Novel Time- and Location-Independent Postharvest Treatment of Cocoa Beans: “Moist Incubation” of Unfermented and Dried Cocoa Nibs

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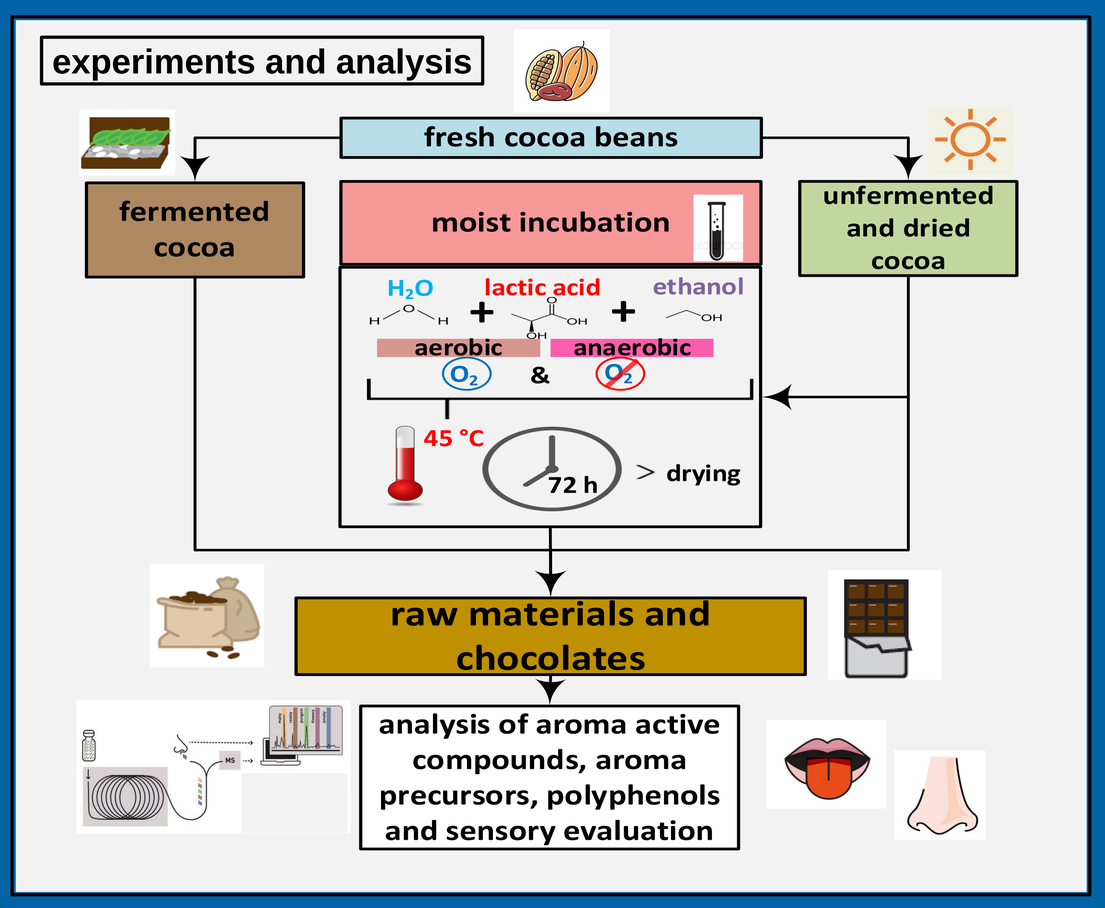
Background

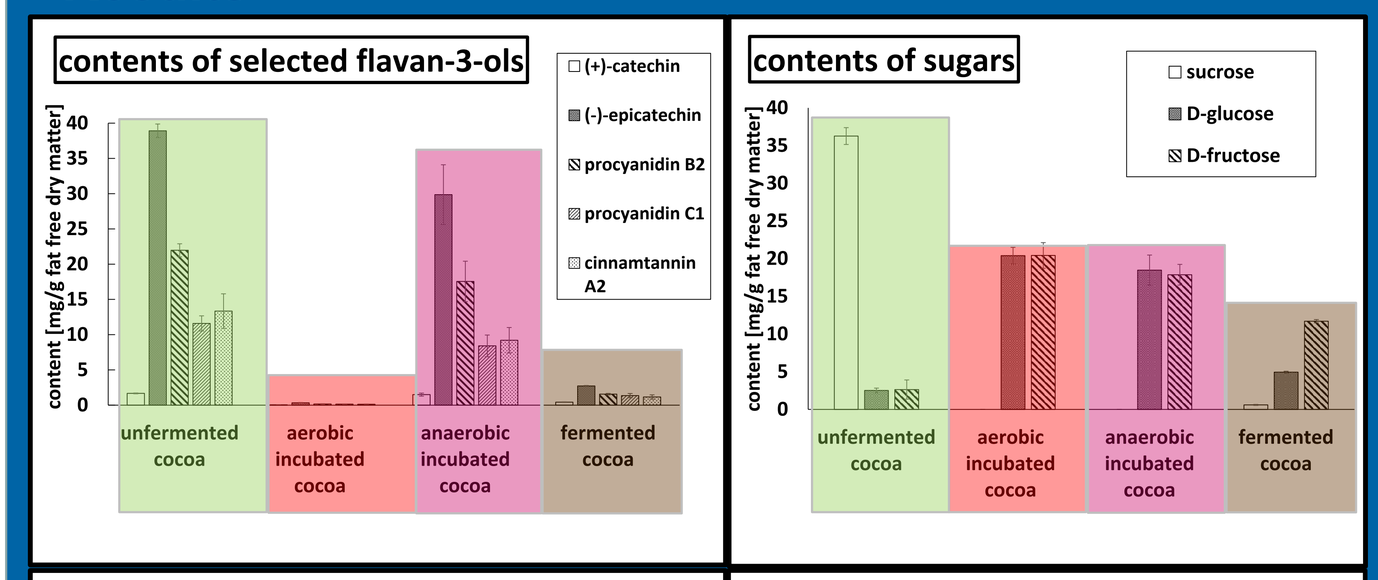
Unfermented and dried cocoa beans are storable and can be transported to any location. Direct drying of cocoa beans inactivates the seeds embryo and destructs cell walls similar to traditional fermentation. Enzymes stay active but separated from the substrates [1]. The cotyledons can be rehydrated with acidic solution and incubated to facilitate contact of enzymes and substrates to trigger biotransformation which also occurs during fermentation.

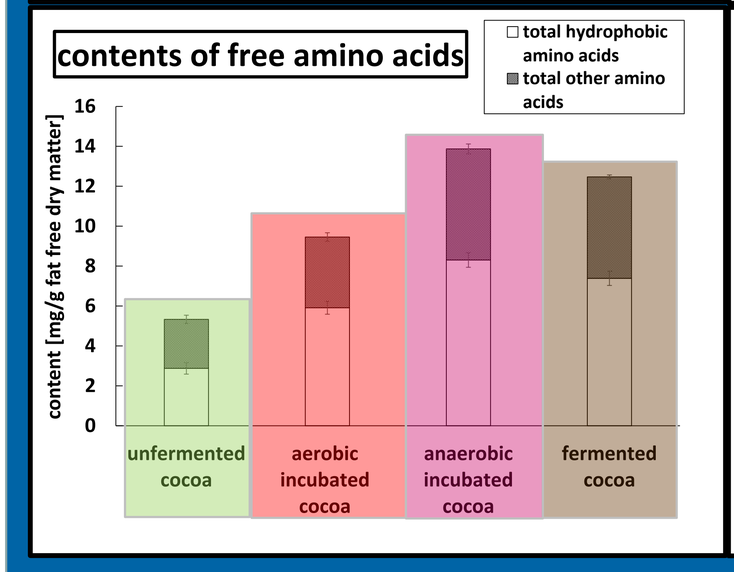
Materials and Methods

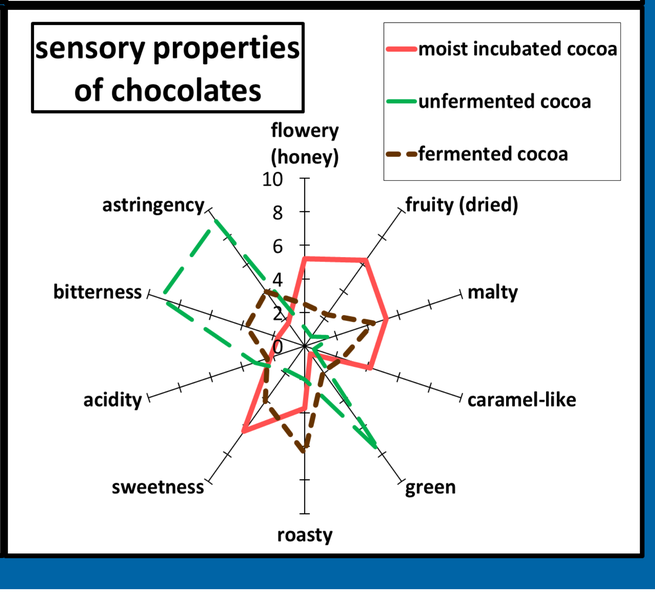
Key aroma compounds and sensory attributes were analysed before and after moist incubation treatments and fermentation and further processing to chocolate [2,3]. Additionally, aroma precursors formation and the transformation of polyphenols were analysed [4].



Results







odor activity values (OAV)[a] of chocolates

odorant name	odor treshold [µg/kg]	moist incubated cocoa	unfermented cocoa	fermented cocoa
dimethyl trisulfide	0.03	210	<1	148
3-methylbutanoic acid	11	121	17	314
phenylacetic acid	26	113	28	162
acetic acid	350	67	114	159
3-methylbutanal	15	61	14	39
4-hydroxy-2,5-dimethyl-3(2H)-furanone	27	19	3	20
2-methylbutanal	34	8	<1	5
2-phenylethanol	490	4	4	3
2-ethyl-3,5-dimethylpyrazine	1.7	5	4	65
ethyl 3-methylbutanoate	0.98	4	1	2
2-methylbutanoic acid	110	4	<1	16
2-ethyl-3,6-dimethylpyrazine	76	<1	<1	2

[a] OAV=ratio of odorant concentration and odor threshold of odorant

The same key aroma compounds were identified after all treatments. Fruity esters and Strecker aldehydes were quantified in equal or higher concentrations after aerobic moist incubation, while acetic acid and 2-, and 3-methylbutanoic acid and pyrazines were found in higher concentration in the fermented cocoa. Aroma precursors formation and transformation of phenolic compounds were comparable during moist incubations and traditional fermentation. After anaerobic incubation aroma precursors were formed to a higher extent, while the oxidation and polymerization degree of phenolic compounds stayed low. This suggests that the degree of bitterness and astringency can be controlled during moist incubation. The degree of oxidation and polymerization of phenolic compounds can be controlled by forced aeration. Sensory evaluation underlined the results of the chemical analysis.

Conclusion

Moist incubation of unfermented and dried cocoa nibs may serve as a controllable time- and location independent postharvest treatment. Drying of the beans is less labor intensive in comparison to fermentation and quality fluctuations can be avoided. Furthermore, the cocoa pulp can be valorized to a greater extent, because it is not needed for moist incubation.

References

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