



HMF in HONEY

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HONEY REGULATIONS

- Codex Alimentarius Commission
Joint FAO/WHO Food Standard Programme
(24th session, Geneva, 2-7 July 2001)

Report of the seventh session of the Codex Committee on Sugars
(ALINORM 01/25, London 9-11 Feb. 2000)

- EC Directive 2001/110 Relating to Honey



ALINORM 01/25



Additional Composition and Quality Factors

- Chemical composition (*moisture, sugars, insoluble solids, conductivity*)
- Diastase activity
- Hydroxymethylfurfural (HMF)
- Hygienic temperatures
- Labelling
- Methods of sampling and analysis

EC Directive 2001/110

Annex II – Composition criteria for honey

1. sugars
2. moisture
3. water insoluble solids
4. electrical conductivity
5. free acids
6. Diastase activity and HMF (determined after processing)

6.a HMF

≤ 40 mg/kg scale

≤ 30 mg/kg in honeys of declared origin from a region with tropical climate

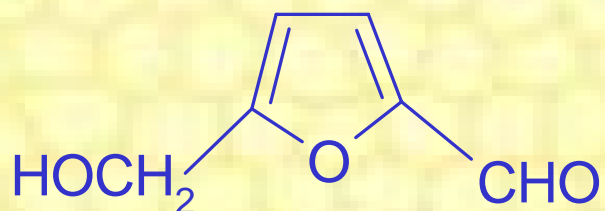
Fructose (or glucose)



-3 H₂O



H⁺ Catalysed



HMF

Statement: the amount of HMF in honey depends
How much these limits in the present regulations
are “scientific sound”
only by time and temperature of heating and/or storage

Effect of heating

HMF in unifloral honeys:

Effect of storage

HEATING TREATMENTS



Citrus (Citrus Aurantium L.)



Chestnut (Castanea Sativa L.)



Eucalyptus (Eucalyptus Camaldulensis L.)



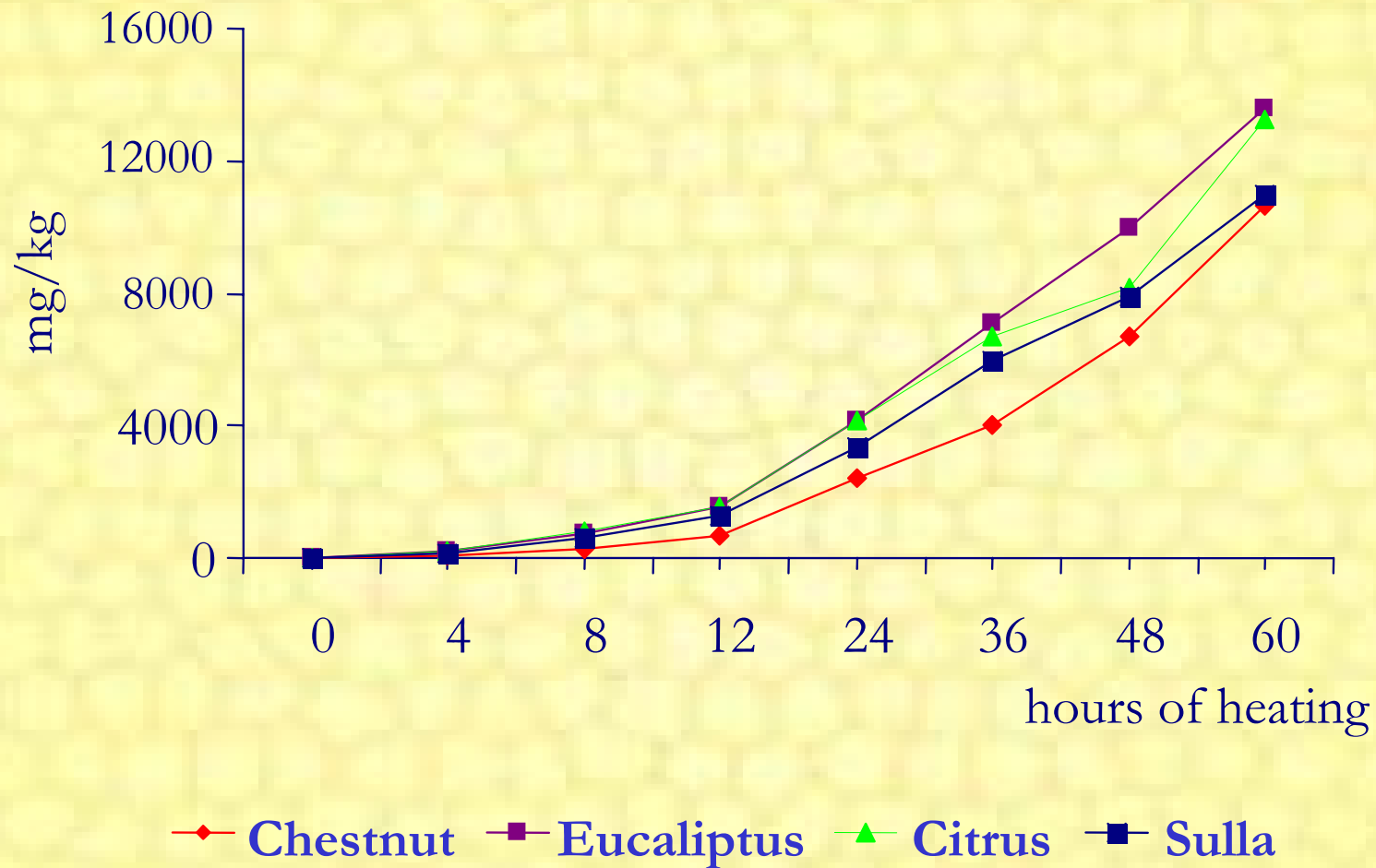
Sulla (Hedysarium Coronarium L.)

Analyses: Moisture, glucose, fructose, pH, free acids,
lactones, total acidity, conductivity, ash, diastase and HMF
Heating at:
50 °C up to 144 h (6 days)
70 °C up to 96 h (4 days)
100°C up to 60 h (2.5 days)

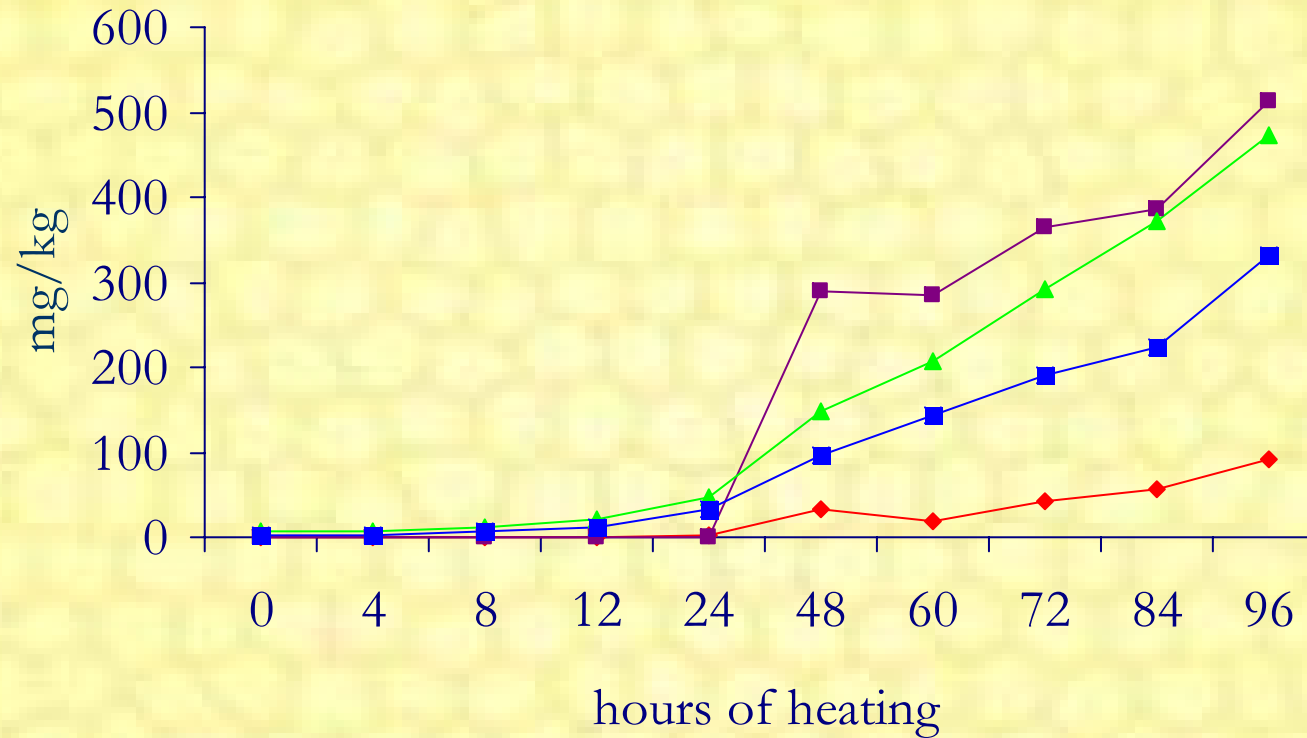
Chemical composition of the Unifloral honeys

Parameter	Citrus	Chestnut	Eucalyptus	Sulla
pH	3.4	5.9	3.7	3.4
Free acids (meq/kg)	22.5	9.7	23	15.5
Total acidity (meq/kg)	25	11.4	32.5	18
Electrical conductivity(μ S)	193	1128	413	126
Diastase (DU)	7.6	27.3	33.9	10.8
HMF (mg/kg)	5.95	-	-	1.23

HMF formation during heating at 100°C

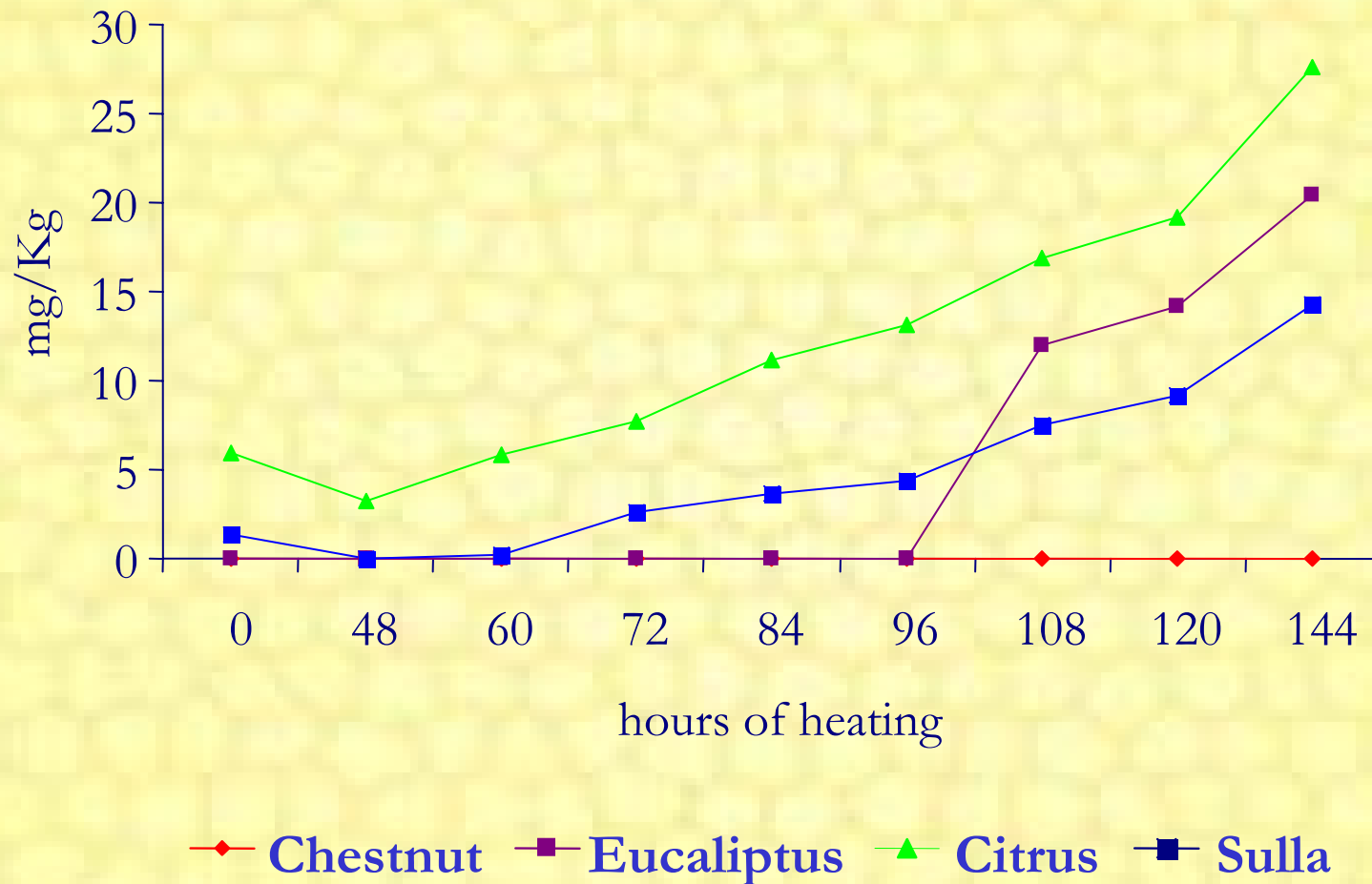


HMF formation during heating at 70°C



—◆— Chestnut —■— Eucalyptus —▲— Citrus —■— Sulla

HMF formation during heating at 50°C



Influencing factors on HMF levels at 50°C

Main factors:

- pH of honey
- temperature and time of heating

Specific factors:

- *Eucalyptus* and *Sulla* were correlated to acidity
- *Citrus* was correlated, at the same time, to:
time, pH and free acidity

HMF is clearly an heating index, but the statement that the amount of HMF is independent of honey type and composition could be wrong.

Among the studied honeys, *Citrus*, at the same time of heating, gives the highest amount of HMF

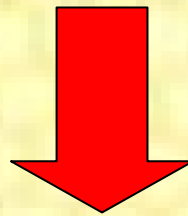
Citrus honey is a low natural enzyme content

9.3 ± 2.7 (Range: 3.4-16.3) D.U.

(Persano Oddo et al., 1995, 1999)

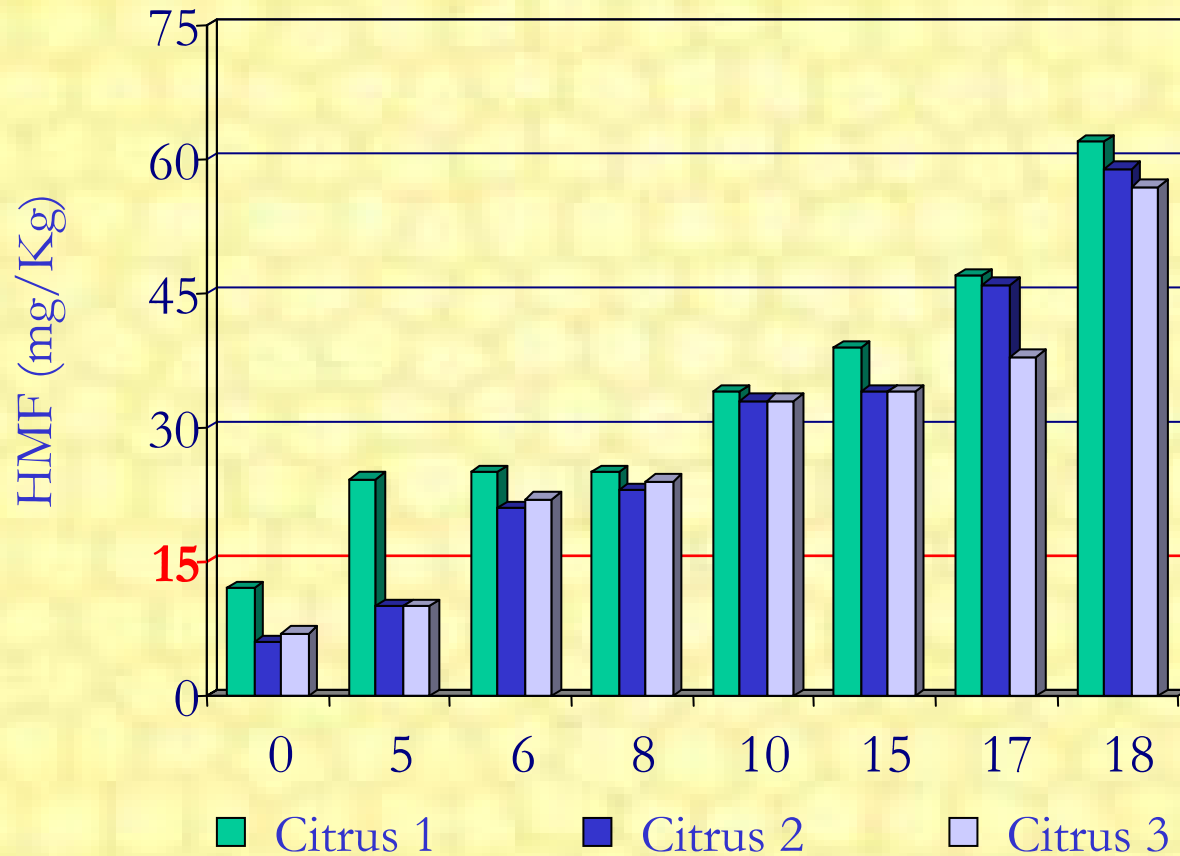
The half life of Diastase in honey at 30°C is:

6/7 months



This means 15 mg/kg as HMF limit

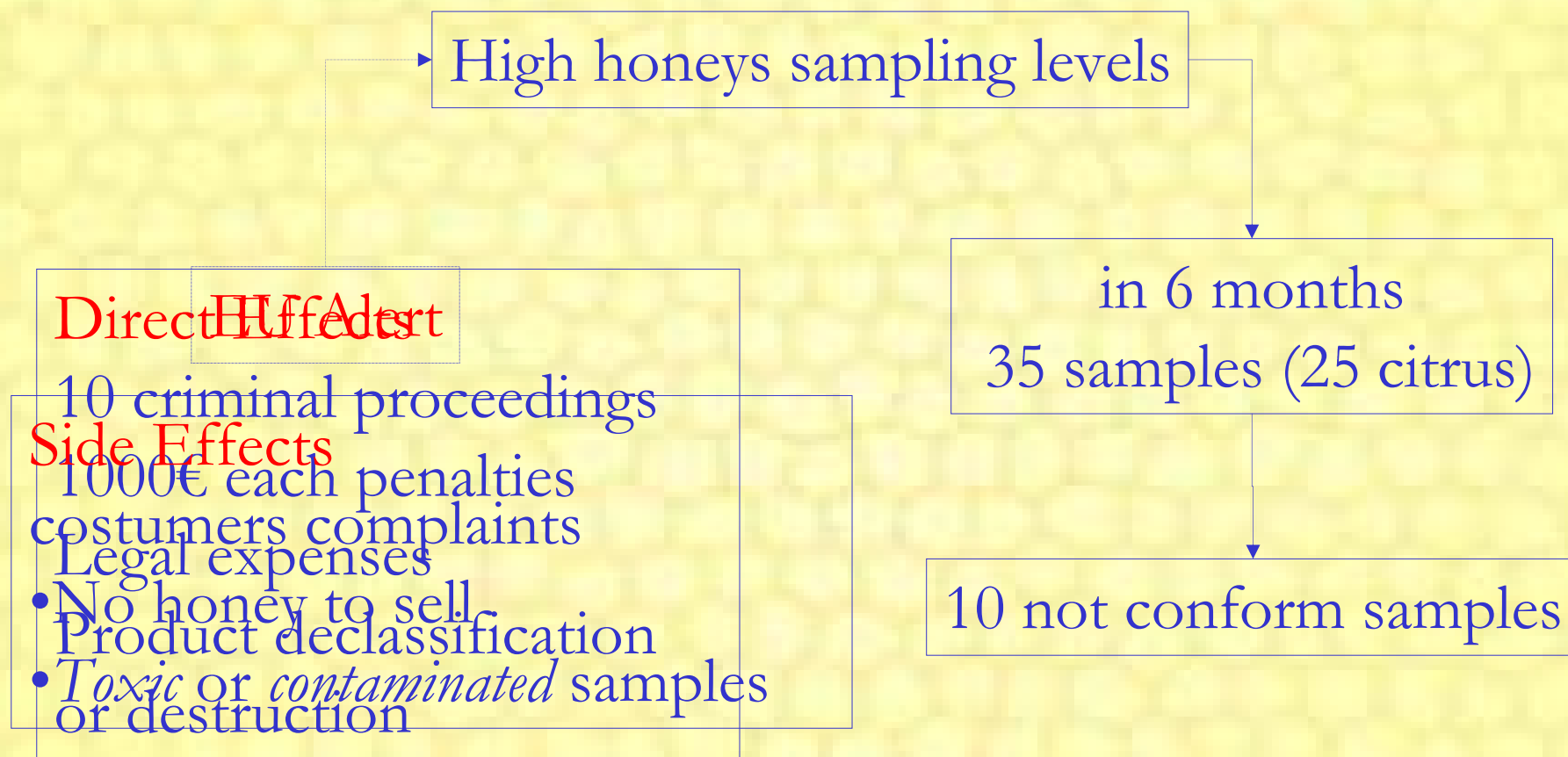
Storage of Citrus Honey (24±4°C)



This does not sound as “scientific based” because:

- a very low limit when there is a natural attitude to form HMF, independently from heating
- at the same time, honeys of different origin (*chestnut*) can be overheated without reaching the limit (40 mg/Kg).

Practical consequences (2004):



Conclusions:

More attention to: *Hygiene aspects and Contaminants*

Eliminate the limit of 15 mg/kg for low enzyme honeys

Correlate HMF limits to chemical parameters of honeys
and not to the diastase activity

Many Thanks for Your kind attention