Comparison of European Honeys to Tropical Honeys – Effects of Yeast Cell Numbers on the Concentration of Selected Components

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Due to the climate conditions, especially tropical honeys are often affected by yeasts which may lead to negative sensory changes in the honeys. Because yeasts mostly produce glycerine and ethanol, it was postulated to limit the yeast cell number in commercial honeys to 500.000/10g and the content of glycerine to 300 mg/kg (RUSSMANN) as well as the content of ethanol to 10 mg/kg (SCHROEDER).
Therefore, we analysed the yeast cell number, the contents of glycerine and ethanol (see also BECKH and LUELLMANN, 1999) in several European honeys and tropical honeys (Fig. 1-3).

Additionally, we determined different metabolism products (TIMMROTH and SPEER), e.g. the free fatty acids after methylation as their methyl esters. Furthermore, using GC/MS, we detected ethyl esters of three fatty acids in some honeys (Fig. 4). This was not unexpected because the ethyl esters were described by WAGNER and RAPP as ingredients in wine affected by wild yeast species. The chromatogram of a rapeseed honey is presented in Figure 5.

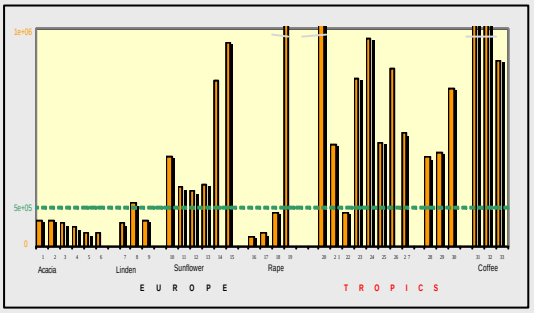

Fig. 1 Yeast cell number / g in European and tropical honeys
for improved representation the y-axis was scaled withradical-function

Country-Code ISO 3166	ISO Code2
1	S-E EUROPE
2	S-E EUROPE
3	RO
4	HU
5	S-E EUROPE
6	RO
7	RO
8	RO
9	RO
10	S-E EUROPE
11	FR
12	FR
13	FR
14	TR
15	FR
16	DE
17	CZ
18	DE
19	CZ
20	BR
21	BR
22	BR
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29	MX
30	VN
31	VN
32	VN
33	VN

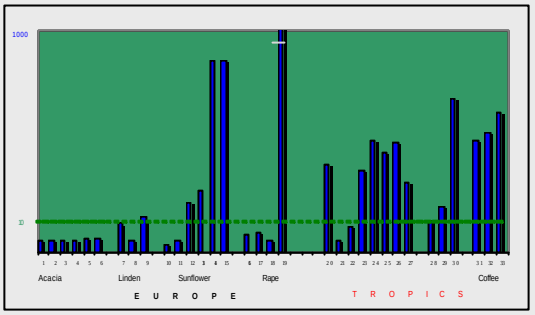

Fig. 2 Ethanol content (mg / kg)
for improved representation the y-axis was scaled withradical-function

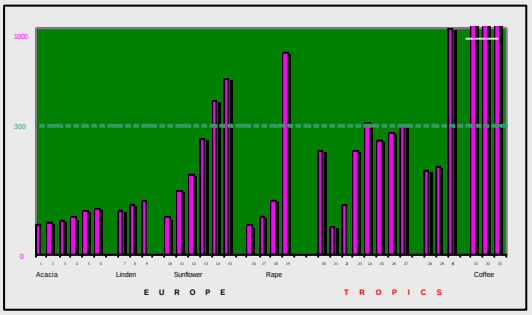

Fig. 3. Glycerine content (mg / kg)
for improved representation the y-axis was scaled with radical-function

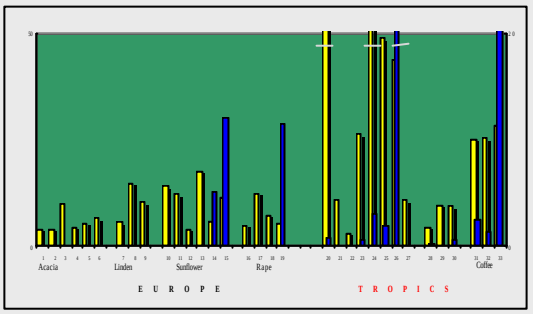

Fig. 4. Total of free fatty acids ($C_{16:0}$, $C_{18:1}$, $C_{18:3}$) and their ethyl esters.
All contents are in mg / kg honey.

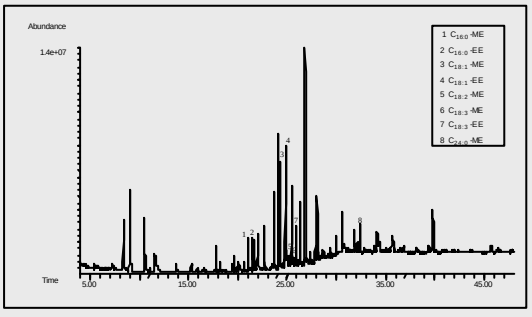

Fig. 5. GC/MS chromatogram of a rapeseed honey (The Czech Republik)

Conclusion:

1. **Tropical honeys were significantly stronger yeast-loaded than European honeys**
2. **The yeast cell number , the glycerine content and the ethanol content in tropical honeys frequently exceed the postulated limits by RUSSMANN and SCHROEDER**
3. **Fatty acid ethyl esters were more often detected in tropical honeys in correlation with a higher yeast cell number and a higher ethanol content**

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References
(1) Rußmann, H.: Hefen und Glycerin in Blütenhonigen - Nachweis einer Gärung oder einer abgestoppten Gärung. Lebensmittelchemie (1998), 52, 116-117.
(2) Beckh, G. and Lüllmann, C.: Natürliche Bestandteile des Honigs - Hefen und deren Stoffwechselprodukte. Teil 1: Hefegehalt. Deutsche Lebensmittel-Rundschau (1999), 95, 457-463.
(3) Schroeder, A.: Charakterisierung der Fermentation von Honig (Honigverderb) anhand chemischer, physikalischer, mikrobiologischer und sensorischer Parameter. Diss. Logos-Verl. (2002) Berlin, 97 - 111
(4) Timmroth, R. and Speer, K.: Development of analytical indicator substances for honeys strongly contaminated withyeasts in: Proceedings of EUROFOODCHEM XII (2003) Strategies for Safe Food, Brugge, Belgium, 24 - 26 September, Volume 1, 142 - 145.
(5) Wagner, K. and Rapp, A.: Über den Einfluß der Hefe auf die Bildung von 2-Phenylethanol bei der alkoholischen Gärung. Deutsche Lebensmittel-Rundschau (1999), 95, 304-309.