

# INFLUENCE OF ORIGIN AND THERMAL PROCESSING ON THE AROMA QUALITY OF COCOA FRUIT PULP FOR ITS USE AS A FOOD INGREDIENT

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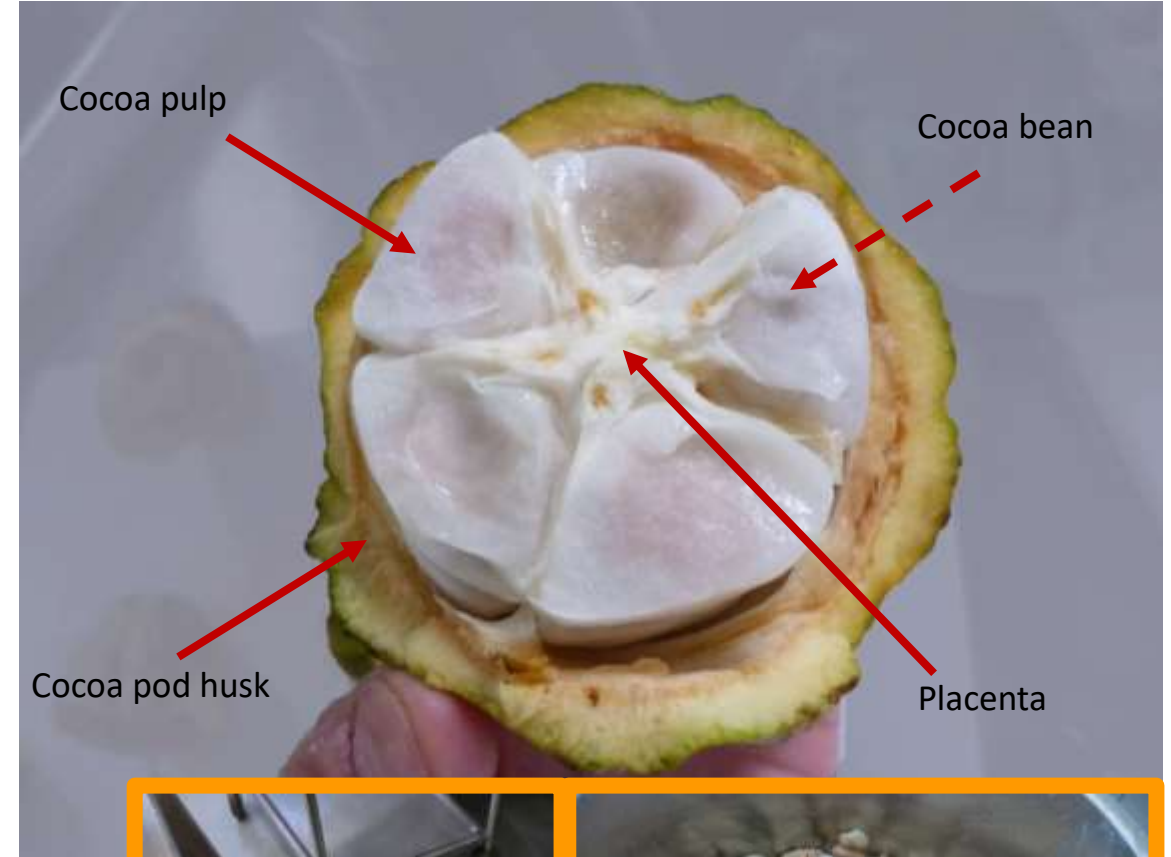
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# Cocoa, more than just beans







- Production of around 5.2 million tons of beans in 2021
- Cocoa beans make up only 20-30% of the fruit.
- About 70-80% of the biomass is lost in the process.
- European consumers want sustainable and new products.
- Partial de-pulping prior fermentation can accelerate this step and improve the later quality of cocoa beans.
- In 2019 cocoa pulp was approved by EFSA as an ingredient from a third country.
- Cocoa pulp has not been completely characterised



# How does the origin affect the composition of cocoa pulp?



# Chemical composition of cocoa pulps from different origins

Sample		Dry Matter [%]	pH-value [-]	Brix [%]	Water activity [-]	Ash [% in the DM]	Protein [% in the DM]	Fat [% in the DM]
Vietnam		19.72 ± 0.0	3.50 ± 0.0	17.47 ± 0.2	0.9823 ± 0.001	1.68 ± 0.0	4.67 ± 0.0	0.8 ± 0.0
Cameroon		19.23 ± 0.3	3.85 ± 0.0	16.1 ± 0.1	0.9923 ± 0.003	2.15 ± 0.0	4.44 ± 0.03	0.27 ± 0.0
Indonesia (SUL1)		11.21 ± 0.2	4.06 ± 0.0	9.73 ± 0.1	0.9840 ± 0.005	2.29 ± 0.1	4.73 ± 0.02	0.31 ± 0.1
Indonesia (SUL2)		16.85 ± 0.1	3.39 ± 0.0	15.30 ± 0.3	0.9860 ± 0.002	1.81 ± 0.1	3.28 ± 0.04	0.35 ± 0.0
Indonesia (MCC2)		28.59 ± 0.0	4.04 ± 0.0	25.97 ± 0.2	0.9641 ± 0.003	1.79 ± 0.1	4.50 ± 0.05	0.21 ± 0.0
Nicaragua (TSH565)		14.36 ± 0.7	3.68 ± 0.0	16.53 ± 0.1	0.9820 ± 0.002	n.d	8.29 ± 0.05	n.d.

# Aroma Properties of Cocoa Fruit Pulp from Different Origins

- 65 aroma-active regions within FD 2 and FD 1024
- 36 odorants identified in all cocoa pulps
- Aldehydes were the most predominant group, followed by carboxylic acids, lactones, phenols and ketones.
- Some odorants with high FD factors: *trans*-4,5-epoxy-(*E*)-decenal, 2- and 3-methylbutanoic acid, 3-(methylthio)propanal, 2-isobutyl-3-methoxypyrazine, (*E,E*)-2,4-nonadienal, (*E,E*)-2,4-decadienal and linalool

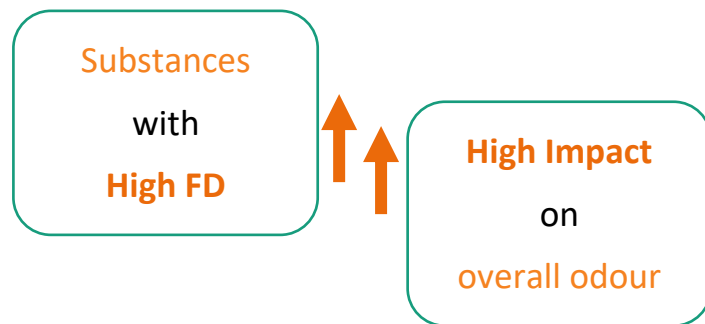


Table 1: Aroma description of cocoa pulp distillates from different origins

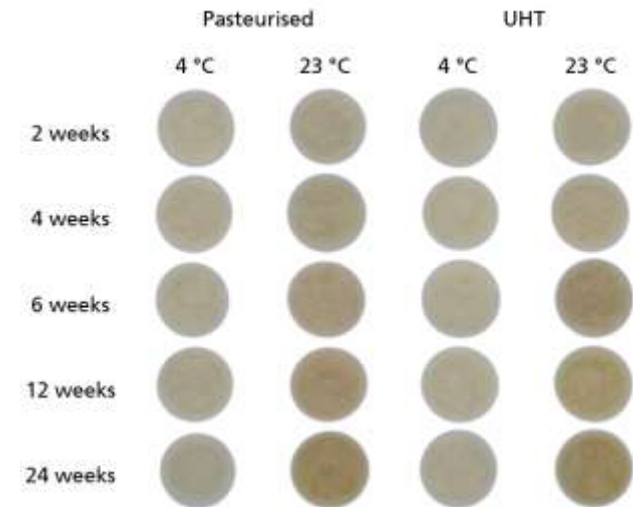
Origin	Aroma description
Indonesia	Fatty, cheesy, green and phenolic
Vietnam	fatty, green and smoky
Cameroon	butter-like, popcorn-like, flowery and fruity
Nicaragua	fruity, flowery, but also exhibited honey, clove and vanilla-like notes

# Effects of thermal processing technologies on the sensory profiles, aroma composition, colour and microbiological stability

- Transport of fresh fruits is costly
- High water content (>80% of the total weight)
- High sugar content (13% in the fresh weight)
- Need for processing protocols to preserve cocoa pulp
  - Pasteurisation (80°C, 20 min)
  - UHT (135°C, 30 s)
- Sensory profiles by descriptive methods and GC-MS/O
- Microbiological analyses
- Colour determination
- Storage tests for 24 weeks at 4 °C and 23 °C

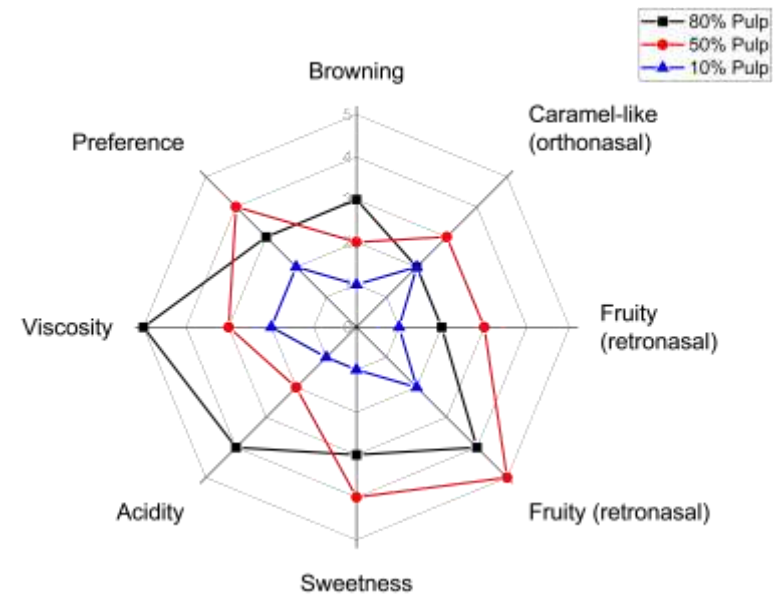


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# Cocoa pulp production in Indonesia

- Preservation trials with farmers' cooperative in Bali
- Pulp from partially de-pulped cocoa beans.
- Dilution 1:1 scored highest in preference, but was highly viscous. Dilution 1:9 showed an ideal viscosity but lacked in sweetness.
- Pasteurisation took place at 80 °C for 10 min.
- Room for hygienic production is in planning.
- Commercialization of pulp beverages in Jakarta and Bali.



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# Conclusions

- Cocoa pulp from different origins exhibit different aroma properties, enabling a broad range of food products.
- Pasteurisation and UHT are suitable and reliable technologies for cocoa pulp preservation. However, performing a pasteurisation at farm level requires less apparatus effort.
- A cold storage is recommended to maintain the cocoa pulp's colour and prolong the aroma profile.
- Diluting the pulp facilitates the preservation and filling steps.
- By processing and selling cocoa pulp, farmers may profit from new sources of income.



“Our motivation is that innovation [...] will be able to bring cocoa farmers to a better direction. [...] we want to get additional income from the cocoa pulp process.”

-Cocoa farmer, Bali, 14.10.2022





Thank you for your attention!

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# Contact

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