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Effects of the thermic treatment of the retam honey in the El-Oued region on some physical and chemical properties

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Abstract

The purpose of this study is to study the effect of heat treatment on the physiochemical characteristics of the honey sample of the plant retam taken from Oued Souf region for the season 2018 , In this we have studied the properties of (acidity, Colour, hydroxy methyl forural (HMF), total phenols and flavonoids, anti-oxidant activity). based on the methods of the Spectrophotometer, After exposing equal amounts of honey to the frozen at -18c°, and heat at 50 °C, 70c° and 90C°, they heated them for a period of half hour and a period four and a half hours. The results show that all samples of different, which have been heated at different temperatures or freezing at -18 ° C over a period of time has differences between pH values at 4 and 1/2 hours, 30 minutes. its pH and ranged in value between between (4.4 - 4.5) and (4.4 - 5.03), respectively. Besides, it was found that the more the temperatures get increased and the duration of heating, the more total acidity and color intensity increased, too. Where it reached The total acidity value at 90 c° in the heat for 4.5 hours (37.5) and 30 minutes (30)mg/kg. While the color intensity reached 136.96, 112.84, respectively. The results showed that heat or cooling treatment increased the hydroxy Mithil Fororal content (138.68;67mg/kg) and the content of secondary metabolites total phenols (530.5, 268.3 mg/kg)and flavonoids(32.2, 30.1mg/kg)as well as the antioxidant activity against the DPPH. Where the values of each of them respectively at 4.5 hours and 30 minutes. The degree and duration of heating affect the properties of honey. Any failure to ensure health quality.

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Introduction

Honey is considered a favored food for man, It is a natural product that has been accompany since the highest antiquity. It is a mixture consisting mainly of carbohydrates (glucose, fructose, sucrose, maltose, polysaccharides), in addition to water, nitrogen compounds, lipids, vitamins, minerals, gluconic acid, lactones, phenolic compounds, flavonoids, carotenoids, enzymes, volatile compounds (Alamanni *et al.*,1992;White ,1993;Fallico *et al.*,2003; Carvalho *et al.*,2005;). This combination makes the honey is characterized by physical and chemical characteristics, They are represented in (moisture, pH, total acidity, mineral content, viscosity, ash, reducing sugars, insoluble sugars, Hydroxy methyl furfural (HMF), and so on.) that is different for different types of honey, which varies according to season and type of nutrition available to the bees, taste, smell and sweetness that differ from plant sources, which combines the bees from nectar (Marchini *et al.*,2008;Nobel,2004)changes in its quality. It is therefore, necessary to know the main factors that can alter its quality, of which temperature is the main factor that degrades sugars, thus leading to the formation of hydroxyl methyl furfural, generally not present in fresh honey. Other parameters that cause browning (Bodganov *et al.*, 1997; Bath andSingh, 1999; Villamiel *et al.*, 1998) and generally chemical contamination by carcinogenic or allergenic products related to their physiology.

The change of humidity and heat creates favorable conditions for transformational chemical reactions. These interferences could be due to Honey heating, requires both to reduce viscosity, and to prevent crystallisation or fermentation.

The treatments are used to show the honey characteristics Visual that meet the quality standards described by the international food organizations.

Therefore, the aim of this work is to study and compare the effects of heating at different temperatures on the characteristics of honey in the area of Oued Souf.

Material and methods

Sample

Honey Retam sample were directly taken private by local beekeepers of El oued, were from the 2018 season.

Heating treatment

Sample (30 g) were transferred to vials and heated in a Water bath at 50, 70 and 90 C. At definite time intervals (270 min and 30min), In addition to cooling at -18 for the same two time periods. the vials were withdrawn, rapidly cooled and samples were analysed.

Determination of acidity

PH were measured in 10% honey solution using PH mètre, according to the method of Gethin *et al.* (2008).Neutralization of The total acidity in sample by Solution of sodium hydroxide 0.5 M in the presence of phenolphthalein. according to the method of A.O.A.C.(1999).

Colour measurement

Colour was evaluated according the pfund scale after measuring the absorption of light rays of the solution of honey with a concentration of 50% at the wavelength 635 nm.

Determination of HMF

HMF was estimated by the White method as described by Bongdavo (2002), which is based on absorption readings at wavelengths 284 and 336 nm. And then calculate compound concentrations (HMF) by applying the following equation:

HMF (mg / kg) = (A284-A336) 149.7 × 5 × D / W

Determination of total phenolic

The phenolic compounds are quantified by the UV-Vis spectrophotometer and the use of gaelic acid as a reference phenolic compound with concentrations between 0.01, 0.04 mg / ml at 760nm (**Chemsa** *et al.*, 2016).

Determination of flavonoids

Flavonoids of phenolic compounds can be chemically

evaluated in the presence of aluminum nitrate AlCl3 and use of Christine as reference in concentrations between (0.002, 0.01 mg / ml)At a wavelength of 415nm so that it was (R^2 = 0.9818) (Kavita, 2015).

Antioxidant activity

The principle is to measure the ability of antioxidants to return the free root DPPH (diphenyl picryl-hydrayl), which is relatively stable at room temperature and turns purple when melted in ethanol or methanol. In the presence of antioxidants. The free radical scavenging activity of honey samples was determined by the 1,1-diphenyl-2-picrylhydrazyl (DPPH) assay as described by Which is estimated according to the method (Chemsa *et al.*, 2016)

Results and discussion

pH

Table 1 results showed differences between pH values at 4 and 1/2 hours, 30 minutes unchanged at found (Makhloufi, 2010) In studying on 66 species of Algerian honey, the pH of all honey samples ranged between 40.3 and 23.6 where it indicated that there were no fixed limits to pH values, but this could be used as evidence of plant origin, and was found (Hocine 2012).

Tabe 1. Effects of the thermic treatment on pH of the Retam Honey.

LSD	90C°	70C°	50C°	TC°	-18C°	Tem.p	Sample
0.65	5.03	4.7	4.7	4.4	4.4	4.5 h	R2018
0.84	4.5	4.4	4.4	4.4	4.4	30min	R2018

The difference in thermal parameters had no effect on pH, while found (Cavia, 2007 and Nair, 2016). During their studies on some types of Algerian honey, the pH values of heated honey have varied different temperatures for all samples and the pH decreases rapidly in linear fashion when the temperature of honey has increased. Therefore, there is a linear relationship between pH and warming temperature.

Table 2. Effects of the thermal treatment onvalue (IC_{50}) of the Retam Honey.

DPPH activityIC_{50} (µg/mL)		Temperature
Time		
270min	30min	
145.29	187.55	-18
331.81	331.81	T
243.67	213.32	50
238.53	249.95	70
126.28	186.67	90
11.34	9.95	LSD

Total acidity

The results of the Fig.1 show the change in acidity with the heating process, which increased according to the increase in temperature at 4 and a half hours, and in 30 d the change was only at 90°C. The freezing of honey at -18°C has an effect on total acidity similar to the warming effect at 90°C.The statistical study indicated that the cooling and heating at 90°C in both cities led to a moral decrease, 50°C had no moral effect on the two samples, and at 70°C the significant increase of R2018 was four and a half hours.

Color intensity

The results of the Fig. 2 show that the thermal treatment changed the color intensity of the honey, increasing by increasing the temperature of heating and freezing, and there was a direct relationship between the duration of heating and color intensity, and we found a significant increase in color intensity at all temperatures. When the results were consistent

with the Pfund ladder, it was found that the honey produced in 2018 and the heater for four and a half hours between (72.71 -136.96).

The warmer for half an hour is between 71. 72 and 112.82 It is a light amber color, Gonzales *et al.* (1999) pointed out that the dark color in honey is the result of the effect of the Millard reaction, and Fructose Caramel, And activity of multiple phenols and enzymes. The degree of thickness of the honey color varies depending on the duration and temperature.

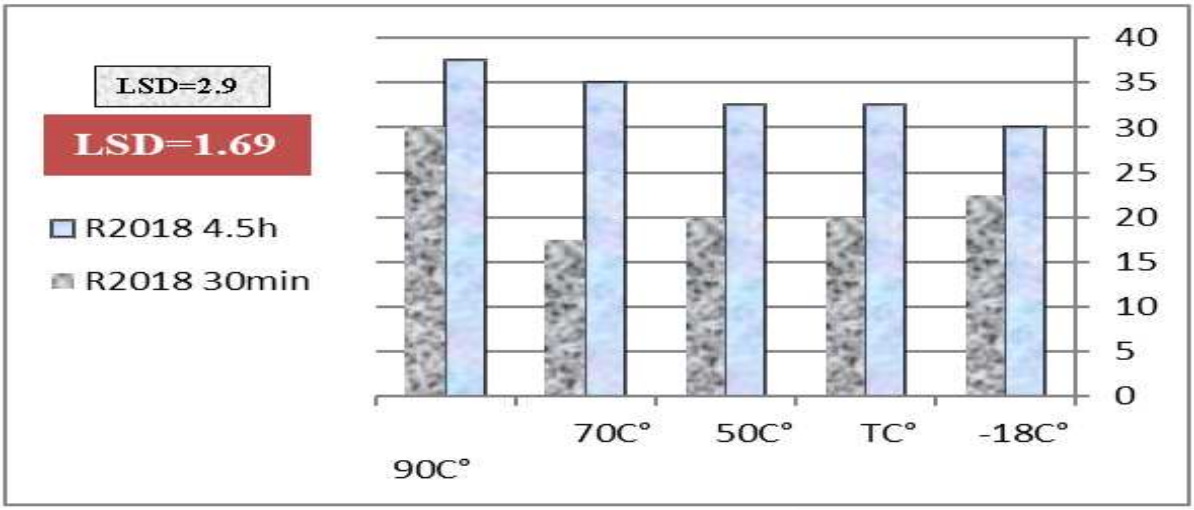

Fig. 1. Effects of the thermic treatment ontotal acidity of the Retam Honey.

Hydroxy methylforural (HMF)

The results of the figure 03 show that temperature did not affect HMF content during the first half hour, while a gradual significant increase with heating at four and a half hours and a maximum value at 90°C (138.68 mg/kg), where HMF is formed as a result of carbs reactions, especially hexagonal sugar in the acidic medium (Aldiab and Jarkas, 2015) and Resende Ribeiro *et al.*, (2012) suggested using HMF content as a sign of heat-quality honey loss, the content of which is significantly increased when exposed to high temperatures over a long period of time.

Phenolic estmate

The results of the figure04 show the effect of the pre-heat parameters on the R2018 sample, which led to a significant increase in the quantity of the heated sample in half an hour and four and a half hours.

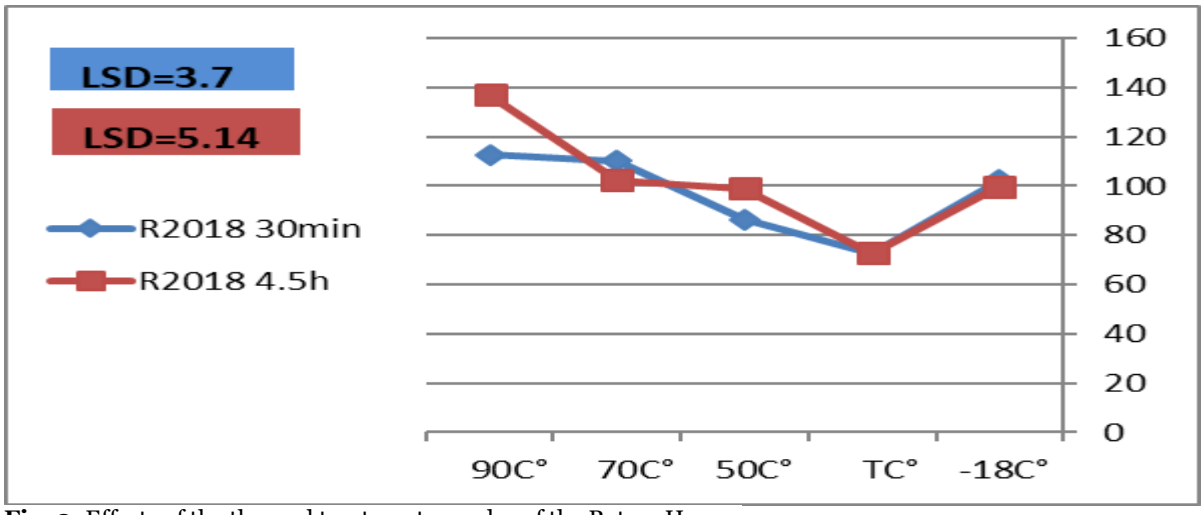

Fig. 2. Effects of the thermal treatment on color of the Retam Honey.

These results correspond to what Turkmen*et al.*, (2006) and Jahan *et al.*, (2015) are getting,that explained the result that phenol had increased because of the destruction of the effective site of protein, the degradation of self-oxidizing antioxidants and the production of some non-food antioxidants as a result of the Millard reaction.

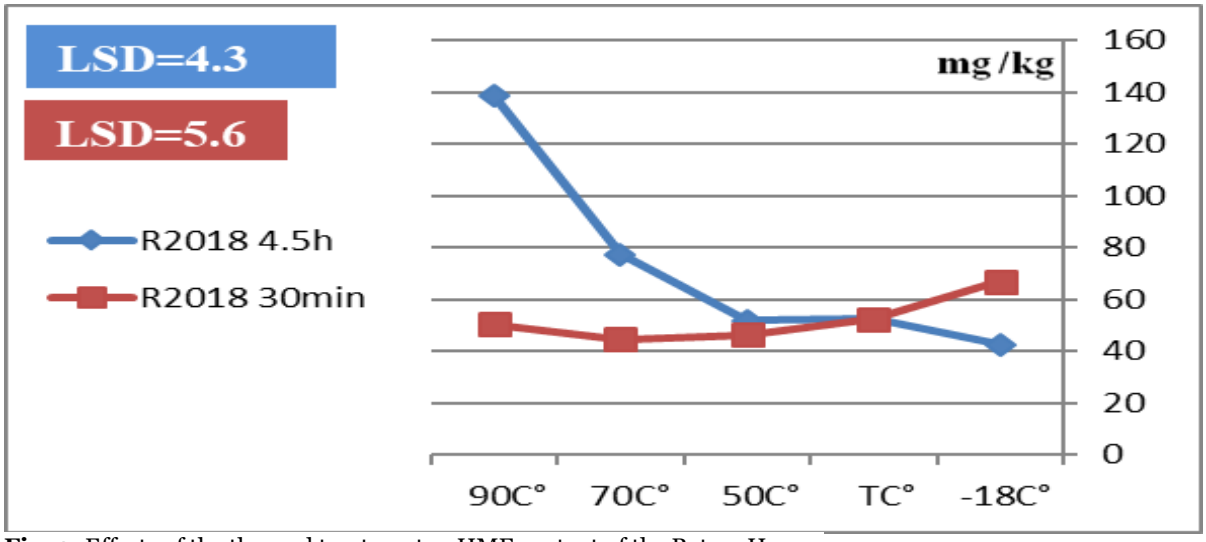

Fig. 3. Effects of the thermal treatment onHMF content of the Retam Honey.

Flavonoids estmate

The results of the figure05 show that the thermal treatment led to significant increases in Flavonoids content at 90°C, at which time it was reduced by 50°C and 70°C, this results that matched the results it found by Jahan *et al.*(2015).

Anti-oxidant activity in honey

The Table 2 shows the results of the effect of the thermal treatment on antioxidant activity in the round-roam honey produced in 2018, with the results showing an increase in the diatonic activity against the DPP that has reached a value (IC_{50}) (126.28, 186.67) µg/mL at 90 °C for heating houses 4.5 hours and 30 minutes in order instead of 331.8 µg/mL for the R2018 non-heat coefficient sample (T).

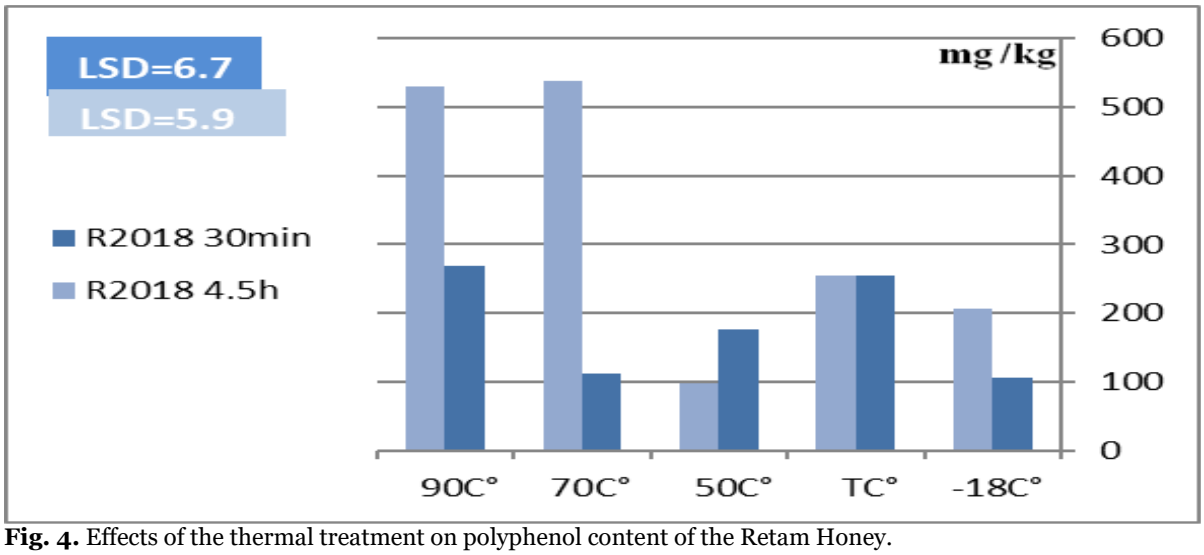

Fig. 4. Effects of the thermal treatment on polyphenol content of the Retam Honey.

The results of the document 06 show the effect of the pre-heat parameters on the R2018 sample, which led to a significant increase in the quantity of the heated sample in half an hour and four and a half hours.

These results correspond to what Turkey and others are getting (Yang*et al.*, 2013;Jahan *et al.*, 2015). DPPH content has decreased significantly with a gradual increase in temperature (50°C, 70°C, 90°C), which represents an increase in antioxidant activity. The increase in antioxidant activity may be due to the production and activation of some heat-resistant compounds that contribute to the increased activation of anti-oxidants. Brudzynski (2012) noted that the products of the Maylard interaction, in particular melanodin resulting from the process of association and the reaction of sugar with amino acid are characterized by antioxidant activity for its ability to inhibit free radicals that form when honey is treated with heat or when storage time is prolonged.

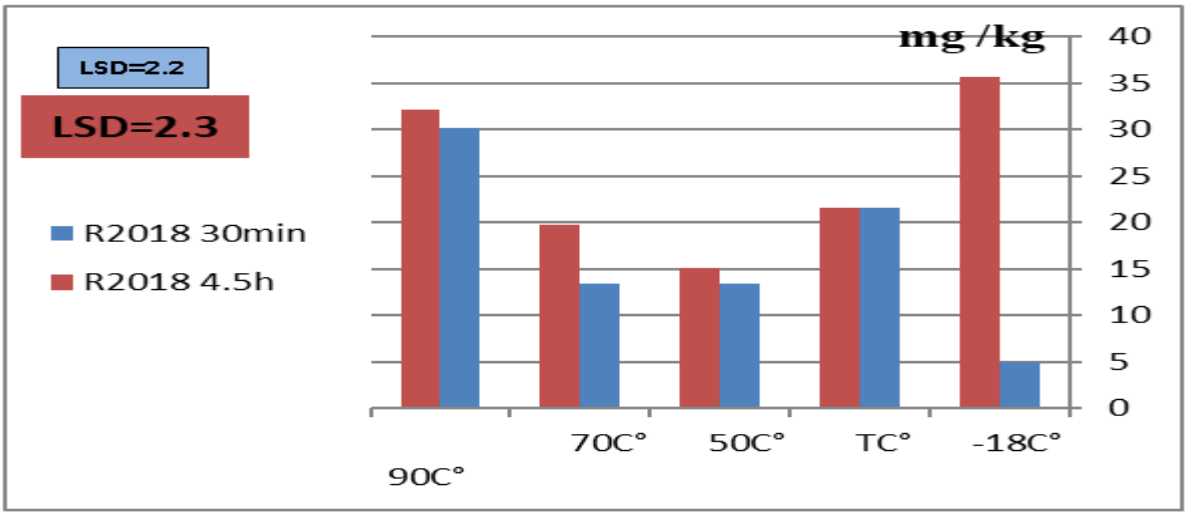

Fig. 5. Effects of the thermal treatment onflavonoid content of the Retam Honey.

Conclusion

The physical and chemical standards of honey prior to heating were in conformity with the required standards of international standards.

The results obtained indicated that honey was affected by freezing and heating according to the duration of the transaction and temperature, and that the effect of the transaction was 90° and 18° C, more clearly than 50° and 70° C, and for four and a half hours more than half an hour. Many changes have been observed except for pH, where total acidity has increased, as well as the increase in color intensity, quantity of phenols and fluvoonides, as well as antioxidant activity. These changes are related to reactions to honey organic materials caused by the Millard reaction.

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