

## **MINERALS AND ENZYMES COMPOSITION OF HONEYS OF DIFFERENT BOTANICAL ORIGIN IN SAUDI ARABIA .**

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### **ABSTRACT**

Eight multifloral of Saudi honeys from different botanical origin collected from eight regions were studied . Eight region samples of Saudi honeys were (Fakhera, Rabie Fayad, El. Bashaier, Rabie Kobba, El-Saiel Al Kabeer, El-Nokhba, Tabba and Om Azoaba). The chemical parameters were measured including proline and enzymes of diastase , invertase and catalase . The results of chemical composition show that the diastase content ranged from 3.0-23.04 (DN), the invertase content ranged from 9.54-55.63 (u/kg) and the catalase content ranged from 0.008-0.15 (K). The proline content ranged from 52.38-142.86 mg/100g, Protein content 0.05-0.35%. Minerals of copper (Cu) , manganes(Mn) , cadmium(Cd) and lead(Pb) were not found in all honey types analyzed. The values of potassium (338.98 – 2992.7 ppm) is the predominant elements in all honey types , while iron values (9.13 – 57.73 ppm) is the minor elements in all honey types .

### **INTRODUCTION**

Honey, is also known to contain a large number of enzymes (white, 1979) including a. and B. amylase (diastase), a. glucocidase (invertase), glucose oxidase, catalase and acid phosphatase. Also, protease and estrase activity have been reported (Evanov, 1981).

Enzymes in honey are of interest as indicators of honey quality (FAO/WHO Codex Alimentarius Cammisson, 1970). The discovery of each new enzyme in honey leads to speculation on its origin (bee – added or other) and purpose.

Other trace elements include nitrogenous compounds among which the enzymes originate from salivary secretions of the worker honeybees. They have an important role in the formation of the honey. Their reduction or absence in adulterated, overheated or excessively stored honeys serve as an indicator of freshness. The main enzymes in honey are invertase (saccharase), diastase (amylase), catalase and glucose oxidase traces of other proteins, enzymes or amino acids, as well as water soluble vitamins are thought to result from pollen contamination in honey (Krell , 1996) . Jones (1987) concluded that the low concentration of heavy metals in honey and their inherent variability detract from the reliable use of honey for monitoring purpose.

Minerals are present in very small quantities , potassium being the most abundant . Dark honeys particularly honeydew honeys are the richest in minerals. In recent years research efforts were done in order to find more characteristic components for classifying honeys ( Blank, 1990; Castro *et al* , 1992; Delgado *et al.* , 1994) .

The aim of this work was to search for significant parameters in distinguishing honeys of different botanical origin. This work was implimented in the Bee – keeping Res. Plant Protec.Res. Intst.during the year 2005

## MATERIALS AND METHODS

Sample of Saudi honeys were collected from eight regions (Fakhera, Rabie Fayad, El Bashaier, Rabie Kobba, El-Saiel Al Kabeer, El-Nokhba, Tappa and Om Azoaba) in Saudi Arabia. All the samples were analyzed for the following properties:- diastase (DN) , invertase (u/kg) , catalase (k), proline (mg/100g) , and protein

The determination of diastase based on the method of Schade, *et al.*, (1958) , while the invertase was measured according to (Siegenthaler , 1977) , the catalase was measured according to (AOAC, 1990a) , the proline was measured according to (Din, 1991), the total protein was measured according to (Loiseleur , 1963) .

The contents of K , Na ,Ca, Mg, Fe, Pb, Cd , Cu and Mn were determined in honey by atomic absorption spectrophotometry. Standard solutions were supplied by Perkin Elmer Corporation (USA).

A series dilutions was prepared for each standard solution prepare a calibration curve from which the concentration was calculated .

Sample preparation for determination of mineral composition was carried out according to A.O.A.C.( 1990 b) .

## RESULTS

Table (1) shows the minerals composition of the eight honey types of Saudi Arabia. The minerals of copper (Cu), Manganes (Mn), cadmium(Cd), and lead(Pb) were not found in all types of honey analyzed. The value of iron (Fe) were , 12.79 , 24.49 , 20.74,18.13,9.13,57.73,17.24 and 20.66 ppm. in honeys of Fokhera, Rabie Fayad , El Bashaier , Rabie Kobba , Esaiel AlKabeer, El Nokhba , Taba , and Om Azoaba, respectively. The values of potassium (K) were 2099.24 , 1781.02 , 2906.98 , 338.98 , 2318.27 , 2140.08 , 2992.70 and 1508.30;The values of Sodium (Na) were , 200.38 , 591.97 , 217.05 , 150.66 , 343.80 , 155.64 , 319.34 and 331.80 ppm.; The values of phosphorous (P) were 190.83, 145.98, 775.19, 47.08, 687.62, 778.21, 729.92 and 150.8 ppm.; And The magnesium (Mg) values were , 37.46 , 52.56 , 101.55 , 10.08 , 84.97 , 40.22 , 103.23 and 41.48 ppm.

Table (1) Minerals composition of Saudi Arabia honeys

| Minerals (ppm) | Honey Types |             |             |             |                   |            |         |           |
|----------------|-------------|-------------|-------------|-------------|-------------------|------------|---------|-----------|
|                | Fakhera     | Rabie Foyad | El Bashaier | Rabie Kabba | El Saiel AlKabeer | El Nokhbba | Taba    | Om Azoaba |
| Iron (Fe)      | 12.79       | 24.49       | 20.74       | 18.13       | 9.13              | 57.73      | 17.24   | 20.63     |
| Copper (Cu)    | 0.00        | 0.00        | 0.00        | 0.00        | 0.00              | 0.00       | 0.00    | 0.00      |
| Manganese(Mn)  | 0.00        | 0.00        | 0.00        | 0.00        | 0.00              | 0.00       | 0.00    | 0.00      |
| Potassium (K)  | 2099.24     | 1781.02     | 2906.98     | 338.98      | 2318.27           | 2140.08    | 2992.70 | 1508.30   |
| Sodium (Na)    | 200.38      | 591.97      | 217.05      | 150.66      | 343.80            | 155.64     | 319.34  | 331.8     |
| Phosphorus (P) | 190.83      | 145.98      | 775.19      | 47.08       | 687.62            | 778.21     | 729.92  | 150.8     |
| Magnesium(Mg)  | 37.46       | 52.56       | 101.55      | 10.08       | 84.97             | 40.22      | 103.23  | 41.48     |
| Cadmium (Cd)   | 0.00        | 0.00        | 0.00        | 0.00        | 0.00              | 0.00       | 0.00    | 0.00      |
| Lead (Pb)      | 0.00        | 0.00        | 0.00        | 0.00        | 0.00              | 0.00       | 0.00    | 0.00      |

Data in Table (2) shows the enzymes activity of eight Saudi Arabia honey types .The diastase content in different types of honey ranged between 3.00 and 23.04 (DN) ; while the invertase content ranged between 9.536 and 55.629 (u/kg) , on the other hand ; the catalase content in different types of honey ranged between 0.00775 and 0.15238 .The proline content in different types of honey ranged between 52.38 and 142.86 mg/100g ; while the protein content in different types of honey ranged between 0.046 and 0.35% .

**Table (2) : Enzymes activity of some Saudi Arabia honeys .**

| Parameter         | HoneyTypes |             |             |             |                    |           |       |           |
|-------------------|------------|-------------|-------------|-------------|--------------------|-----------|-------|-----------|
|                   | Fakhera    | Rabie Fayad | EI Bashaier | Rabie Kobba | EI Saiel AL Kabeer | EI Nokhba | Tabba | Om Azoaba |
| Diastase (DN)     | 7.5        | 7.5         | 23.04       | 3.0         | 7.5                | 15.0      | 30.0  | 6.0       |
| Invertase (u/kg)  | 25.43      | 46.09       | 23.84       | 9.54        | 42.91              | 52.45     | 55.63 | 19.08     |
| Catalase (K)      | 0.008      | 0.10        | 0.01        | 0.04        | 0.09               | 0.01      | 0.38  | 0.1       |
| Proline (mg/100g) | 104.8      | 85.71       | 114.29      | 52.38       | 142.86             | 123.81    | 100.0 | 80.95     |
| Protien (%)       | 0.30       | 0.30        | 0.35        | 0.06        | 0.10               | 0.06      | 0.30  | 0.05      |

## DISCUSSION

Data presented in Table (1) demonstrate a common feature that the content of some minerals (K, Na, Ca, Mg, Fe, Cu and Mn) in floral honeys are higher than those in non floral honeys. As a general feature, K, Na, Ca and Mg are considered macroelements of honey, while Mn, Fe and Cu are microelements. Ca is the predominant mineral in the cotton and citrus honeys, while K is the predominant element in clover, camphor and non floral honeys. Mn is the minor mineral in all honey samples except for cotton honey in which Cu is the minor element. Echigo *et al.* (1986) reported that the content of K, Na, Ca, Mg, and Fe are 339.0, 120.0, 13.0 , 38.2 and 25.0 mg / Kg , respectively .Frias *et al.* (1991) concluded that the average content of Fe was 6.1 ppm while it was 1.0 ppm for Cu. Rodriguez *et al.* (1992) reported that the amounts of Na, K, Ca, Mg , Cu , Fe and Mn were found at the rates of 98.0, 653.0, 88.0, 38.0, 0.62 5.0 and 1.92 mg/Kg, in respectively the mean value for ash (W:W) was 0.192. Mattos *et al.* (1998) reported that K 1130; Mn 3.88; Fe 2.79; Zn2.34 and Cu 0.54mg/Kg. Ycdottess and Yavuz (1999) reported that the mean values for Na, Ca, Mg, Cu, Fe and Mn, were 118, 296, 51, 33, 1.8 and 6.6 mg/Kg, respectively.

The discrepancy between our results and the previously reported results may be due to the different nestar sources.

Parameter of diastase activity (Table 2) was used to determine the degree of deterioration of the honey . It was found to be within acceptable limit of all samples .Diastase (amylase) digest starch to simple compounds but no starch is found in nectar. It has been used as a measure of honey quality in several countries. Diastase shows different values ranging between 3.0 – 30.0 DN. Gomez *et al* (1993) found that the mean values of diastase is 20.1 (Go the scale). Tarrab *et al.* (2002) reported that diastase ranging

between 0.18 – 236.0. Laurino and Gelli (2002) found that the values of diastase activity range between 15.0 – 20.3 (DN).

Invertase splits sucrose into its constituent simple sugar, dextrose and levulose. The sucrose content of honey never reaches zero. In our study, invertase values ranged from 9.54 to 55.63 (u/kg). Comparable results are reported by other authors. Laurino and Gelli (2002) found that the values of invertase activity ranged from 11.03 to 12.87 u/kg.

Different amino acids can be found in honey, for example, proline being the most important from a quantitative point of view. In the present study the proline values ranged from 52.38 to 142.86 (mg/100g). Our results are in agreement with foldhazi *et al.*,(1996) who found that the values of proline ranged from 199 to 426 mg/100g. Gomez *et al* (1993) found that the mean proline value was 46.4 Mg/100g, while Tarab *et al* (2002) reported that the values of proline ranged between 1.52 to 301 mg/100g.

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تقدير العناصر المعدنية والإنزيمات للأعسال المختلفة المصادر النباتية بالسعودية  
عماد الدين أحمد عبد الحميد نافع - عماد عز الدين أحمد ثروت  
معهد بحوث وقاية النباتات - مركز البحوث الزراعية.

جمعت عينات من الأعسال من ثمانى مناطق فى المملكة العربية السعودية وقد تم تحليل  
جميع هذه العينات لدراسة المكونات الكيميائية والتي تشمل : الدياستيز - الأنفرتيز - الكتاليز -  
الحمض الأميني برولين - فى حين كان النشاط الأنزيمى لأنزيم الدياستيز ٢٣,٠٤-٣,٠ (DN)  
وأنزيم الأنفرتيز ٩,٥٤-٦٣,٥٥ ( وحدة/كجم) وأنزيم الكتاليز ٠,٠٠٨ - ٠,١٥ (K) . بينما  
المحتوى من البرولين ٥٢,٣٨ - ١٤٢,٨٦ (ملجم/١٠٠جم) والمحتوى من البروتين ٠,٣٥-٠,٠٥  
% وذلك فى الأنواع المختلفة من الأعسال المختبرة . أما بالنسبة للعناصر المعدنية فلم يتم تسجيل  
العناصر التالية : النحاس ، المنجنيز ، الكاديوم والرصاص ، فى حين عنصر البوتاسيوم سجل  
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