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Optimisation of Oven-Drying of Baobab Leaves Using a Central Composite Design

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Introduction

Sun-drying baobab leaves

Baobab leaves are nutritious and nutraceutical foods, traditionally consumed as a sticky sauce by rural populations in north and centre of Benin. Drying represents their main way of conservation, but the traditional ways used deteriorate the leaves quality.

Thus, this study aimed to optimize the drying conditions of baobab leaves.

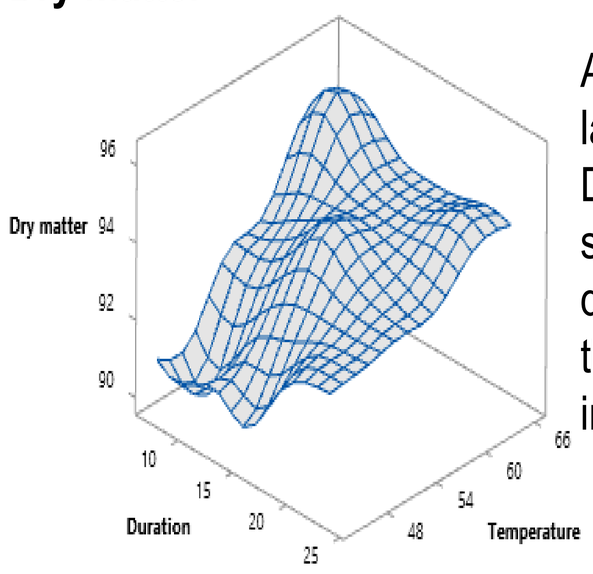
Sauce of baobab leaves

Material and Methods

Washing and draining → Drying (Central Composite Design with 3 central, 4 axial and 4 cubic points once repeated) → Temperature (44 – 66.5 °C), Duration (9 – 23.5 h) → Dried leaves → Analyses: Least gelation concentration (LGC), Dry matter, Colour (Lightness, Hue and Chroma) → Data → Analysis with Minitab 19

Results and Discussion

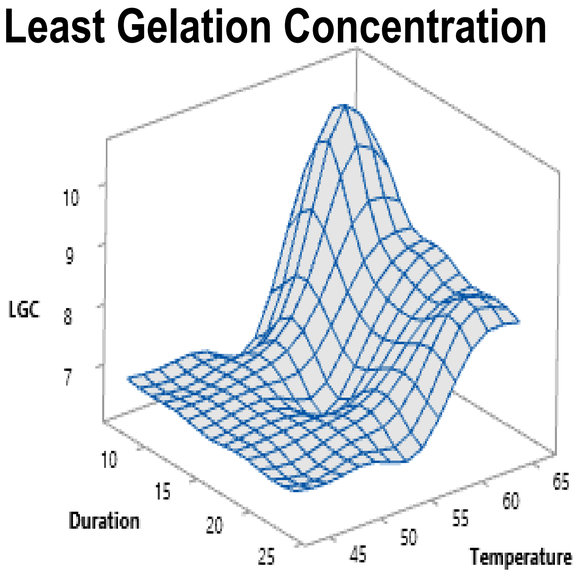
Dry matter



Adjusted and predicted r^2 > 80 %
lack-of-fit p-value>0.05
Dry matter variability is affected significantly by temperature and duration; their increase induce in the same sense dry matter increase

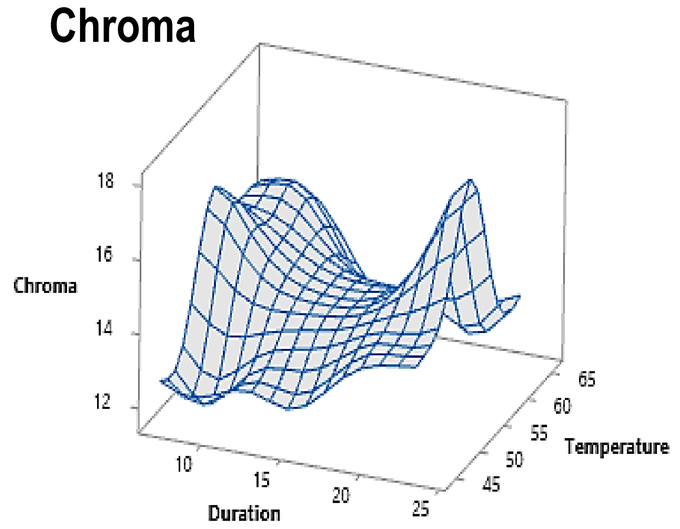
Adjusted and predicted r^2 > 50 %
lack-of-fit p-value<0.05
LGC variability is lead by the one of the temperature. Lower is LGC, better is the gelation property of dried baobab leaves.

Least Gelation Concentration



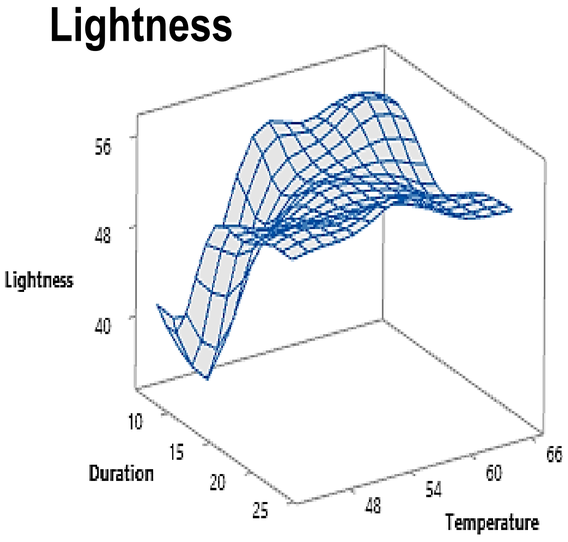
Results and Discussion

Chroma



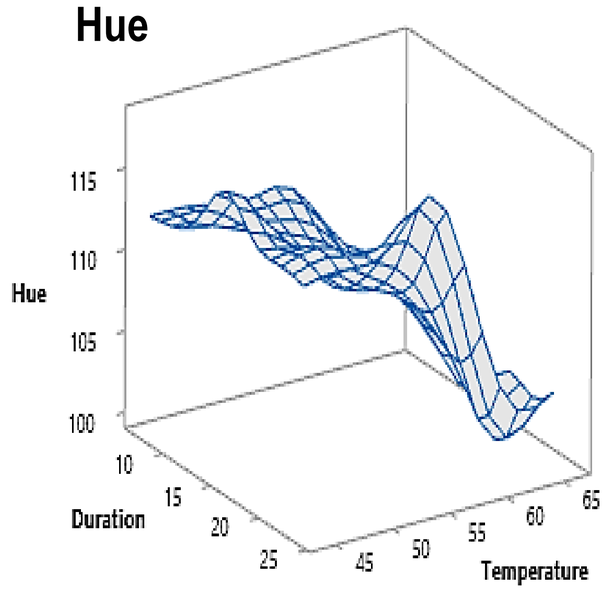
Lack-of-fit p-value >0.05 and r^2 adj. and pred. > 50 %

Lightness



Lack-of-fit p-value <0.05 and r^2 adj.> 50 %

Hue



Lack-of-fit p-value >0.05 and r^2 adj. and pred. > 50 %

High temperatures tend to decrease the chroma and the hue. But the duration tend to affect positively these colour parameters; long drying duration tend to preserve green saturation and hue of baobab leaves.

Correlations between variables

Variables	DM	L*	H*	C*
Lightness (L*)	**0.60**			
Hue (H*)	**-0.59**	0.00		
Chroma (C*)	0.26	**0.63**	0.34	
LGC	0.50	0.11	**-0.63**	-0.09

Even dough lightness and least gelation concentration models did not fit the data, they are correlated to other variables.

Optimal baobab leaves drying in desirability conditions of obtaining a target value of 8% of moisture, and of maximizing the hue and chroma are: 44.83 °C for 23.49 hours.

Conclusion

Temperature represents the most important factor in baobab leaves drying. Different schemes can be determined in function of the final use of the leaves, based on the generated models. Drying at 45 °C for 23.5 h looked like the optimal way to obtain a baobab leaves respecting codex standard, preserving more its colour, and thus minimizing the loss of gelling capacity.

Acknowledgements

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