂ oh ₂ Demol ition ability	0.7710 567	0.733 8833	0.842 9078	0.669 7844	1.000 0000

Taking into account the relationship between polyphenolic compounds and antioxidant properties, the antioxidants derived from mozzafati, cabbage and

other plant wastes are due to polyphenolic compounds and confirm the presence of these compounds in the selection. Health-related effects on the human body

A strong correlation between polyphenol content and the antioxidant activity of various nutrients has been demonstrated in many studies. For example, Xiao²⁷ And his colleagues²⁸) examined chickpeas. The results of their study show that there is a strong relationship between these compounds and their antioxidant properties. The highest correlation was reported between polyphenolic compounds with iron antioxidant power (0.964) and DPPH radical scavenging property (0.914) [29].

4 - conclusion

In this study, the extraction of polyphenolic compounds from three date varieties including Mozzafati, Kakab et al., the effects of ultrasound and heat treatment, as well as the antioxidant properties of these compounds were investigated. The amount of polyphenols released after ultrasound treatment increased in all cultivars. Also, among the three selected temperatures, an increase in temperature up to 50 °C increased the extraction of polyphenolic compounds and then decreased. Also, the medical examination showed that using ultrasound at a temperature of 50 degrees Celsius, a large amount of polyphenolic compounds can be extracted in the variety of Sayer. In all tested varieties, except for the property of antioxidant properties Operation Iron ion using ultrasound and increasing the temperature up to 50 degrees Celsius and then decreased. Also, there were strong correlations between these compounds and their antioxidant properties. Based on the findings of this study, wastes from these day crops are suitable sources of poly compounds. They are phenols that have

health-promoting properties and can be used as inexpensive sources of added value.

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6- Resources

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²⁷ - Xiao

²⁸ - FRAP

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تأثیر دما و اولتراسوند بر میزان استخراج پلی فنول‌ها و فعالیت آنتی‌اکسیدانی ضایعات حاصل از سه رقم خرمای مضافتی، کبکاب و سایر

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چکیده

اطلاعات مقاله

در این مطالعه، تأثیر اولتراسوند و دما در سه سطح ۳۰، ۵۰ و ۷۰ درجه سانتیگراد بر میزان ترکیبات پلی فنولی و خواص آنتی‌اکسیدانی عصاره ضایعات حاصل از سه رقم خرمای مضافتی، کبکاب و سایر بررسی شد. برای بررسی خواص آنتی‌اکسیدانی از سه آزمون خاصیت مهار رادیکال‌های DPPH، خاصیت چلاته‌کنندگی یون آهن و همچنین خاصیت مهار هیدروژن پراکسید استفاده شد. نتایج نشان داد که استفاده از اولتراسوند در تمامی ارقام خرما موجب افزایش میزان استخراج ترکیبات پلی فنولی و فلاونوئیدها شد. همچنین افزایش دما تا ۵۰ درجه سانتیگراد موجب افزایش استخراج پلی فنول‌ها و فلاونوئیدها شده و پس از آن موجب کاهش آن گردید. بیشترین میزان استخراج پلی فنول و فلاونوئید به ترتیب $4/64 \pm 0/07$ میلی گرم اسید گالیک بر گرم و $0/112 \pm 0/326$ میلی گرم کوئرستین بر گرم در رقم سایر و با استفاده از اولتراسوند در دمای ۵۰ درجه سانتیگراد اتفاق افتاد. خاصیت مهار رادیکال‌های DPPH و هیدروژن پراکسید پس از استفاده از اولتراسوند و افزایش دما تا ۵۰ درجه سانتیگراد افزایش یافته و پس از آن کاهش یافت ($P < 0.05$). بیشترین خاصیت مهار هیدروژن پراکسید در رقم مضافتی مشاهده شد. خاصیت چلاته‌کنندگی یون آهن پس از اعمال اولتراسوند در دمای ۳۰ درجه کاهش و پس از آن به صورت معناداری ($P < 0.05$) تا بیشترین میزان $40/433 \pm 0/802$ در رقم سایر افزایش یافت. همبستگی بالایی میان میزان ترکیبات پلی فنولی و خواص آنتی‌اکسیدانی در عصاره حاصل از ضایعات هر سه رقم خرما مشاهده شد بنابراین خواص آنتی‌اکسیدانی عصاره حاصل از ضایعات ارقام مورد آزمایش خرما از ترکیبات پلی فنولی آن ناشی می‌شدند. همین امر می‌تواند موجب استفاده از این ضایعات به عنوان منبعی ارزان برای استخراج ترکیباتی با خواص سلامتی بخش شود.

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