

# Survey On The d13C Values Of Different Honey Types



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## Introduction:

In 1979 the first official method for adulteration of honey with C4-sugars by stable carbon isotope ratio analysis (SCIRA) was established in the US as AOAC 978.17. In 1991 the method was improved by adding the internal standard procedure (ISCIRA, AOAC 991.41) as with the difference between delta <sup>13</sup>C honey protein and delta <sup>13</sup>C honey adulteration can be detected more accurately. In 1992 (1) and in 1998 (2) different data for honey world-wide have been published. Results of the QSI data base are compared with these published data. Basis are the results of imported honey tested by QSI for private industry in Germany within their Quality control during the last six years (honey source as declared by the clients). The maximum, minimum and the average d<sup>13</sup>C honey and d<sup>13</sup>C protein values for all samples resp. for selected honey types as well as the main range are presented. Differences resp. correspondence with published data are discussed.

Variety	total/adulterated samples	not adulterated samples/ pollen analysis conducted	Honey d <sup>13</sup> C‰			Protein d <sup>13</sup> C‰		
			max	min	Ø	max	min	Ø
Acacia	602/ 87 – 14,5%	515/ 257	-24,4	-22,3	-23,9	-24,3	-22,1	-23,9
Linden	254/ 27 – 10,6%	227/ 114	-25,9	-22,7	-24,1	-26,3	-23,0	-24,3
Forest	277/ 28 – 10,1%	250/ 94	-26,7	-22,0	-24,9	-26,2	-21,9	-24,7
Orange	63/ 6 – 9,5%	57/ 27	-25,1	-22,2	-24,0	-25,4	-22,3	-24,2
Sunflower	88/ 3 – 3,4%	85/ 22	-26,0	-23,6	-24,8	-25,9	-23,1	-24,5
Eucalyptus	38/ 4 – 10,5%	34/ 20	-27,2	-24,7	-26,3	-27,4	-23,7	-25,7
Rape	91/ 4 – 4,4%	87/ 18	-27,3	-25,1	-26,1	-26,6	-25,5	-25,9
Clover	43/ 0 – 0%	43/ 9	-26,8	-24,9	-26,3	-25,9	-25,0	-25,5

Tab. 1: Number of total, adulterated and not adulterated ( without/with pollen analysis) samples with max., min. and average d<sup>13</sup>C honey and d<sup>13</sup>C protein values for selected honey varieties

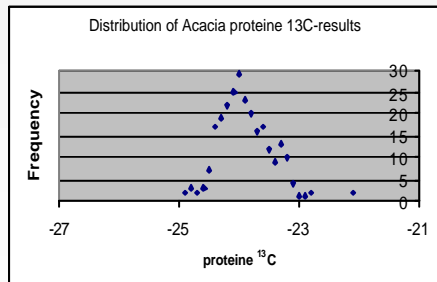
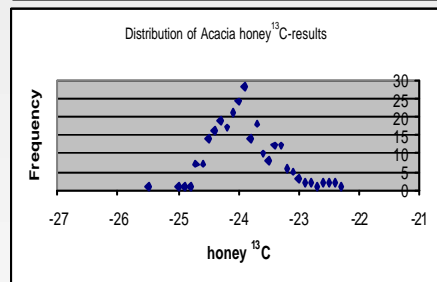


Fig. 1 a+b: Distribution of Acacia honey and protein <sup>13</sup>C-results

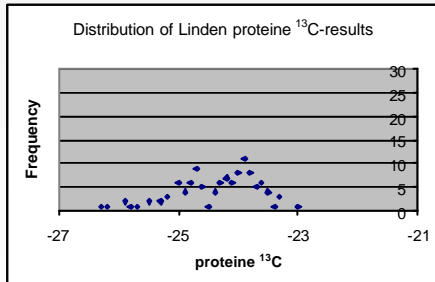
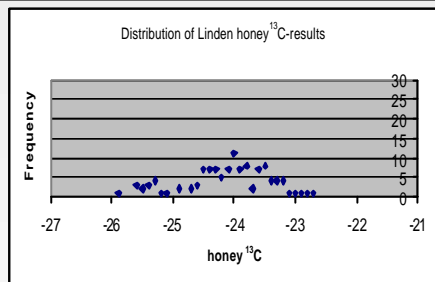


Fig. 2 a+b: Distribution of Linden honey and protein <sup>13</sup>C-results

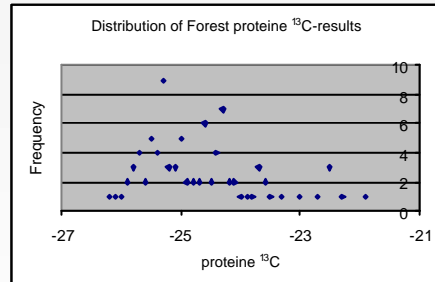
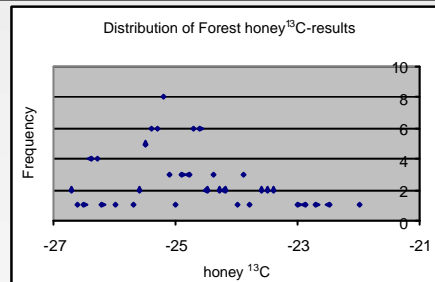


Fig. 3 a+b: Distribution of Forest honey and protein <sup>13</sup>C-results

**ACACIA:** Samples mainly from Eastern Europe (n=241) and few Asia samples (n=16) had a limited ?-range (from minimum to maximum) for honey =2,1 and protein =2,2 (compare Linden: 3,2/3,3 and Forest: 4,7/3,9). The comparison of the average values with published data was good (1,3,4).  
**LINDEN:** Samples from South-eastern Europe occurred in the more negative area of honey and protein <sup>13</sup>C-values (average -24,9/-24,5 n=39) while the less negative results came from China (-24,0/-23,9 n=75). Compared with published data there were found slightly higher values (1,3,5) which were from France, China and USA. Our data were collected mainly from Eastern Europe and Chinese samples – single results fitted to this higher values either. The comparison to published Eastern Europe data was good (4).  
**FOREST:** Forest honey showed regional differences. From more to the less negative average values one found South America (honey <sup>13</sup>C -26,2/protein <sup>13</sup>C -25,3 n=16), Europe (-24,6/\_ -24,4 n=30) and Asia (-22,9/-22,9 n=5). Turkey ranked at the less negative area of honey <sup>13</sup>C for Europe (-23,8 n=9), protein <sup>13</sup>C was European average. The remaining samples were from blended honeys. Forest honey has not a unifloral source and has therefore a wider range compared to Acacia and Linden honey. The comparison to published data was good (1,4).

## Bibliography

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3+4 only honey <sup>13</sup>C data

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## Conclusion:

1. The three honeys with statistical sufficient data available Acacia (Robinia), Linden and Forest showed different distribution patterns of <sup>13</sup>C honey and protein. The comparison to published data was good.
2. Our trends for Orange and Sunflower honey compared to published data were confirmed (1,4,6).
3. Our average Clover honey trend came mainly from Argentine honey and is higher than published (1: origin Canada, 4: origin: Canada and New Zealand, 6: origin USA).
4. For Eucalyptus and Rape honey comparative literature is rare but the trends seemed to match the already published data (1).