









Original article

An Insight into Preference, Quality Perception and Attitudes towards Honey Consumption in Tunisia

Sarra Jribi ^{a,*}, Nour- El Houda Hanafi ^a, Souha Jmal ^a, Hassen Ben Salem ^b,
Hanan Ben Ismail ^{a,c} & Hajer Debbabi ^a

^a University of Carthage, National Institute of Agronomy of Tunisia (INAT), Departement of Agri-food industry UR17AGR01, Tunis, Tunisia

^b Office of livestock and pasture (OEP), Tunis, Tunisia

^c Biodiversity, Biotechnology and Climate Change Laboratory, LR11ES09, University of Tunis El Manar, Tunisia.

Abstract

Honey consumption has increased these past years. Unfortunately, this growth on market may contribute on the spread of honey adulteration. The present study aimed to assess honey consumption habits, preferences and quality perception by Tunisian consumers. A 502 respondents' survey was conducted. Survey results indicate that most of respondents (93 %) are honey consumers. Frequency of consumption ranged between 2 to 3 times a week for 31.9% of respondents and 2 to 3 times a month for 26.3%. Regarding the place of purchase, beekeepers and producers were by far the most declared (75.1%) place. Survey results showed that 83.3% of consumers preferred local honey with slight preference for monofloral honey (51%). Survey respondents did not show particular preferences for honey color (light for 47.6 %, dark for 44.8) or texture (creamy for 45.6%, liquid for 37.8%). Majority of participants (61.6%) trust the product they buy and believe that they are not defrauded. The place of purchase reassures 41.4% of respondents about the lack of adulteration. In conclusion, this study highlights the importance of strengthening the short food supply chain for the development and the promotion of honey value chain. It also indicates the need to implement further tools ensuring food traceability and authenticity to protect consumers.

Keywords: Honey, Consumers' Shopping Behaviors, Consumers' Attitudes, Consumption Drivers, Quality.

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* Corresponding author:

Eng., M.Sc., Ph.D. in food sciences, Sarra Jribi is a member of the Research Unit PATIO (Valorization of Tunisian Natural Resources and Food Heritage through Innovation), National Institute of Agronomy of Tunisia. Her research interests include the Food science, Food processing, Sustainable transformation. Sarra Jribi is also a member in "Food and Health" team at the National Institute of Agronomy.
Email: sarra.jribi@gmail.com

INTRODUCTION

Apiculture is the care and feeding of bee colonies. It allows obtaining various products such as honey, propolis, flower pollen, bee pollen, and royal jelly. In terms of quantity, honey is the most produced bee product. According to the Codex Alimentarius 12-1981, honey is defined as “the natural sweet substance produced by honey bees from the nectar of plants or from secretions of living parts of plants or excretions of plant sucking insects on the living parts of plants, which the bees collect, transform by combining with specific substances of their own, deposit, dehydrate, store and leave in the honey comb to ripen and mature.” Thanks to its composition, honey could offer several health promoting properties such as: anti-inflammatory, antioxidant, anti-cancer activities against breast and cervical cancer and prostate cancer, digestive, analgesic, antimicrobial and antiseptic characteristics (Fakhlai et al., 2020; Ribeiro et al., 2019). Accordingly, the use of honey could be related not only to its sweet taste but also for its therapeutic properties. Such fact could explain the increase in honey consumption and the development of apiculture market. In fact, Global production of honey reached 1 770 119 tons in 2020 (FAO, 2022) with a value of 9.20 billion in 2021 and it is expected to reach the value of USD 16.05 billion by 2029 (Agriculture and animal feed ,2022). Main producers are: China, the United States of America and Argentina. Globally, annual honey consumption ranged from 0,3 to 0,4 kg / inhabitant in Italy, France, United Kingdom to 1 to 1,8 kg / inhabitant in Greece, Denmark, and Portugal (Chirsanova et al., 2021). In Tunisia, average annual honey production was estimated to 2270 tons in 2021 (FAO, 2022), mainly for domestic consumption (99%; Mediterranean Beekeepers Association). Annual honey consumption is very low, about 0.2 kg / inhabitant/year (INS, 2020).

In order to satisfy consumers' expectations and to implement effective honey production and marketing policies, it is necessary to identify the main factors influencing the honey market. Previous studies highlighted that many factors are affecting honey consumption. Profiling honey consumers showed that it could be related to socio-demographic characteristics and product quality attributes like color and texture (Bršćić et al., 2017; Thoma et al., 2019; Testa et al., 2019). Added to, price, brand reputation, packing, may also influence consumer's behavior and their purchasing intentions (Cosmina et al., 2016; Starowicz, et al., 2021).

Food fraud represents an international issue. According to the Food Standards Agency (FSA) food fraud is defined as “deliberately placing food on the market, for financial gain, with the intention of deceiving the consumer” (Brooks et al., 2021). These frauds could be made with different approaches like: Substitution, dilution, counterfeiting, mislabeling, concealment, grey market or unapproved enhancements (Brooks et al., 2021). Honey, as one of the most common foods worldwide that has been subjected to adulteration worldwide (Fakhlai et al., 2020). Overcoming honey adulteration problem could be achieved by implementing traceability systems and analysis to confirm product authenticity

(Brooks et al., 2021). The success of such approach relies on producer's engagement which could be influenced by consumer knowledge and perceptions.

Previous research of Ben-Ali and Taghouti (2022) investigated Tunisian consumer preferences for local forest honey attributes with focus on market segmentation. Meanwhile, to the best of our knowledge, research on consumers' purchasing, consumption, preferences and quality perception of honey in Tunisia still incipient. Thus, the current study was undertaken to identify the determinant factors for purchasing and consuming honey as well as quality perception in a developing country study case.

MATERIALS and METHODS

This research was based on a survey. The questionnaire was conducted through face-to-face interviewing and an online self-administered structured questionnaire, as previously described by Jribi et al. (2022). It was developed through Google website, and administered in French language (the academic language in Tunisia) from January to March 2022. Respondents (502) were recruited on a voluntary basis.

The questionnaire consisted of 20 one option and multiple-choice questions structured in 5 sections: (1) Honey consumption habits; (2) Honey preferences; (3) Honey purchase behaviors (4) Honey adulteration. The last part was about respondents' socio-demographic characteristics (gender, age, employment, education, average household income).

Respondents' socio-demographic characteristics are summarized in Table 1. Data were analyzed using descriptive statistics, as percentages. Chi-square tests of independence were used to test for associations with demographic variables, using Minitab software (Minitab 17, Pennsylvania, USA). Statistical significance was determined by $p < 0.05$.

Table 1. Socio-demographic characteristics of the respondents

		% of respondents
Gender	Women	66.14%
	Men	33.86%
Age (years old)	<25	21.12%
	25-40	33.47%
	41-60	40.24%
	More than 60	5.18%
Occupation	Managers and higher intellectual professions	32.07%
	Craftsmen, traders, entrepreneurs	5.78%
	Employee	25.90%
	Student	23.71%
	Retired	5.78%
	Jobless	6.77%
Average household income (TDN/month)	Less than 1000	24.50%
	1000-3000	55.78%
	More than 3000	19.72%

RESULTS and DISCUSSION

Honey consumption and purchasing

Although average honey consumption does not exceed 0.2 kg/year (INS, 2020), almost respondents reported that they consume this product (93%). Such trend in honey consumption were previously reported (Kabakcı&Dodoloğlu, 2021; Roman et al., 2013). The high rate of honey consumers may be attributed to its multiple uses (health, nutrition, cosmetic...) and its association to a positive consumer attitude. In fact, results of a qualitative study conducted by Oravecz&Kovács (2019), in Hungary showed that honey has a good evaluation of the respondents when they were asked to formulate what they think of the word "honey". Moreover, our results showed that there was a significant relation between age and honey consumption.

Regarding honey consumption frequency only 13.1% of respondent used honey every day, around one third (31.9%) used it weekly, 26.3% monthly and 28.7% rarely. These frequencies demonstrate that honey is not a food staple. It could rather have other purposes of use. Thus, results could lead to profiling consumers into several groups: It could be attributed that consumers who use honey as sweetener would use it every day or several times a week while those who use honey for medical purposes would use it monthly or even rarely, on specific situations (Oravecz&Kovács, 2019). In the same context, our results revealed a high significant relation ($p<0.01$) between consumption frequency with age and monthly household income. In other words, needs may differ according age. Another aspect to consider,

consuming honey regularly would depend on its availability at home, on its self availability could be related to the product price.

For the place of purchase, regardless gender, age and monthly household income, most respondent (75.1%) declared that they buy honey from beekeepers. These findings may be related to the development of the short food supply chain in Tunisia. In fact, the direct contact of consumer with the producer allows better information about the product and in some cases more trust on product attributes (Ben Ali & Taghouti, 2022).

In case of frequency of purchase, more than one third of respondents (36.1%) bought honey each year, 20.1% did it each six months and only 15.9% did it monthly. These results could be related to consumers purchasing habits but also honey specificity: Availability of numerous categories according to botanic origin would lead to different harvesting time (according to botanic origin and flower life cycle). Moreover, our results showed that consumers prefer buying directly from beekeepers. As they have information about production and harvesting time, they would plan to purchase their annual needs freshly on harvesting season. No specific link was observed between the frequency of purchase and respondents socio-demographics (gender, age, household monthly income).

Purchasing behavior is defined by several drivers. In this study, consumers were asked about the most important criteria they consider while buying honey: Quality was the first criteria declared by 70.7% of respondents followed by reputation of origin with 18.7% then price with 7.4%. These results are in accordance with those of Kabakcı & Dodoloğlu (2021) who investigated honey marketing problems and honey consumption habits in Erzurum, Turkey. Main findings of this study showed that consumers pay attention to the quality of 76.19%, the price of 7.16%, the brand of 8.57% and the region of 7.61% when buying honey. Quality is a general term. In case of food products it could be considered as the sum of all properties and attributes making the product acceptable by the consumer. Considering previous results of place of purchase, where 75.1% of respondents declared buying directly from beekeepers, it would be expected that reputation of origin would be the second most important criteria. The origin of the product is determinant in food choice because of its impact on products properties (geographic origin, floral origin, sensory attributes) (Ben Ali & Taghouti, 2022). Moreover, the purchase intention of Tunisian consumers is very influenced by the affirmation of the quality of previous consumers (Ben Ali & Taghouti, 2022).

Table 2. Honey consumption and purchasing habits

		Total (%)	Gender (%)		Age (years)(%)				Monthly household income (TND)(%)		
			Women	Men	<25	25-40	41-60	60	<1000	1000-3000	3000
Honey consumption	Yes	93	93.7	91.8	97.2*	92.9*	93.1*	76.9*	92.7	92.5	94.9
	No	7	21	8.3	2.8*	7.1*	6.9*	23.1*	7.3	7.5	5.1
Consumption frequency	Every day	13.1	12.6	14.1	8.5**	10.7*	18.3*	7.7**	5.7**	13.6*	21.2*
	2-3 times a week	31.9	33.1	29.4	19.8*	33.9*	35.6*	38.5**	21.1**	35**	36.4*
	2-3 times a month	26.3	25	28.8	32.1*	23.2*	26.7*	19.2**	27.6**	27.1*	22.2*
	Rarely	28.7	29.2	27.6	39.6*	32.1*	19.3*	34.61*	45.5	24.3*	20.2*
Place of purchase	Special shops of dietetic products	2.8	3.6	1.2	0.9	3	3.4	3.8	4	2.2	3
	On line	2.2	2.1	2.4	0.9	2.4	3	0	2.4	2.2	2
	Fair/exhibitions	2.4	1.8	3.5	1.9	0.6	3.4	7.7	3.2	1.8	3
	Market/supermarket/mall	9.2	7.2	12.9	13.3	5.9	9.9	7.7	10.4	8.3	10
	Honey house	8.4	8.7	7.6	6.7	7.1	8.9	19.2	11.2	5.8	12
	Beekeepers	75.1	76.6	72.3	76.2	81	71.3	61.6	68.8	79.7	70
Frequency of purchase	Monthly	15.9	15.6	16.5	14.1	11.9	20.3	15.4	13.8	15	21.2
	Each 3 months	27.5	27.4	27.6	21.7	29.2	30.2	19.2	20.3	28.9	32.3
	Each 6 months	20.1	19	22.3	23.6	20.2	18.8	15.4	23.6	20	16.2
	Each year	36.4	38	33.5	40.5	38.7	30.7	50	42.3	36.1	30.3
Most important criteria	Disponibility	1.2	0.9	1.9	0.9	0.6	1.5	3.8	1.6	1.1	1
	Packaging	0.6	0.6	0.6	1.9	0.6	0	0	0.8	0.4	1
	Proximity	1.4	1.8	0.6	0	1.8	1	7.7	0	2.1	1
	Quality	70.7	74.2	68.3	75.5	70.8	67.8	73.1	75.6	68.2	72
	Reputation of origin	18.7	16.5	24.7	15.1	16.1	23.3	15.4	12.2	21.1	20
	Price	7.4	20	3.8	6.6	10.1	6.4	0	9.8	7.1	5

* p <0.05; **p<0.01 : for each Chi-square test, the percentages shown represent column proportions.

TND: Tunisian dinar

1TND=0.3 Euro

Honey characteristic preferences

After assessing honey consumption and purchasing habits an interest was accorded to honey preferences. In case of botanic origin, more than half respondents (51.6%) preferred monofloral honey and the botanic preference was significantly related to respondents age. Such trend was previously reported by Sedik et al. (2018) with young Slovakian consumers. The botanic origin does not reflect honey quality which is rather related to physico-chemical parameters like: sugars, phenolic compounds,

Hydroxymethylfurfural (HMF) (Archilia et al., 2021). Geographic origin is defined as the country or the area where the honey was produced (Di Vita et al., 2021). In case of this parameter, more than three quarters of respondents (83.3%) expressed their preference for local honey. These findings are in agreement with those of Oravec et al. (2020) and Ribeiro et al. (2019). Preference of local products might be explained by social reasons like traditions, community and belonging (Ben Ali & Taghouti, 2022).

Color of honey is among important honey attributes. It ranges from watery white to nearly black (Archilia et al., 2021). Honey color depends on botanical origin, ash content, temperature and time of storage (Gambaro et al., 2007). In this research, respondents preferred bright honey more than dark ones. In fact, light-colored honey types are often preferred by consumers (Archilia et al., 2021) as observed in previous research conducted by Sedik et al. (2018) and Ribeiro et al. (2019). Color is the first sensory property perceived by the consumers, which could determine if they will buy the product or not (Gambaro et al., 2007). It could even be linked with other sensory attributes like flavor: mild-flavored honey would be usually bright while dark honey would have strong flavor (resulting from intrinsic characteristics or high heating temperature), with exceptions (Archilia et al., 2021). These results suggest the need to promote specific marketing strategies for dark honeys like buckwheat, blackbutt, wildflower, thyme, dandelion, jarrah, chestnut, meadow, and manuka honey. Interest should be accorded to highlighting their nutritional interest through health and nutritional claims.

Food texture represents also an important sensory attribute affecting consumers' choices. In case of honey, viscosity is the most important factor influencing consumers' preferences (Saludin et al., 2019). Results demonstrate the preference of creamy and liquid honey as only 4.8% of respondents chose crystallized honey. Preferences were not linked to gender, age and monthly income. Although, crystallization is a guarantee that honey is pure, natural it might create the impression that it is adulterated (Amariei et al., 2020). In fact, textural properties depend on honey physico-chemical parameters like: moisture content, Brix concentration, fructose content (Oroian et al., 2015). Moreover, preferences for creamy and liquid texture could be related to the facility of handling and use. Altogether, results show a narrow knowledge of honey by Tunisian consumer.

Table 3. Honey characteristics preferences

		Total(%)	Gender (%)		Age (years) (%)				Monthly household income (TND)(%)		
			Women	Men	<25	25-40	41-60	60	<1000	1000-3000	3000
Botanic origin	Monofloral honey	51.6	50	54.7	43.4**	44.6**	59.4**	69.2**	49.6	52.1	53.5
	Mountain honey	29.9	29.2	31.2	34.9**	29.8**	27.7**	26.9**	34.7	29.3	26.3
	Both	18.5	20.8	14.1	21.7**	25.6**	12.9**	3.9**	15.7	18.6	20.2
Geographic origin	Local honey	83.3	84.9	80	83	83.9	83.7	76.9	81.3	84.3	82.8
	Imported Honey	3.4	3	4.1	4.7	3	3.5	0	1.6	3.2	6.1
	No specific preference	13.3	12.1	15.9	12.3	13.1	12.8	23.1	17.1	12.5	11.1
Color	Bright	47.6	47.6	47.6	42.4	42.9	53	57.7	46.3	47.1	50.5
	Dark	44.8	44.9	44.7	50	50	39.1	34.6	46.3	47.1	36.4
	No specific preference	7.6	7.5	7.7	7.6	7.1	7.9	7.7	7.4	5.8	13.1
Texture	Liquid	37.8	33.7*	45.9*	29.2	36.9	43.1	38.5	33.3	37.9	43.4
	Creamy	45.6	49.4*	38.2*	54.4	45.8	41.6	38.5	46.3	46.1	43.4
	Crystallized	4.8	5.7*	1.8*	7.5	4.2	3	3.8	5.7	4.6	2.1
	No specific preference	11.8	11.2*	14.1*	8.9	13.1	12.3	19.2	14.7	11.4	11.1

*p <0.05; **p<0.01 : for each Chi-square test, the percentages shown represent column proportions

TND: Tunisian dinar

1TND=0.3 Euro

Consumers and honey adulteration

Food adulteration would be defined as the act of intentionally decreasing the quality of food either by adding or swapping low-quality materials or eliminating various important integrant (Fakhlaei et al., 2020). The rising demand on honey market and attractive prices could enhance honey adulteration (Moskric et al., 2021) which could endanger consumers' health (Chekol et al., 2022). The last part of this research was reserved to investigating consumers' opinion regarding honey adulteration. Firstly, respondents were asked if they are sure that their purchased honey is pure. For more than half (61.6%) the answer was yes. This perception seems significantly depending on gender and age. The main reason reassuring respondents was the place of purchase. This fact highlights again the previous results where 75.1% of respondents declared buying honey directly from beekeepers as also observed in Romania (Pocol&Boboaca, 2013), Hungary Oravec et al. (2020), Poland (Roman et al., 2013) and Portugal (Ribeiro et al., 2009). This choice might be based on trust relation between consumers and producers. Added to, our results show a link between reasons reassuring consumers and monthly household income. This survey showed the link between honey consumption frequency and income (Table 2). Taking into account the price of honey it could be suggested that consumers with high income would be able to buy honey at high prices from the best vendors and consequently with good quality and lack of adulteration. When buying honey, sensory attributes (color, taste, odor) are the guaranty of honey authenticity for

55.6% of respondents, particularly women. Reputation of origin stands just after sensory attributes for 30.1% of respondents. Although, detection of honey authenticity relies on analytical methods 25.5% of surveyed consumers declared that know tricks to discover if honey adulteration. These methods could be related to some wrong information as observed previously with crystallized texture.

Table 4. Consumers and honey adulteration

		Total	Gender (%)		Age (years) (%)				Monthly household income (TDN) (%)		
			Women	Men	<25	25-40	41-60	60	<1000	1000-3000	3000
Are you sure that your purchased honey is pure and not defrauded?	Yes	61.6	65.7**	53.5**	67.9*	66.7*	55.9*	46.1*	59.3	61.1	65.6
	No	38.4	34.3**	46.5**	32.1*	33.3*	44.1*	53.9*	40.7	38.9	34.4
What reassures you that your honey is not defrauded?	Informations mentioned, certification	5.8	5.5	6.5	0	5.4	9	7.7	3.2**	7.2**	5.1**
	Vendor/place of purchase	41.4	39.9	44.1	29.2	40.4	49.5	34.6	30.1**	41.2**	56.1**
	Taste	14.5	12.8	17.6	15.1	13.9	12	34.6	15.4**	14.8**	12.2**
	Texture	23.1	26.5	16.5	32.1	24.1	19	11.5	26.8**	22.4**	20.4**
	Color	3.2	3.7	2.3	4.7	3.6	2	3.9	4.9**	3.2**	1.1**
	Price	12	11.6	13	20	12.6	8.5	7.7	19.6**	11.2**	5.1**
When buying honey, what attributes can reassure you that the honey is not fraudulent?	Characteristics (color, taste, odor)	55.6	61.4**	44.1**	18.9	58.3	42.1	50	72.4**	52.5**	43.4**
	Product presentation	2.4	2.7**	1.8**	0	1.8	3.4	7.7	1.6**	2.5**	3**
	Reputation of origin	30.1	26.5**	37.1**	73.9	25	40.6	38.5	20.3**	31.4**	38.4**
	Tacability	11.9	9.4**	17**	26.1	14.9	13.9	3.8	5.7**	13.6**	15.2**
Do you know any methods/tricks to recognize if the honey is fraudulent?	Yes	25.5	27.1	22.3	22.6	30.3	21.8	34.6	19.5	26.3	30.3
	No	74.5	72.9	77.7	77.4	69.7	78.2	65.4	80.5	73.7	69.7

*p <0.05; **p<0.01 : for each Chi-square test, the percentages shown represent column proportions

1TND=0.3 Euro

Conclusion

The present study is an attempt to provide knowledge regarding Tunisian consumers' purchase and consumption patterns as well as preferences for honey. This study has indicated that survey respondents consider medicinal and therapeutic properties as the most important feature shaping the consumption of honey, suggesting that awareness on health benefits of honey should be intensified. Beekeepers and producers represent the most declared place of purchasing. Moreover, geographic origin and its reputation are main drivers determining honey purchasing. Consequently, further efforts on strengthening short food supply chain. Added to, Protected Designation of Origin (PDO) should be

carried out to promote honey value chain. These strategies should implement adapted tools to ensure food traceability and authenticity in order to empower consumers to guarantee their purchase for honey, and thus its health benefits.

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Conflicts of interest

No potential conflict of interest was declared by the authors

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