POLYFLORAL, LINDEN AND ACACIA HONEYS WITH DRIED CHERRIES AFTER THREE MONTHS OF STORAGE – ANTIOXIDANT AND SENSORY EVALUATION

Jelena J. Vulić*, Jasna M. Čanadanović-Brunet, Gordana S. Četković, Sonja M. Djilas, Vesna T. Tumbas Šaponjac and Sladjana M. Stajičić

University of Novi Sad, Faculty of Technology, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia

Samples of three types of honey: polyfloral (PH), linden (LH) and acacia (AH,) without and with addition of dried cherries (40%) were analyzed before and after three months of storage. The total phenol (TPh), flavonoid (TFd) and anthocyanin (TAn) contents, antioxidant activities and sensory properties of honeys with and without the addition of dry cherries were evaluated. TPh and TFd increased with addition of dried cherries to the honey, while enriched honeys showed high TAn. The LH sample with dried cherries showed the highest anthocyanins content (41.41mgCGE/100g). The antioxidant activity increased with addition of dried cherries in honey in the DPPH• test and reducing power. The PH and enriched PH exhibited the best antiradical activity compared to LH and AH. The EC_{50}^{DPPH} values were: 23.81 for PH and 24.19 mg/mL for PH, while the EC_{50}^{DPPH} were: 1.16 mg/mL for PH40 and 1.18 mg/mL for PH40s. RP_{0.5} values were: 57.00 mg/mL for PH40 and 56.00 mg/mL for PH40s, while RP_{0.5} were: 15.05 mg/mL for PH40 and 15.18 mg/mL for PH40s. The statistical analysis showed that TPh, TFd and TAn, and antioxidant activity of honeys and enriched honeys showed significant correlation. Sensory analysis of honey with dried cherries, before and after storage, indicated very good sensory characteristics.

KEY WORDS: Honey, dried cherry, antioxidant activity, sensory analysis, storage

INTRODUCTION

Honey is a natural food product well known for its high nutritional and prophylactic-medicinal value (1). It is often used as a sugar substitute, an ingredient or a natural preservative in many of manufactured foods, because of its sweetness, color and flavor. Also, it can prevent oxidation reactions in foods (e.g., lipid oxidation in meat (2) and enzymatic browning of fruits and vegetables (3)). Numerous flavonoids (such as apigenin, pinocembrin, pinobanksin, kaempferol, quercetin, galangin, chrysins, and luteolin) and phenolic acids (caffeic, gallic, cinnamic, protocatechuic, p-coumaric, and chlorogenic acids) were identified in honey samples (4,5). Several studies have shown that the varia-
bility in sugars and secondary metabolites are related to the source and botanical origin of the nectar (6). Apitherapy (the medical use of honeybee products) has recently become the focus of attention as a folk and preventive medicine for treating certain conditions and diseases, as well as promoting overall health and well-being (7). Serbia has a very long tradition of beekeeping. Its favorable climate, good geographical conditions and a variety of botanical species provide great potential for the development of apiculture (8).

Honeys are divided as monofloral or polyfloral. Monofloral honeys are produced from one plant species containing predominantly its nectar with minor nectar contributions from other botanical origins. Polyfloral honey has several plant sources, none of which is predominant. In practical terms it can be considered as a blend of several monofloral honeys with significant nectar or honeydew contributions from different plants [9]. In Serbia, honey is consumed in original form and as a comb honey or with the addition of propolis, pollen or other bee products. Also, some nuts or dried fruits can be added to honeys and used as a very delicious dessert.

Fruits are considered as a natural source of antioxidants, including anthocyanins and phenolics (10). These compounds can reduce the risk of degenerative diseases caused by oxidative stress, such as cancer and cardiovascular diseases (11). The production of cherry fruit is on the third place in Serbia. It is a highly profitable fruit variety, because it is relatively easy growing and has a good demand on market (12). Phenolic contents in cherries are influenced by the cultivar, the growing season and the growing location (13,14). Drying is one of the oldest methods for food preservation (15).

To our knowledge, this is the first study of the antioxidant and sensory characteristics of honeys with dried cherries. The aim was to evaluate total phenolic, flavonoid and anthocyanin contents, antioxidant activity and sensory properties of polyfloral, linden and acacia honeys with dried cherries before and after three months of storage. Antioxidant characteristics were determined by 2,2-diphenyl-1-picrylhydrazyl (DPPH) test and reducing power (RP).

**EXPERIMENTAL**

**Chemicals and reagents**

The chemicals used for these investigations were Folin-Ciocalteu reagent (Fluka Chemical Co., Buchs, Switzerland), trichloroacetic acid, 2,2-diphenyl-1-picrylhydrazyl (Sigma Chemical Co., St. Louis, Mo, USA). All other chemicals and reagents were of the highest analytical grade, obtained from J.T. Baker (Deventer, Holland). The total phenolic, flavonoid, anthocyanin, DPPH free radical scavenging assays and reducing power were determined using an UV-1800 spectrophotometer (Schimadzu, Kyoto, Japan).

**Honey and dried cherries samples**

The honeys with dried cherries were prepared from polyfloral (P), linden (L) and acacia (A) honey (obtained from the honeybee farm „Simonović“, Belgrade, Serbia). Dried cherries (produced by Agranela, Valjevo, Serbia) were added to the honey in 40%
mass concentrations (PH40, LH40, and AH40). The enriched honeys before and after three months storage were grounded in domestic food processor (Bosh, Compact Kitchen Machine 4420, Gerlingen-Stuttgart, Germany).

**Total phenolic content (TPh)**

Total phenolics were determined spectrophotometrically by the Folin-Ciocalteu method [16]. The content of total phenolics was expressed as mg of gallic acid equivalents per 100 g of honey sample (mg GAE/100 g).

**Total flavonoid content (TFd)**

Total flavonoids were measured by the aluminium chloride spectrophotometric assay [17]. Total flavonoid content was expressed as mg of rutin equivalents per 100 g of honey sample (mg RE/100 g).

**Total anthocyanin content (TAn)**

Total anthocyanins were determined spectrophotometrically by the Markham et al. method [18]. The content of total anthocyanins was expressed as mg of cyanidin-3-O-glucoside equivalents per 100 g of honey sample (mg CGE/100 g).

**DPPH free radical scavenging assay**

Homogenized honeys were dissolved in methanol, and each sample (1.5 mL) or methanol (1.5 mL, blank) was mixed with DPPH solution in methanol (3 mL, 0.02 mg/mL) in appropriate range of investigated concentrations (for honeys: 0.56-500 mg/mL; for enriched honeys: 0.11-55.56 mg/mL). The mixtures were left for 15 min at room temperature and then the absorbances was measured at 517 nm against reference mixtures that were prepared in the similar manner, by replacing the DPPH solution with methanol. The ability of honey samples to scavenge DPPH radicals, $SA_{DPPH}$ value, was calculated using the following equation: $SA_{DPPH}$(%) = 100 × $(A_0 - A_x) / A_0$, where $A_0$ and $A_x$ are the absorbances of the blank and the sample, respectively.

**Reducing power**

The solution of honeys and enriched honeys (1.5 – 300 mg/mL) in distilled water (1 mL) or distilled water (1 mL, blank) was mixed with phosphate buffer (1 mL, pH 6.6) and potassium ferricyanide, K$_3$[Fe(CN)$_6$], (1mL, 1 w/w). The mixture was incubated at 50°C for 20 min and then rapidly cooled. Following this, trichloroacetic acid (1 mL, 10%) was added and the mixture was then centrifuged at 1811.16 g for 10 min. An aliquot (2 mL) of the upper layer, mixed with distilled water (2 mL) and FeCl$_3$ (0.4 mL, 0.1%), was left to stand for 10 min. The absorbance of the mixture was measured at 700 nm against the blank.
Sensory analysis

Sensory analysis was conducted according to the general guidelines regarding the design of test rooms (19), general sensory analysis guidance (20) and training of assessors (21). Sensory evaluation was carried out by seven experienced panelists (ages 35 to 60) selected from previously trained academic staff of the Faculty of Technology, Novi Sad. Drinking water was provided for palate cleansing between each sample. Sensory profiling was performed using a generic descriptive analysis technique, according to Piana et al. (22). Sensory evaluation included the selected representative properties of honey samples: density, intensity of color, aroma and odor. These properties were evaluated using a 3-point method. Marks were given based on the scale from 0 “unacceptable product” to 3 “optimal quality level”.

Statistical analysis

All analyses were run in triplicate and the results were expressed as means ± standard deviation (SD) except for sensory analysis (n=7x7). Statistical analyses were done by using Microsoft Office Excel 2007 software. Significant differences were calculated by ANOVA test and least significant difference (LSD) test ($p < 0.05$).

RESULTS AND DISCUSSION

Polyfloral (P), linden (L) and acacia (A) honeys were used to prepare honey samples with 40% of dried cherries (PH40, LH40 and AH40). Also, the changes in the antiradical activity of honeys after three months of storage (PH40s, LH40s and AH40s) were investigated. The comparative evaluation of the phenolic composition of honey samples was based on: total phenolics (TPh), total flavonoids (TFd), total anthocyanins (TAn) content, the ratio of TFd in relation to TPh (TFd/TPh) and the ratio of TAn in relation to TPh (TAn/TPh) (Table 1).

The TPh and TFd increased with the addition of dried cherries to honey, while enriched honeys showed high TAn. TAn were not detected in raw honeys. LH40 showed the highest anthocyanins content (41.41mgCGE/100g). In comparison to honey, the TPh increase was by 1.45 times for PH40, 1.21 times for LH40 and 2.17 times for AH40, while in the honeys after three months of storage the TPh increased by 1.40 times for PH40s, 2.31 times for LH40s, and 2.15 times for AH40s. The increase in TFd was approximately 2.81 times for PH40, 1.21 times for LH40 and 1.44 times for AH40, while after three months of storage TFd increased 2.84 times for PH40s, 1.16 times for LH40s and 1.45 times for AH40s. The TAn contents were determined only in enriched honeys, before and after storage. The determined TAn contents in enriched honeys were slightly lower after three months of storage.

It can be concluded that enriched honeys possess higher content of phenolics in comparison to raw honeys. Honeys and enriched honeys after storage had almost the same phenolics content like before the storage time. The amount of phenolics in honeys is closely related not only to the floral variety but also to the specific parameters such as soil
composition and meteorological conditions [23]. The botanical origin of honey is one of its main quality parameters, and its price is very often related to the floral origin (1).

Table 1. Phenolics composition of honeys with and without addition of dried cherries

<table>
<thead>
<tr>
<th>Sample</th>
<th>TPh (mg GAE/100 g)</th>
<th>TFd (mg RE/100 g)</th>
<th>TAn (mg CGE/100g)</th>
<th>TFd/TPh</th>
<th>TAn/TPh</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH</td>
<td>38.50±1.7a</td>
<td>8.32±0.34a</td>
<td>-</td>
<td>0.22</td>
<td>-</td>
</tr>
<tr>
<td>PHs</td>
<td>38.40±1.14a</td>
<td>8.06±0.25a</td>
<td>-</td>
<td>0.21</td>
<td>-</td>
</tr>
<tr>
<td>PH40</td>
<td>55.77±2.13b</td>
<td>23.41±0.69b</td>
<td>37.91±1.43a</td>
<td>0.42</td>
<td>0.68</td>
</tr>
<tr>
<td>PH40s</td>
<td>53.88±2.14b</td>
<td>22.86±1.09bc</td>
<td>37.57±1.66a</td>
<td>0.42</td>
<td>0.70</td>
</tr>
<tr>
<td>LH</td>
<td>23.96±1.62**</td>
<td>18.11±0.81**</td>
<td>-</td>
<td>0.76</td>
<td>-</td>
</tr>
<tr>
<td>LHs</td>
<td>23.01±0.99</td>
<td>17.56±0.64</td>
<td>-</td>
<td>0.76</td>
<td>-</td>
</tr>
<tr>
<td>LH40</td>
<td>53.96±2.45b</td>
<td>21.84±0.78bc,d</td>
<td>41.41±1.86a</td>
<td>0.40</td>
<td>0.77</td>
</tr>
<tr>
<td>LH40s</td>
<td>53.13±2.02b</td>
<td>20.42±1.01b</td>
<td>40.41±1.97a</td>
<td>0.38</td>
<td>0.76</td>
</tr>
<tr>
<td>AH</td>
<td>20.04±0.88e</td>
<td>14.03±0.56e</td>
<td>-</td>
<td>0.70</td>
<td>-</td>
</tr>
<tr>
<td>AHs</td>
<td>19.66±0.72e</td>
<td>13.88±0.49e</td>
<td>-</td>
<td>0.71</td>
<td>-</td>
</tr>
<tr>
<td>AH40</td>
<td>43.40±1.77d</td>
<td>20.26±0.89d</td>
<td>31.23±1.46b</td>
<td>0.47</td>
<td>0.72</td>
</tr>
<tr>
<td>AH40s</td>
<td>42.20±1.56d</td>
<td>20.18±0.77d</td>
<td>30.06±1.43b</td>
<td>0.48</td>
<td>0.71</td>
</tr>
</tbody>
</table>

*Taken from Cetkovic et al. (2014).

1Total phenol content expressed as mg gallic acid equivalents per 100 g of honey sample; 2Total flavonoid content expressed as mg rutin equivalents per 100 g of honey sample; 3Total anthocyanin content expressed as mg cyanidin-3-O-glucoside equivalents per 100 g of honey sample; 4TFd/TPh: the ratio of TFd in relation to TPh; 5TAn/TPh: the ratio of TAn in relation to TPh. TPh, TFd and TAn values are mean ± SD of three replicates. Values sharing the same letters in the same column are not significantly different from each other at the level of 5%.

Tumbas et al. (24) reported that the addition of 40% of prunes to raw acacia honey, increased the content of total phenolics content by 2.5 times (from 16.18 to 41.64 mgGAE/100g), while the flavonoid level was increased approximately by 11.15 times (from 2.65 to 30.86 mgRE/100g). The results in this study are in accordance for phenolics, while the flavonoids content increased less from raw to honey with dried cherries, than in the study by Tumbas et al. (24). Beretta et al. (25) and Bertoncelj et al. (26) reported the phenolics contents of acacia honeys: 5.52 mgGAE/100g of commercial acacia honey and 4.48 mgGAE/100g of Slovenian acacia honey, respectively. The results shown in Table 1 have higher values.

In our research we evaluated the antioxidant activity of honeys and honeys with dried cherries using two spectrophotometric methods: DPPH test and reducing power. The antioxidant molecules can quench DPPH free radicals (i.e. by providing hydrogen atoms or by electron donation, conceivably via a free-radical attack on the DPPH molecule) and convert them to a colorless/bleached product (i.e. 2,2-Diphenyl-1-hydrazine, or a substituted analogous hydrazine), resulting in a decrease in the absorbance at 517 nm (27). The presence of reductants (i.e. antioxidants) causes the reduction of the ferric–ferricyanide complex to the ferrous–ferricyanide complex of Perl’s Prussian blue. Therefore, Fe^{2+} can be monitored by measuring the absorbance at 700 nm in reducing power method (28).

The honeys with dried cherries exhibited higher antioxidant activity than honeys without dried cherries, while the honeys after three months of storage did not exhibit big changes in the antioxidant activity. Cetkovic et al. (5) showed that the antioxidant activity
Increased with increasing the concentration of dried apricots in linden honey and that it could be explained by the fact that bioactive components of dried apricot were transferred to linden honey, while the same trend of honey samples antiradical activity remained after the storage period. Vulic et al. (29) reported an increase in the phenolics content and antioxidant activity of polyfloral honey with dried apricots. Also, after one-year storage there was no significant changes in antioxidant activity. Canadanovic-Brunet et al. (30) reported that dried apricot has good antioxidant activity and that phenolic compounds in dried apricot appear to be the main contributors to their antioxidant capacity. Besides phenolics present in honeys, the compounds present in dried cherries were most probably the key constituents contributing to the antioxidant capacity of the enriched honey samples.

The EC$_{50}$ defined as the concentration of extract required for 50% scavenging of DPPH radicals under experimental condition employed, was used to measure the free radical SA [31], while for RP it is the concentration of the antioxidant assigned at 0.5 value of absorption. The results are presented in Table 2.

**Table 2.** Antioxidant activities of honeys with and without addition of dried cherries

<table>
<thead>
<tr>
<th>Sample</th>
<th>EC$_{50}$ (mg/mL)$^1$</th>
<th>RP$_{0.5}$ (mg/mL)$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH</td>
<td>23.81±1.02$^a$</td>
<td>57.00±2.67$^a$</td>
</tr>
<tr>
<td>PHs</td>
<td>24.19±1.09$^{a,b}$</td>
<td>56.00±2.65$^a$</td>
</tr>
<tr>
<td>PH40</td>
<td>1.16±0.02$^c$</td>
<td>15.05±0.71$^b$</td>
</tr>
<tr>
<td>PH40s</td>
<td>1.18±0.03$^c$</td>
<td>15.18±0.69$^b$</td>
</tr>
<tr>
<td>LH</td>
<td>189.83±6.24$^{*d}$</td>
<td>169.00±6.06$^{*c}$</td>
</tr>
<tr>
<td>LHs</td>
<td>190.01±8.99$^d$</td>
<td>170.11±8.00$^c$</td>
</tr>
<tr>
<td>LH40</td>
<td>1.42±0.07$^c$</td>
<td>16.09±0.73$^b$</td>
</tr>
<tr>
<td>LH40s</td>
<td>1.41±0.06$^c$</td>
<td>15.21±0.64$^b$</td>
</tr>
<tr>
<td>AH</td>
<td>314.80±14.77$^e$</td>
<td>256.64±11.65$^d$</td>
</tr>
<tr>
<td>AHs</td>
<td>315.03±14.98$^e$</td>
<td>257.99±11.99$^d$</td>
</tr>
<tr>
<td>AH40</td>
<td>1.69±0.07$^c$</td>
<td>17.60±0.54$^b$</td>
</tr>
<tr>
<td>AH40s</td>
<td>1.71±0.08$^c$</td>
<td>15.96±0.70$^b$</td>
</tr>
</tbody>
</table>

$^*$Taken from Cetkovic et al. [5]  
$^1$the concentration of antioxidant necessary to decrease the initial concentration of DPPH radicals by 50%; $^2$the concentration of antioxidant assigned at 0.5 value of absorption; EC$_{50}$ DPPH and RP$_{0.5}$ values are mean ± SD of three replicates. Values sharing the same letters in the same column are not significantly different from each other at the level of 5%.

The PH and enriched PH exhibited the best antioxidant activity comparing to LH, AH, LH40 and LH40, before and after storage. The EC$_{50}$ DPPH values were: 23.81 for PH and 24.19 mg/mL for PHs, while the EC$_{50}$ DPPH were: 1.16 mg/mL for PH40 and 1.18 mg/mL for PH40s. RP$_{0.5}$ values were: 57.00 mg/mL for PH40 and 56.00 mg/mL for PH40s, while RP$_{0.5}$ were: 15.05 mg/mL for PH40 and 15.18 mg/mL for PH40s. It can be concluded that during the three months honeys and enriched honeys retained good antioxidant activities.

Because of the great variation in honey composition, the biological activities exhibited by the honey samples varied according to the geographical and botanical origin of honey, while processing and storage condition might affect the biological activities only to a minor degree (32).
For the correlation analysis, the EC$_{50}$ values were transformed into their reciprocal values, 1/EC$_{50}$. The 1/EC$_{50}$ values are more representative of the presented activity because they follow the increasing trend of honey samples in tested assays (Figure 1).

![Figure 1. 1/EC$_{50}$ values of honeys with and without addition of dried cherries](image)

Statistical tool can be considered as a useful complimentary approach to investigate the relationship between the antioxidant activities of honey and its biochemical composition. Pearson’s correlation coefficients (R) between the composition and the antioxidant activities of honey samples are shown in Table 3.

<table>
<thead>
<tr>
<th></th>
<th>TPh (mg GAE/100 g)</th>
<th>TFd (mg RE/100 g)</th>
<th>TAn (mgCGE/100 g)</th>
<th>1/EC$_{50}$ (mL/mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DPPH</td>
</tr>
<tr>
<td>1/EC$_{50}$ (mL/mg)</td>
<td>RP</td>
<td>0.93</td>
<td>0.73</td>
<td>0.57</td>
</tr>
<tr>
<td></td>
<td>DPPH</td>
<td>0.91</td>
<td>0.81</td>
<td>0.62</td>
</tr>
<tr>
<td>TPh (mg GAE/100 g)</td>
<td>-</td>
<td>0.74</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td>TFd (mg RE/100 g)</td>
<td></td>
<td>-</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>TAn (mgCyG/100g)</td>
<td></td>
<td></td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

There was a very good correlation between the total phenolic contents and the analyzed antioxidant activities of honey samples (0.91 for DPPH radical scavenging activity and 0.93 for reducing power). The correlation coefficients for the relation between the analyzed antioxidant activities and flavonoids (0.81 for DPPH radical scavenging activity and 0.73 for reducing power) and anthocyanins (0.62 for DPPH radical scavenging activity and 0.57 for reducing power) were slightly lower. Cetkovic et al. (5) and Vulic et
al. (29) also reported high correlation factors between the phenolics and flavonoid contents, and antioxidant activity of honeys.

Based the high correlation coefficients, it can be noticed that phenolics, flavonoids and anthocyanins play very important role in the antioxidant activity of honeys and honeys with dried cherries. Dai et al. (33) reported that, although the mechanisms behind the bioactivities of phenolics and anthocyanins involve many pathways, the most remarkable aspect of their activities may be their ability to act as either antioxidants or prooxidants in some biological environments. Significant correlations between the color parameters, phenolics, and antioxidant capacity have been demonstrated by Beretta et al. (34), Ferreira et al. (35) and Bertoncelj et al. (36).

An important parameter of honey is its color, which reflects the floral source (36). PH, LH and AH with and without dried cherries, before and after storage, were evaluated by a 7-member trained expert descriptive attribute sensory panel. The sensory quality of honey samples was defined based on density, intensity of color, aroma and odor. Samples were scored using the 0 to 3 intensity scale and the results are presented in Figure 2.

**Figure 2.** Sensorial characteristics of honey samples. a) PH and PH with addition of dried cherries, before and after storage; b) LH and LH with addition of dried cherries before and after storage; c) AH and AH with addition of dried cherries before and after storage.

Scores are means of seven evaluations by 7 seven panelists. Scores: 0 - unacceptable, 1 - acceptable, 2 - good, 3 - optimal quality level.
Darker honeys tend to have higher antioxidant activity and an increased concentration of phenolic compounds (37). Ferreira et al. (35) showed that dark honeys were richer in phenolics and had a higher antioxidant activity. Sensorial descriptive profiling of all honeys indicated very good quality. Panelists' evaluations of honeys indicated that polyfloral honeys with the addition of dried cherries showed the best sensory properties. Dried cherries in PH improved density, color, odor and aroma. The total sensory scores, increased from 2.73 for PH to 2.88 for PH40 and 2.78 for PHs to 2.86 for PH40s, which shows that the quality of honey samples was improved with addition of dried cherries. Good sensory characteristics of honey enriched with dried cherry remained practically unchanged after three months of storage.

CONCLUSION

This study showed that polyfloral, linden and accacia honeys and honeys with dried cherries, before and after three months storage, contained high amounts of bioactive compounds and possessed good antioxidant activity. Also, high level of correlation between the phenolics, flavonoids and anthocyanins content and antioxidant activities of all studied honeys confirmed that they may be products of wide use due to good consumers acceptance. The addition of dried cherries improved the sensory properties of investigated honeys. The three-month storage of the raw and enriched honeys did not affect the good quality of the samples.

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REFERENCES


ЛИВАДСКИ, ЛИПОВ И БАГРЕМОВ МЕД СА ДОДАТКОМ СУВЕ ВИШЊЕ НАКОН 3 МЕСЕЦА СКЛАДИШТЕЊА – АНТИОКСИДАТИВНА И СЕНЗОРСКА АНАЛИЗА

Јелена Ж. Вулић, Јасна М. Чанадановић-Брунет, Гордана С. Ћетковић, Соња М. Ђилас, Весна Т. Тумбас, Слађана М. Стајчић

Универзитет у Новом Саду, Технолошки факултет, Булевар цара Лазара 1, 21000 Нови Сад, Србија

Ливадски (ПХ), липов (ЛХ) и багремов (АХ) мед, без и са сувом вишњом (40%), пре и након 3 месеца складиштења, су анализирани у овом раду. Одређени су укупни феноли, флавоноида, антоцијани, антиоксидативна активност и сензорске карактеристике. Садржаји укупних фенола и флавоноида су порасли са додатком суве вишње у мед, а обогаћени медови су показали висок садржај укупних антацијана. ЛХ40 имао је највећи садржај укупних антацијана (41,41 мгГЕ/100г). АНТИОКСИДАТИВНА АКТИВНОСТ је порасла са додатком сувих вишња у мед код ДППХ теста и редукционе способности. ПХ и обогаћени ПХ показао је најбољу антиоксидативну активност у поређењу са ЛХ и АХ. EC50ДППХ вредности су: 23,81 за ПХ и 24,19 мг/мл за ПХс, док су EC50ДППХ: 1,16 мг/мл за ПХ40 и 1,18 мг/мл за ПХ40с. РП0,5 вредности су: 57,00 мг/мл за ПХ40 и 56,00 мг/мл ПХ40с, док су РП0,5: 15,05 мг/мл за ПХ40 и 15,18 мг/мл за ПХ40с. Статистичке анализе су показале да су укупни феноли, флавоноида и антоцијани и антиоксидативна активност снажно повезани. Сензорска анализа медова са додатком суве вишње, пре и након складиштења, је указала на веома добре сензорске карактеристике.

Кључне речи: мед, сува вишња, антиоксидативна активност, сензорска анализа, складиштење

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