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Evaluation of Honey and Propolis Consumption Habits of Adults During the COVID-19 Pandemic

COVID-19 Pandemi Sürecinde Yetişkinlerin Bal ve Propolis Tüketim Alışkanlıklarının Değerlendirilmesi

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ABSTRACT

Objective: This study was conducted to assess the consumption preferences and quantities of bee products in adults and to determine change in consumption of honey and propolis during the COVID-19 pandemic period.

Material and Method: This descriptive cross-sectional study was conducted with 1217 individuals between November 2021 and March 2022. An online questionnaire was used for data collection, which included descriptive characteristics and participants' honey and propolis consumption habits. The data was analyzed using number, percentage, mean, McNemar, and Marginal Homogeneity test.

Results: In this study, mean age of individuals was 26.84±10.96 years, 68.9% were male, 51.8% had a secondary education, and 73.4% had no chronic disease. It was found that honey and propolis increased among subjects during the pandemic ($p<0.001$). Participants consume honey and propolis because they are tasty and nutritious, strengthen immune system, and are effective in treating diseases. It was found that participants preferred filtered honey as honey type and multi-floral blossom honey (plateau) and honeydew (pine) as honey variety.

Conclusion: This study is the first study with a large sample size conducted in Türkiye to determine the consumption of honey and propolis in adults during the pandemic and to evaluate the changes due to the pandemic. The results of this study show that the consumption of honey and propolis has increased during the pandemic.

Anahtar Kelimeler: COVID-19, honey, propolis

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ÖZET

Amaç: Bu çalışma, yetişkinlerin arı ürünleri tüketim tercihlerini ve miktarlarını değerlendirmek, COVID-19 pandemisi döneminde bal ve propolis tüketimindeki değişimi belirlemek amacıyla yapılmıştır.

Materyal-Metot: Tanımlayıcı nitelikteki kesitsel çalışma, Kasım 2021 ile Mart 2022 tarihleri arasında 1217 kişi ile gerçekleştirilmiştir. Verilerin toplanmasında katılımcıların tanımlayıcı özellikleri, bal ve propolis ile ilgili tüketim alışkanlıklarını içeren çevrimiçi bir anket kullanıldı. Veriler sayı, yüzde, ortalama, McNemar ve Marjinal Homojenlik testiyle analiz edilmiştir.

Bulgular: Bu çalışmada bireylerin yaş ortalaması 26,84±10,96 yıl olup, %68,9'u erkek, %51,8'i ortaöğretim mezunu, %73,4'ünün herhangi bir kronik hastalığı bulunmamaktadır. Pandemi sürecinde katılımcıların bal ve propolis tüketiminin arttığı tespit edilmiştir ($p<0.001$). Katılımcılar bal ve propolisi lezzetli ve besleyici olmaları, bağışıklık sistemini güçlendirmeleri ve hastalıkların tedavisinde etkili olmaları nedeniyle tükettiklerini bildirmiştir. Katılımcıların bal türü olarak süzme balı, bal çeşidi olarak ise çok multifloral çiçek balı (yayla) ve çam balını (çam) tercih ettikleri belirlenmiştir.

Sonuç: Bu çalışma, pandemi sürecinde yetişkinlerde bal ve propolis tüketiminin belirlenmesi ve pandemiye bağlı değişikliklerin değerlendirilmesi amacıyla Türkiye'de yapılan geniş örneklemli ilk çalışmadır. Bu çalışmanın sonuçlarına göre arı ürünleri olan bal ve propolis tüketimi pandemi döneminde artmıştır.

Keywords: COVID-19, bal, propolis

1. Introduction

The novel COVID-19 outbreak, which has emerged in Wuhan, China has rapidly spread around the world, has significantly affected the world economy and the life of societies. Efforts to prevent the COVID-19 pandemic, which affected the entire world in a short period of time, continue apace. COVID-19 prompted several countries to take strict restriction measures to counteract the infection. The resulting lockdown immediately had a significant impact on people's daily lives and many habits were changed. People stayed at home longer and tried to maintain their health by using natural foods. In the process, it has been reported that people have resorted to complementary and alternative treatments such as apitherapy for COVID-19 prevention and disease management [1]. For more than 125 million years, bees have remained one of the most important and industrious species in nature. Bee products are natural products with many biological and medicinal functions, and honey, pollen, propolis, bee venom, apilarnil, and royal jelly are commonly used in apitherapy. These products used in apitherapy are generally known to have very important effects such as antibacterial, antioxidant, anti-inflammatory, vasodilatory and antitumor effects [2]. However, when examining studies on bee products during the pandemic, it is noteworthy that they mainly focus on honey and propolis.

Honey and its ingredients are attracting attention as an effective natural therapy, as it is able to relieve acute inflammation by strengthening the immune response. Several studies have demonstrated its potential healing power for numerous chronic diseases and conditions, including lung and heart disease, diabetes, hypertension, autophagy dysfunction, bacterial and fungal infections. Most importantly, honey has proven its virucidal effect on various enveloped viruses such as HIV, influenza virus, herpes simplex and varicella zoster virus. Honey is rich in phenolic compounds, mainly flavonoids and phenolic acids, which act as powerful antioxidants [3]. The anti-inflammatory effect of honey is also well documented. Studies conducted before the pandemic have shown that honey has an antiviral effect [4-6]. However,

there are few studies on the effectiveness of honey on COVID-19. Honey can be beneficial for patients with COVID-19 caused by the enveloped virus SARS-CoV-2 by boosting the host's immune system, improving comorbid conditions and acting as an antiviral. Studies have shown that some bioactive compounds in honey (methylglyoxal, chrysin, caffeic acid, galangin, and hesperidin) have an antiviral effect and boost the immune system, but new studies are needed on the mechanisms of action of these compounds on COVID-19 [6-9].

Propolis, a resinous material produced by honeybees from plant exudates, has long been used in traditional herbal medicine and is widely consumed as a health remedy and to boost the immune system. The COVID-19 pandemic has reignited interest in propolis products worldwide. Fortunately, various aspects of the SARS-CoV-2 infection mechanism are potential targets for propolis compounds [2]. Propolis contains various bioactive substrates such as polyphenolic acids, flavonoids, vitamins, and minerals. Propolis, a natural bee product, has been shown to have antiviral, anti-inflammatory, antifungal, antioxidant, anticarcinogenic, antidiabetic, immunostimulating activities, and antitumor effects. Due to these effects, it has been reported that propolis can be used prophylactically or as an adjunct to COVID-19 treatment [10]. There is no study investigating only the consumption habits of honey and propolis in adults in Türkiye during the pandemic period. Therefore, this study was planned and conducted to investigate the amount of honey and propolis consumption and preferences of adults and to determine the change in consumption of honey and propolis by individuals during the COVID-19 pandemic.

2. Material and Method

This was a descriptive cross-sectional study conducted between November 2021 and March 2022 among participants aged 18-65 years. The inclusion criteria were: 1-use of social media such as WhatsApp, Facebook, and Instagram, 2-residence in Türkiye and 3-age 18 years or older. Participants were asked to provide their e-mail addresses to avoid duplicate submissions, and duplicate submissions with the same e-mail address were excluded from the analysis.

Prior to the start of the study, an application was submitted to the Scientific Research Platform of the Ministry of Health of the Republic of Türkiye and approval for the study was granted on 30/07/2021. In addition, the approval of the Ethics Committee for Non-Interventional Clinical Research of Izmir Kâtip Celebi University dated 21/10/2021 and number 0444 was obtained.

Data Collection

The questionnaire, which aimed to investigate the amount and preferences of adults for consuming honey and propolis and to determine the change in consumption of honey and propolis during the pandemic, was completed online (via Google forms). A snowball system was used in this study. Participants were informed about the research prior to the study and those who volunteered to participate in the study accepted the consent form and completed the questionnaire. The questionnaire was sent to the participants via social media (WhatsApp, Facebook, Instagram). The invitation to the study was systematically shared on Facebook and Instagram at different times and on different days of the week. After the first 10 responses were received, the necessary corrections were made to the questionnaire. The form also contained the study leader's information and participants were asked to contact her if they had any problems.

Survey Form

The questionnaire contained information on age, gender, education level (low: ≤middle school, medium: high school, high: ≥university), presence of chronic diseases, and honey/propolis consumption habits (frequency of consumption, purpose of use, preferred type and variety of honey).

Statistical Analysis

The research data were analysed using SPSS 25.0 (IBMCorp Ibm 2017). Descriptive statistics of the data are presented as number, percentage, mean, and standard deviation. Compliance with normal distribution was assessed using the Kolmogorov-Smirnov test. The McNemar test was used to examine and evaluate the relationship between two dependent categorical variables, and the Marginal

Homogeneity test was used to compare differences before and during the pandemic. The statistical significance level was accepted as $p<0.05$.

3. Results

The general characteristics of the 1217 individuals who agreed to participate in the study are shown in Table 1. The mean age of the subjects was 26.84±10.96 years, 31.1% (n=378) were female (F) and 68.9% (n=839) were male (M). It was found that the majority of subjects had medium-level education (F: 44.2%; M: 55.2%) and had no chronic diseases (F: 75.1% ; M: 72.6%) (Table 1).

Table 1: Subjects' General Characteristics

	Female		**Male**		**Total**	
Age (Mean±Standard Deviation) (years)	30.24±12.21		25.31±9.98		26.84±10.96	
	n	**%**	**n**	**%**	**n**	**%**
Education Level						
Low	71	18.8	121	14.4	192	15.8
Medium	167	44.2	463	55.2	630	51.8
High	140	37.0	255	30.4	395	32.4
Chronic Disease Status						
Yes	94	24.9	230	27.4	324	26.6
No	284	75.1	609	72.6	893	73.4
Total	**378**	**31.1**	**839**	**68.9**	**1217**	**100**

Figure 1 shows the change in the consumption of honey and propolis during the pandemic. During the pandemic, honey consumption increased from 74.8% to 77.8% and propolis consumption from 28.8% to 44.0%. The differences are statistically significant ($p<0.001$) (Figure 1).

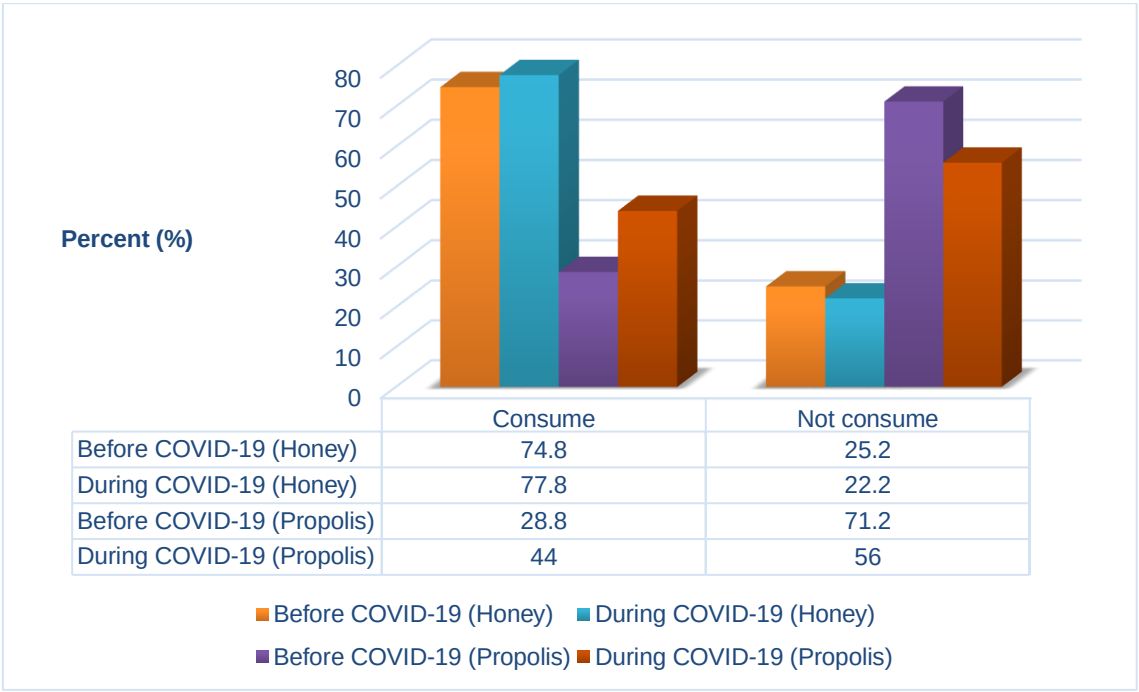

Figure 1: Changes in honey and propolis consumption by subjects during the pandemic McNemar test, $p<0.05$.

Table 2 shows information on the consumption of honey and propolis by the participants' before and during the pandemic. Compared to before the pandemic, the number of individuals who consumed honey rarely (29.1%→33.4%) and once a week (16.2%→17.3%) increased, while the number of individuals who did not consume honey (24.1%→22.1%) decreased. Participants consume honey because it is delicious (45.3%), nutritious (40.8%), and boosts the immune system (29.3%). The number

of individuals who did not consume propolis (76.0%→72.5%) and rarely (12.5%→12.1%) decreased, while the number individuals who consumed it daily (2.0%→5.8%) and every other day (2.7%→3.7%) increased. The frequency of propolis consumption has changed compared to before the pandemic (p<0.001). Participants consume propolis because it boosts immunity (16.8%), is nutritious (15.8%) and is effective in treating diseases (13.6%) (Table 2).

Table 2. Individual consumption habits for honey and propolis

Variables	**Honey Consumption**		**Propolis Consumption**	
	Before COVID-19 n (%)	**During COVID-19 n (%)**	**Before COVID-19 n (%)**	**During COVID-19 n (%)**
Consumption Frequency				
Every day	124 (10.2%)	121 (9.9%)	24 (2.0%)	70 (5.8%)
Every other day	156 (12.8%)	140 (11.5%)	33 (2.7%)	45 (3.7%)
One day a week	197 (16.2%)	210 (17.3%)	51 (4.2%)	51 (4.2%)
One day in fifteen days	93 (7.6%)	70 (5.8%)	32 (2.6%)	22 (1.8%)
Sometimes/rarely	354 (29.1%)	406 (33.4%)	152 (12.5%)	147 (12.1%)
Not consume	293 (24.1%)	270 (22.2%)	925 (76.0%)	882 (72.5%)
p-value	p=0.209		**p<0.001***	
	Honey Consumption		**Propolis Consumption**	
Consumption Purposes**	**n (%)**		**n (%)**	
Effective in the treatment of diseases	295 (24.2%)		165 (13.6%)	
Nutritious	497 (40.8%)		192 (15.8%)	
Being delicious / tasting good	551 (45.3%)		96 (7.9%)	
Being a habit	173 (14.2%)		49 (4.0%)	
Strengthening immunity	357 (29.3%)		204 (16.8%)	
Due to the COVID-19 pandemic	128 (10.5%)		82 (6.7%)	

**Marginal Homogeneity test, p<0.05

Figures 2 and 3 show the preferred honey type and variety of the individuals. Filtered honey was consumed by 69.9% of the participants and comb honey by 30.1%. 51.3% of the individuals consumed honeydew honey (pine), 41.4% consumed multifloral blossom honey (plateau), 5.2% consumed chestnut honey and 2.1% consumed citrus honey. Men consumed significantly more all types of honey (p<0.001).

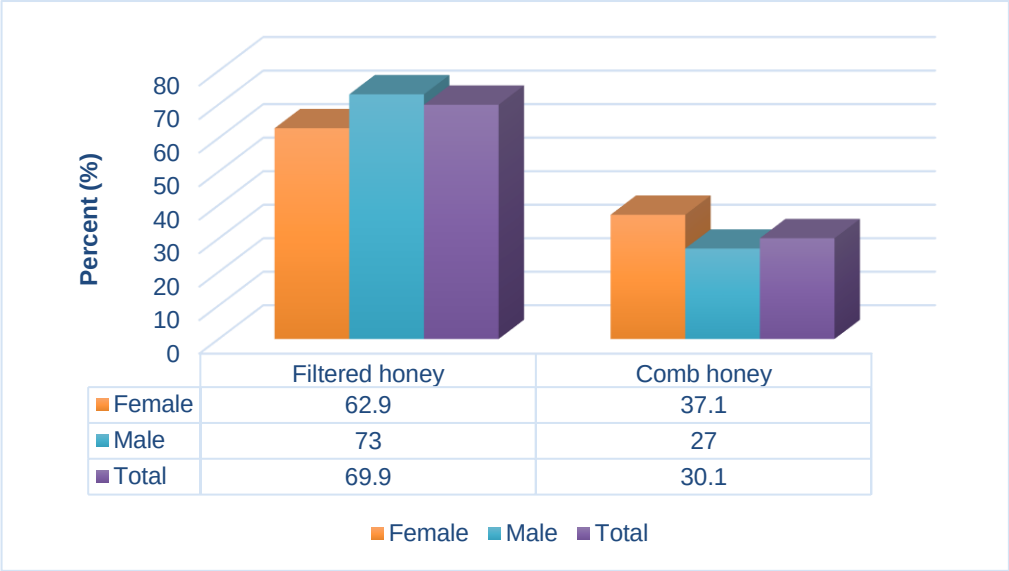

Figure 2. The most preferred honey type by individuals (More than one response was accepted).
McNemar test, p<0.001.

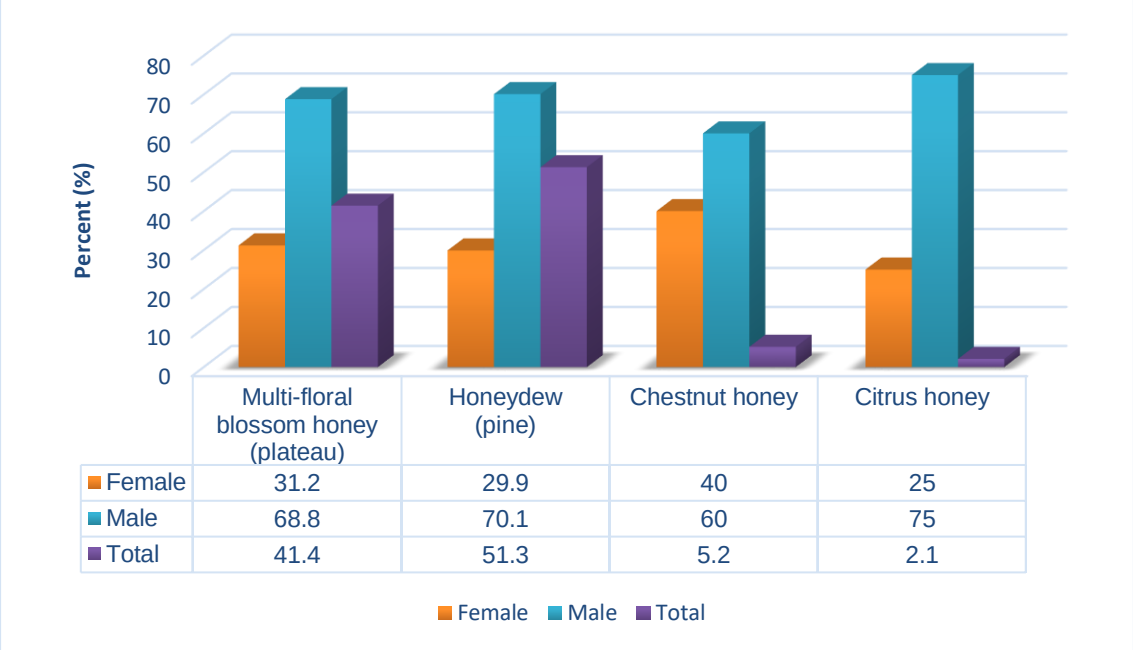

Figure 3. The most preferred variety of honey
McNemar test, p<0.001.

4. Discussion and Conclusion

The main results of this study, which was conducted to investigate the consumption levels and preferences of adults for the consumption of honey/propolis and to determine the change in the consumption of honey/propolis by individuals during the pandemic, can be listed as follows. During the pandemic, honey and propolis consumption by participants increased, and it was found that about one-third of participants consumed honey to boost immunity. It was also found that men consumed more honey during this period time, and more than half of all participants preferred filtered honey and honeydew (pine). Honey boosts the immune system and has many health benefits (antimicrobial, antioxidant, anti-inflammatory, antidiabetic, antihypertensive, cardioprotective) that may help protect against COVID-19 [3]. Naringin contained in honey can inhibit SARSCoV-2 activity in vitro and treatment with honey has been shown to promote earlier recovery and reduce mortality in COVID-19 patients [11]. A study conducted in Poland, which is comparable to this study, found that 34% of adults increased their

honey consumption during the pandemic [12]. A study conducted during quarantine found that honey (43%) and vitamin C (50%) were the most commonly consumed immune-boosting nutrients [13]. Similarly, a study conducted in Indonesia reported that honey consumption increased during the pandemic to boost the immune system [14]. A survey of plants and natural products used as protective measures against COVID-19 during the pandemic in Saudi Arabia found that honey was the most commonly used by 84% of participants [15]. A survey of people infected with COVID-19 in Saudi Arabia also found that honey consumption was among the five most commonly consumed natural products, with the combination of honey and ginger was often preferred [16]. In another study, individuals who did not consume honey increased their honey consumption after infection with SARS-CoV-2 [17].

The current study found that filtered honey, honeydew (pine) and multifloral blossom honey (plateau) were the preferred honey types during the pandemic. It was also found that men consumed significantly more honey for all honey types. There is no information in the literature about the type and variety of honey that was preferred during the pandemic. In this study, the difference in honey consumption between genders can be explained by the higher number of male participants. However, in studies conducted in Western European countries and in the Balkans, men consumed more honey than women, similar to this study. In the same study, participants reported consuming honey for its therapeutic properties and the health benefits associated with its high nutritional value [18]. A study conducted in Western Australia found that women consume honey to relieve sore throats, treat coughs and colds, while men prefer honey for its immune system boosting and antibacterial properties [19]. In this study, consistent with the literature, about one-third of the participants consumed honey to boost the immune system.

It is known that propolis has an antiviral effect due to its flavonoids, caffeic acid, and aromatic acid esters [20]. A randomized controlled clinical trial reported that standardized green propolis extracts administered orally to hospitalized COVID-19 patients in addition to standard treatment shortened the length of hospital stay and offered positive clinical benefits [21]. It has been reported in the literature that propolis may have a beneficial effect on clinical improvement in patients with mild to moderate-severe COVID-19, and that propolis or honey may improve clinical symptoms when used as adjunctive therapy to standard treatment [22]. The literature is more likely to contain information and studies on the possible mechanisms of the effect of propolis on SARS-CoV-2 than on the frequency of its use during the pandemic. This study found that propolis consumption also increased during the pandemic, with about one-fifth of participants consuming propolis to boost immunity. The increased interest in honey and propolis consumption can be explained by the belief in the immune-boosting properties of bee products and the increasing tendency of consumers to consume health-enhancing products during the pandemic [23].

The current study has some limitations. Data collection through an online questionnaire was considered a limitation. In addition, although an attempt was made to reach more women during data collection, the gender distribution was not balanced. Since Türkiye is a very large country and internet access is still limited in many regions, our results can not be generalized to the entire population of Türkiye. However, the study has important strengths. First, it is the first study to examine only the honey and propolis consumption and preferences of the adult Turkish population and to investigate the change in individual honey and propolis consumption during the pandemic period. The second strength of this study is its large sample size.

As a result, it was found that participants' honey and propolis consumption increased during the pandemic and about a third of participants consumed honey to boost immunity. It was also found that men consumed more honey during this time and more than half of all participants preferred filtered and plateau blossom honey.

Acknowledgment

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Declaration of Ethical Code

In this study, we undertake that all the rules required to be followed within the scope of the "Higher Education Institutions Scientific Research and Publication Ethics Directive" are complied with, and that none of the actions stated under the heading "Actions Against Scientific Research and Publication Ethics" are not carried out.

Before the start of the study, an application was submitted to the Scientific Research Platform of the Ministry of Health of the Republic of Türkiye and approval for the study was granted on 30/07/2021. In addition, the approval of the Ethics Committee for Non-Interventional Clinical Research of Izmir Kâtip Celebi University dated 21/10/2021 and number 0444 was obtained.

References

[1] Konakci G., Uran B.N.O., Erkin O. 2020. In the Turkish News: Coronavirus and “Alternative & complementary” Medicine Methods. Complementary Therapies in Medicine, 53:102545.

[2] Özdemir G., Ersöz E., Dilek N. 2021. Apitherapy and Health. Black Sea Journal of Health Science, 4(2):168-74.

[3] Hossain K.S., Hossain M.G., Moni A., Rahman M.M., Rahman U.H., Alam M., et al. 2020. Prospects of Honey in Fighting Against COVID-19: Pharmacological Insights and Therapeutic Promises. Heliyon, 6(12). e0579.

[4] Bogdanov S. 2020. Antiviral Properties of the Bee Products: a Review. Bee Products Against Viruses and for COVID-19 Prevention (review). www.bee-hexagon.net, (Accessed Date: 21.01.2024)

[5] Hashemipour M.A., Tavakolineghad Z., Arabzadeh S., Iranmanesh Z., Nassab S. 2014. Antiviral Activities of Honey, Royal Jelly, and Acyclovir Against HSV-1. Wounds: A Compendium of Clinical Research and Practice, 26(2):47-54.

[6] Ashraf S., Ashraf S., Ashraf M., Imran M.A., Kalsoom L., Siddiqui U.N., et al. 2020. Therapeutic Efficacy of Honey and Nigella Sativa Against COVID-19: A Multi-Center Randomized Controlled Clinical Trial (HNS-COVID-PK). medRxiv, 10.30.20217364.

[7] Ashraf S., Ashraf S., Ashraf M., Imran M.A., Kalsoom L., Siddiqui U.N., et al. 2023. Honey and Nigella Sativa Against COVID-19 in Pakistan (HNS-COVID-PK): A Multicenter Placebo-Controlled Randomized Clinical Trial. Phytotherapy Research, 37(2):627-44.

[8] Mustafa M.Z., Shamsuddin S.H., Sulaiman S.A., Abdullah J.M. 2020. Anti-inflammatory Properties of Stingless Bee Honey May Reduce the Severity of Pulmonary Manifestations in COVID-19 İnfections. The Malaysian Journal of Medical Sciences: MJMS, 27(2):165.

[9] Shaldam M.A., Yahya G., Mohamed N.H., Abdel-Daim M.M., Al Naggar Y. 2021. In Silico Screening of Potent Bioactive Compounds from Honeybee Products Against COVID-19 Target Enzymes. Environmental Science and Pollution Research, 28(30):40507-14.

[10] Bayram N.E., Sorkun K., Öz G.C., Salih B., Topçu G. 2018. Chemical Characterization of 64 Propolis Samples from Hakkari, Turkey. Records of Natural Products, 12(6):569.

[11] Lokken E.M., Huebner E.M., Taylor G.G., Hendrickson S., Vanderhoeven J., Kachikis A., et al. 2021. Disease Severity, Pregnancy Outcomes, and Maternal Deaths Among Pregnant Patients with Severe Acute Respiratory Syndrome Coronavirus 2 Infection in Washington State. American Journal of Obstetrics and Gynecology, 225(1):77. e1-. e14.

[12] Kowalczuk I., Stangierska D., Widera K., Fornal-Pieniak B., Latocha P. 2023. Determinants of Honey Consumption with Special Reference to the Influence of Nutritional Knowledge and Health Status on Consumption Habits. Applied Sciences, 13(2):979.

[13] Bakhsh M.A., Khawandanah J., Naaman R.K., Alashmali S. 2021. The Impact of COVID-19 Quarantine on Dietary Habits and Physical Activity in Saudi Arabia: A Cross-Sectional Study. BMC Public Health, 21(1):1487.

[14] Rachmani N., Apriantini A., ENSD L.C. 2023. Preferences of Young Consumers in Bogor City in Consuming Honey During the Covid 19 Pandemic. Jurnal Ilmu Produksi dan Teknologi Hasil Peternakan, 11(1):13-8.

[15] Alotiby A.A., Al-Harbi L.N. 2021. Prevalence of Using Herbs and Natural Products As A Protective Measure During the COVID-19 Pandemic Among the Saudi Population: an Online Cross-Sectional Survey. Saudi Pharmaceutical Journal, 29(5):410-7.

[16] El-Alosey A.R., Eldiasty J.G., Abushalfeh I.Y., Almasaude A..A., Mosallam S.A.-E.R., Elmetwalli A. 2024. Perceptions of Medicinal Herbal Products During the COVID-19 Pandemic Period Among Saudi Patients: A Cross-Sectional Study. Naunyn-Schmiedeberg's Archives of Pharmacology, 397: 497–506.

[17] Aldwihi L.A., Khan S.I., Alamri F.F., AlRuthia Y., Alqahtani F., Fantoukh O.I., et al. 2021. Patients' Behavior Regarding Dietary or Herbal Supplements Before and During COVID-19 in Saudi Arabia. International Journal of Environmental Research and Public Health, 18(10):5086.

[18] Kleisiari C., Kleftodimos G., Vlontzos G. 2023. Be(e)ha(i)viour(e): Assessment of Honey Consumption in Europe. British Food Journal, 125(4):1374-89.

[19] Batt P.J., Liu A. 2012. Consumer Behaviour Towards Honey Products in Western Australia. British Food Journal, 114(2):285-97.

[20] Attia Y.A., Giorgio G.M., Addeo N.F., Asiry K.A., Piccolo G., Nizza A., et al. 2022. COVID-19 Pandemic: Impacts on Bees, Beekeeping, and Potential Role of Bee Products As Antiviral Agents and İmmune Enhancers. Environmental Science and Pollution Research, 29: 9592–9605.

[21] Silveira M.A.D., De Jong D., Berretta A.A., dos Santos Galvão E.B., Ribeiro J.C., Cerqueira-Silva T., et al. 2021. Efficacy of Brazilian Green Propolis (EPP-AF®) as an Adjunct Treatment for Hospitalized COVID-19 Patients: A Randomized, Controlled Clinical Trial. Biomedicine & Pharmacotherapy, 138:111526.

[22] Dilokthornsakul W., Kosiyaporn R., Wuttipongwaragon R., Dilokthornsakul P. 2022. Potential Effects of Propolis and Honey in COVID-19 Prevention and Treatment: A Systematic Review of in Silico and Clinical Studies. Journal of Integrative Medicine, 20(2):114-25.

[23] Celik B., Dane S. 2020. The Effects of COVID-19 Pandemic Outbreak on Food Consumption Preferences and Their Causes. Journal Of Research in Medical and Dental Science, 8(3):169-73.