J. Agric. Sci. Mansoura Univ., 28(1): 587 - 591, 2003

PHYSICOCHEMICAL PROPERTIES OF THREE HONEYS AFTER HOT STORAGE

El-Basiony, M.N.*; Sahar Y. Abdel-Aziz ** and Azza T. Ashour **

* **Faculty of Environmental Agricultural Science, Suez Canal University. Al-Arish, Egypt**

** **Department of Economic Entomology and Pesticides, Faculty of Agriculture, Cairo University, Egypt.**

ABSTRACT

When three honeys were stored at 50°C, darkening was not accompanied by tangible changes in total nitrogen content and there were only comparatively small changes in total acidity. During storage two honeys showed a considerable decrease in pH, and one showed comparatively small change.

Addition of sulphite decreased colour darkening. Ascorbic acid had little effect on changes in honey colour during storage.

INTRODUCTION

The price of honey on the local market is largely determined by its colour and granulation. The heat storage may introduce a new basis for processing honey during winter season in Egypt. There have been many earlier studies of the changes that occur in honeys during storage and processing (White *et al.*, 1962; Smith, 1967).

The factors influencing darkening in honey during storage on after heating were studied by many workers (Garcia *et al.*, 2000; Thrasyvoulou, 1997; Singh et al., 1998; Azeredo *et al.*, 1999; Gonzales *et al.*, 1999; Perreyra *et al.*, 1999; Bath *et al.*, 2000, Marchini *et al.*, 2000, and Villamiel *et al.*, 2001).

Many workers quantified the effect of heat storage on the pH and protein content (Azeredo *et al.*, 1999; "Barth *et al.*, 1999 and 2000;" Garcia *et al.*, 2000; Mats *et al.*, 2000; Villamiel *et al.*, 2001; and Baroni *et al.*, 2002).

The present paper reports on changes in total nitrogen content, pH and acid content during storage at 50°C and on effects of addition of sulfur dioxide and ascorbic acid on observed darkening of clover honey after hot storage.

MATERIALS AND METHODS

The honeys were chosen as representative of floral sources of honey in Egypt: Citrus, Clover and Cotton. The honey had gone primary extraction only. Each honey sample (100g.) was stored in an incubator for 44 days at 50°C in 125-ml screw cape glass jar. Colour was determined by vision. Total nitrogen, moisture, acidity, free acidity, lactone content and pH were determined as described by White *et al.*, (1962).

The effects of ascorbic acid and sodium metadisulphite on clover honey as a honey having initial light colour were determined by dissolving ascrobic acid (55 mg. or 200 mg.) or sodium metadisulphite (50, 100, 500 or 1000 mg.) in 100 g. honey. Each sample was stored at 50°C in a 125 ml. screw cape jar.

RESULTS AND DISCUSSION

In the three honeys, the nitrogen content was relatively unaffected by storage at 50°C (Table, 1); this result agrees with those of Bath *et al.*, 1999 and Bath *et al.*, 2000; who examined total nitrogen content of heneys exposed to extremes of storage and heat treatment. Results suggest a higher total nitrogen content of light citrus honey than dark cotton honey as found by Baroni *et al.*, (2002) who studied some 100 honeys of different floral origin.

For one honey, a change in pH during storage was very slight, and consistent with the small storage-induced variations in free and total acids and in lactone content in all honeys. However, appreciable decreases in the pH values of two honeys were observed during storage: 0.13 and 0.47 pH units for clover and cotton honeys, respectively (Table, 1). The results appear to indicate an inverse relationship between acid content and hydrogen ion concentration in the honeys studied. This aspect will be considered in other paper devoted to the qualitative and quantitative study of organic acids in honey. It appears that none of the changes observed during storage were related to the initial moisture content, in spite of the known importance of moisture levels in browning reactions. These results are in line with those of Garicia *et al.*, (2000), Mats *et al.*, (2000) and Villamiel *et al.*, (2001).

The addition of chemicals to inhibit darkening in honey has been investigated by many authors (Ganzales *et al.*, (1999) and Perreyera *et al.*, (1999).The effect of the incorporation of sulfur dioxide on clover honey darkening was examined, since sulphure dioxide is known to retard Millard reactions and is widely used to prevent darkening in the hydrolysed starch syrup industry. Ascorbic acid is similarly used on the basis of its antioxidant properties in products such as apple juice, and its effect on honey darkening was therefore also investigated.

Changes observed in colour during storage at 50°C for our honey samples containing 0.50, 1000 and 10,000 ppm of sodium metadisulphite; were initially decreased during the first 6 days of storage for all sulphite levels. The exent of the decrease was depending on concentration of added sulphite. Clearly, sodium metadisulphite lightened the honey colour by bleaching pigments originally present. At the two highest sulphite levels used (5000 and 10,000), the honey colour remained at its initial light colour for approximately 20 days. The time required for sulphited honey to recover its initial colour was related to sulphite concentration. Thus with 500 ppm of added sulphite approximately 8 days were required, with 1000 ppm approximately 12 days, and with 5000 and 10,000 ppm colour was still markedly below the initial colour after 30 days. The clover honey darkening was lower for honey samples containing added sulphite than for the control samples.

The effect of ascorbic acid on honey darkening was examined by adding 0, 500, and 2000 ppm ascorbic acid to clover honey before storage at 50°C. Ascrobic acid did not inhibit honey darkening and thus it appears that an oxidative mechanism is not involved.

Table (1): Moisture content, total nitrogen, pH, free acidity and lactone content of three honeys before and after storage at 50°C for 44 days.

Honey type	Moinsture content (%)	Total N. (%)		PH.		Free acid (mg/kg)		Total acid (mg/kg)		Lactone (mg/kg)	
	Initial	Initial	Stored	Initial	Stored	Initial	Stored	Initial	Stored	Initial	Stored
Clover	18.3	0.020	0.020	4.18	4.05	17.9	15.8	22.9	20.7	4.9	5.1
Cotton	15.9	0.035	0.036	3.88	3.41	16.1	14.9	21.9	20.9	6.7	5.9
Citrus	21.3	0058	0.058	4.53	4.50	38.1	34.4	42.9	40.7	6.9	6.4

REFERENCES

Azeredo M.AA.; L.C. Azereodo and J.G. Damascens (1999). Physico-chemical characteristics of the honeys from Sao Fidelis Country. Ciencia-e-Technologia-de-Alimentos. Abstract.

Baroni M.V.; G.A. Chiabrando; C. Costa and D.A. Wunderlin (2002). Assessment of the floral origin of honey by SDS-Page immunoblot techniques. T. Agric. Food Chem., (6) 1362-7.

(1999). A coparison between *Helianthus annus* and *Eucalyptus lanceolatus* honey. Food Chemistry, 67 (4): 389-397.

Bath P.K.; Narpinder-Singh and N. Singh (2000). Chemical Change in *Helianthus annus* and *Eucalyptus lanceolatus* honey during storage.Journal of Food Quality., 23: 443-451.

Garcia-Alvarez M.; J.F. Huidobro; M. Hermida and J.L. Rodriguez – Otero (2000). Major components of honey anlysis by near-infrared transflectance. J. Agric. Food Chem., (48): 5154-8.

Gonzales A.P., Burin L., and Pilar B.M. (1999). Colour changes during storage of honeys in relation to their composition and unitial colour. Biological Abstract. Food R. Inter., 32 (3): 18-191.

Marchini L.C.; A.C.L. Rodrigues and A.C. Moreti (2000).HMF (Hydroxymethylfurfurar) and diastase of honeys liquefied by heating. Boletin-de-Indstria-Animal., 57(1): 85-91.

Mats I.; J.F Huidobro; M.P Sanchez; J. Simal-Lozano; M.T. Sancho and del-Sanchez M.P. (2000). Calculation of different citric acid forms in honey and their relationship with the honey pH.Deutsche-Lebensmittel-Rundschau., 96 (5): 177.180.

Perreyra C.A.; L. Burin and B.M. Pilar (1999). Colour changes during storage of honeys in relation to their composition and initial colour. Food Res. Inter., 32 (3): 185-191.

Singh N.; P.K. Bath and S. Narpinder (1998). Relation between heating honey types. J. Food Sci. and Tech., 35(2):154-156.

Smith F.G. (1967). Deterioration of the colour of honey. J. Apic. Res., 6 (2): 95-98.

Thrasyvoulou A. (1997). Heating times for Greek honeys. Melissokomiki-Epitheorisi., 11(2): 79-80.

Villamiel M.; M. Dolores-del-Castillo; N Corzo and A. Olano (2001). Presence of furosine in honeys. J. of the Sci. of Food and Agric., 81 (8): 790-793.

White J.W.; M.L. Reithof; M.H. Sueers and J. Kushnir (1962). Composition of American Honeys. Tech. Bull. USDA., 1261.

الصفات الكيميائية الفيزيائية لثلاثة أنواع من العسل بعد التخزين على درجة حرارة عالية:

محمد نجيب البسيونى[١] - سحر ياسين عبد العزيز[٢] -عزة توفيق عاشور[٣]

١- كلية الزراعة والبيئة بالعريش - قناة السويس - جامعة العريش

٢- قسم الحشرات الاقتصادية والبيدات - كلية الزراعة - جامعة القاهرة

عند تخزين ثلاثة أنواع من العسل على درجة ٥٠م وفى الظلام فلا يصحبه تغيرات واضحة فى مكونات النيتروجين الكلية ولكنه يصحبه تغيرات طفيفة فى حامضية العسل.
أظهر اثنين من أنواع العسل نقص فى درجة الـpH كما أظهر نوع واحد تغيرات ظفيفة وذلك خلال فترة التخزين. بالإضافة الى أن نقص الحديد أظهر اللون الغامق وكان تأثير حامض الاسكوربك طفيفاً على لون العسل.