



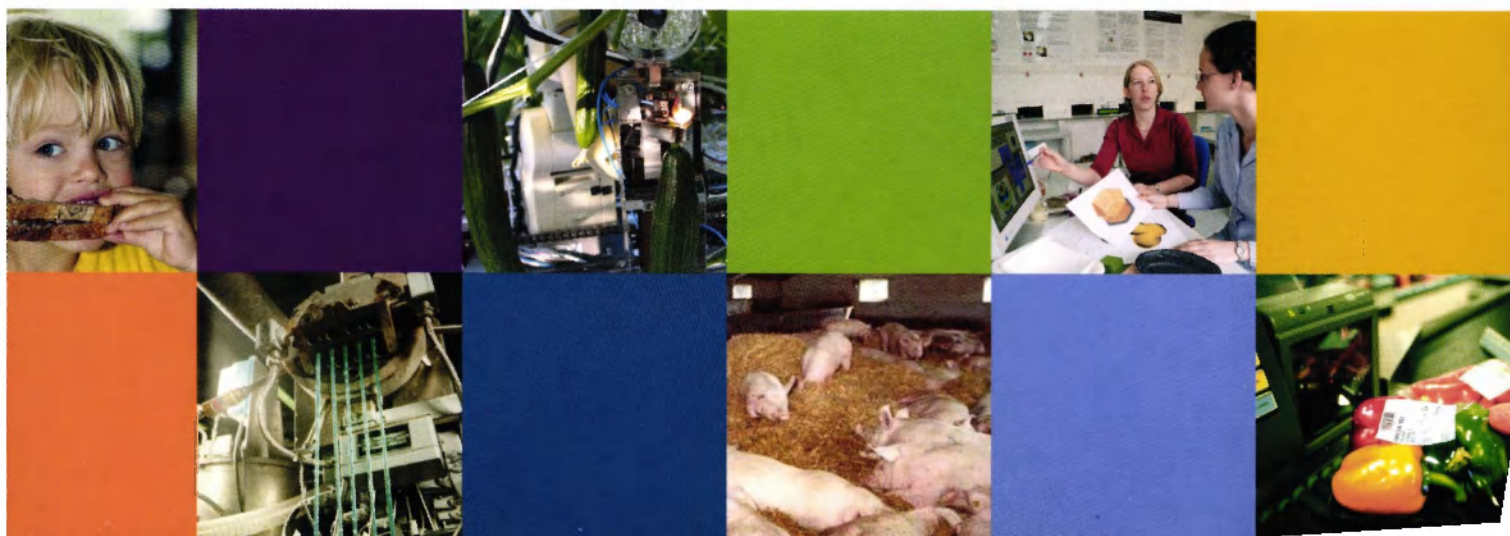
# Tobacco Bits storage

## *Quality decay model*

Confidential

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Report B741



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# Colophon

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## Tobacco Bits storage

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- Best storage conditions at 23°C
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## Experiment goals

- Determine optimal storage conditions for Tobacco Bits at 23°C
- Determine maximum storage time at optimal conditions at 23°C
- Data for model-based design of package (technical properties)

## Storage conditions

- Storage temperature 23°C (shop conditions)
- 4 relative humidity (RH) levels (54, 75, 85 and 100%)
  - in order to see the effect of different RH
- 2 gas conditions (0 and 40% CO<sub>2</sub>)
  - CO<sub>2</sub> suppresses microbiological growth
- Barrier-foil package
  - reference
- Storage during 6 months
- Every month:
  - Duplo sensory evaluation
  - Duplo water content, water activity, bacteria and mould levels measurements



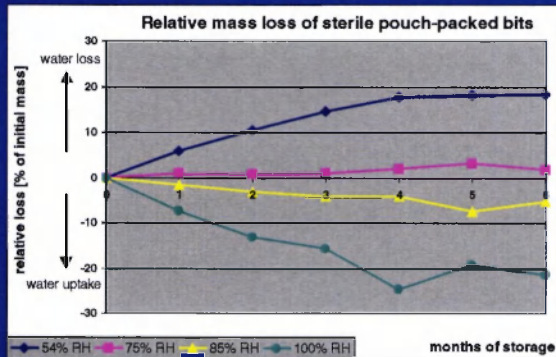
## Measurements - physiology

- A&F: mass change of sterile and barrier-foil packed samples
- Swedish Match:
  - water content
  - water activity
  - bacteria and mould



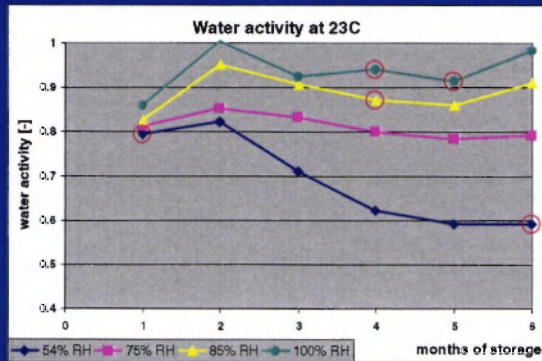
## Measurements - physiology

- Environmental climate is important.
- There is a maximum to water loss or to water uptake given RH.
- No difference between in air or in increased CO<sub>2</sub> stored samples.



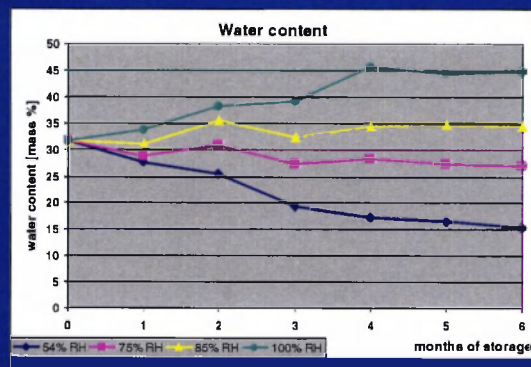
## Measurements - physiology

- No difference between in air or in increased CO<sub>2</sub> stored samples.
- Water activity above 0.62 may induce a climate for yeast, bacteria or mould growth.
- No occurrence of mould in under increased CO<sub>2</sub> stored samples.
- Bacteria occurred under air as well as under increased CO<sub>2</sub> level environment.



## Measurements - physiology

- Environmental climate is important.
- There is a maximum to water loss or to water uptake given RH.
- No difference between in air or in increased CO<sub>2</sub> stored samples.



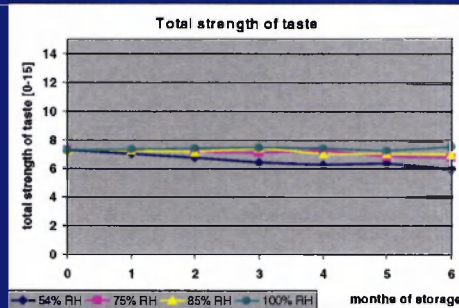
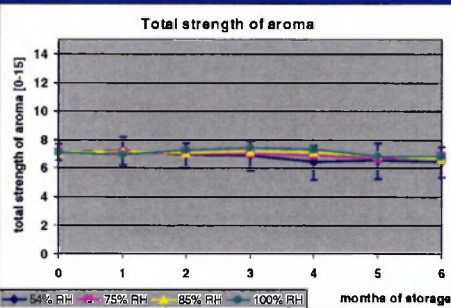
## Measurements - sensory

- Swedish Match
- Trained sensory panel
- Attributes 0 (weak) - 15 (strong) :
  - aroma: total strength, smoke, sweet, dried fruit, sour/acid
  - taste: total strength, smoke, dried fruit, spicy
  - sensation: throat irritating, mouth feeling (0: soft - 15: hard)



## Measurements - sensory

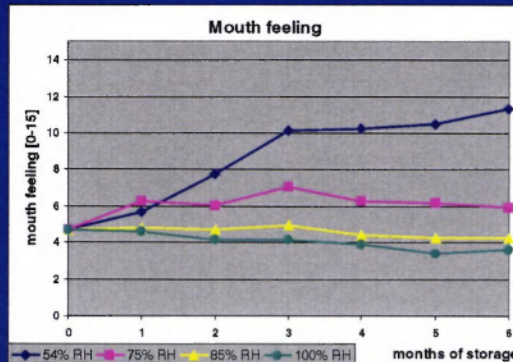
- No changes during storage in the sensory attributes except for mouth feeling.
- Within the attributes no difference between the samples stored in CO<sub>2</sub> or stored in air.





## Measurements - sensory

- Important because of product introduction in market.
- Strived value: 3.75, batch initial value: 4.7.
- Development is related to relative humidity.
- Level is related to water content (and water activity).
- No difference between in air or in increased CO<sub>2</sub> stored samples.

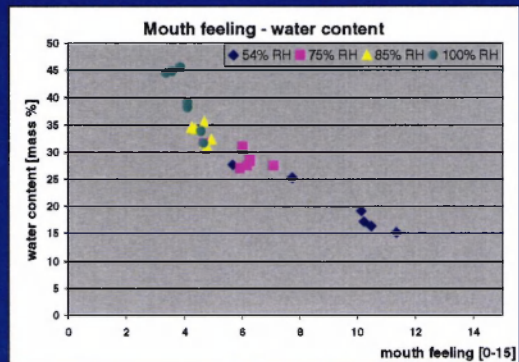


## Best storage conditions at 23°C

- 6 months storage is possible
- Physiological evaluation:
  - water content, initially 32% water:
    - 75% RH and lower leads to water loss (75% RH: to 27% in 6 months)
    - 85% RH and higher leads to water uptake (85% RH: to 35% in 6 months)
  - water activity always in risk area for microbiological problems
  - bacteria and mould:
    - bacteria levels very low (maximum count 10<sup>3</sup>)
    - mould detected at air storage, not in increased CO<sub>2</sub> level storage
    - bacteria and mould can be dangerous -> analysis is needed
- Sensorial evaluation:
  - Strived mouth feeling value: 3.75 -> RH above 75% needed

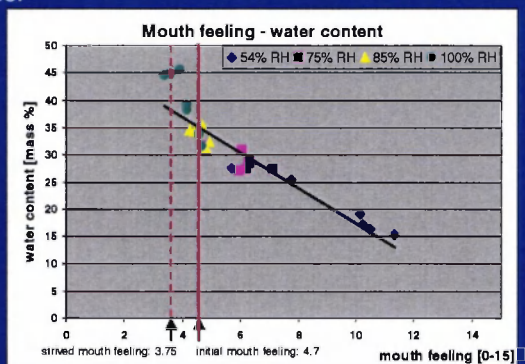
## Post-storage behaviour

- Development is related to relative humidity.
- Level is related to water content (and water activity).



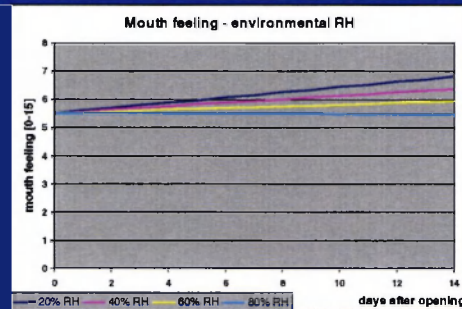
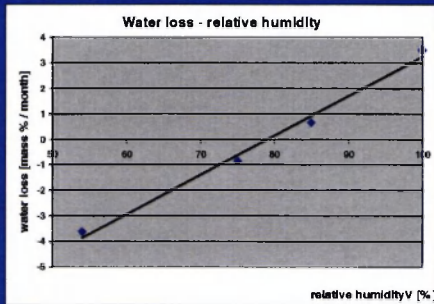
## Post-storage behaviour

- Development is related to relative humidity.
- Level is related to water content (and water activity).
- Necessary to prevent water loss.



## Package properties

- Before and after opening: no or limited weight loss, no microbiological problems.
- Is 2 weeks pleasurable consumption possible after opening? Should an expiration period after opening be added? How should a partial seal configuration be?



## Summary

	air (different RH)				CO <sub>2</sub> (different RH)			
	54%	75%	85%	100%	54%	75%	85%	100%
water activity	-	-	-	-	-	-	-	-
bacteria	-	-	-	-	-	-	-	-
mould	-	-	?	-	+	+	+	+
mouth feeling	-	-	+	+	-	-	+	+
costs		ref	€			€	€€	

- Product improvement requires investments in packaging and machinery to pack at increased levels of relative humidity and to gas-packaging.
- The improvements lead to better mouth feeling values. Thus, it will add consumer appreciation.