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Correlation between visual appearance and physicochemical attributes of a chinicuil-based condiment using computer vision for quality monitoring

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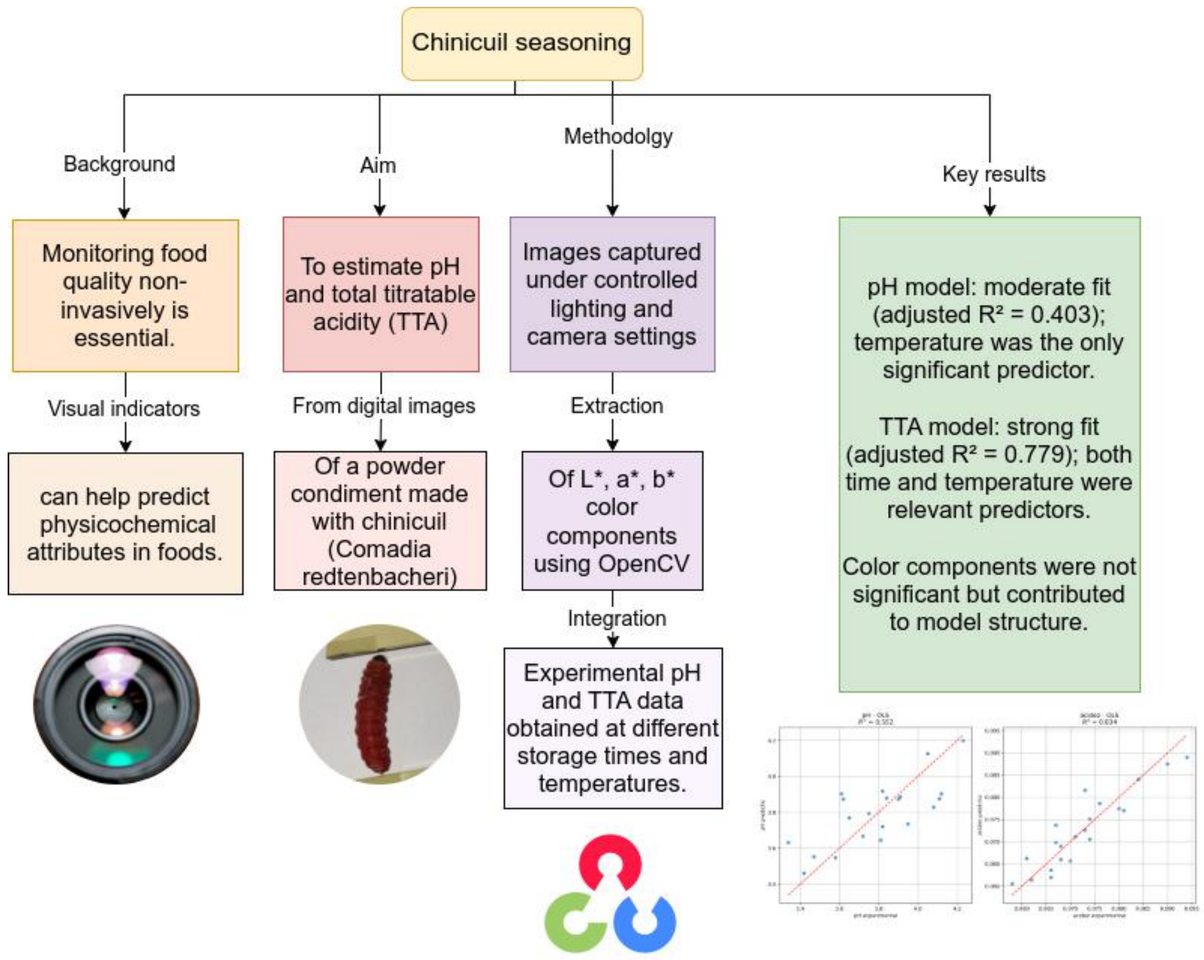
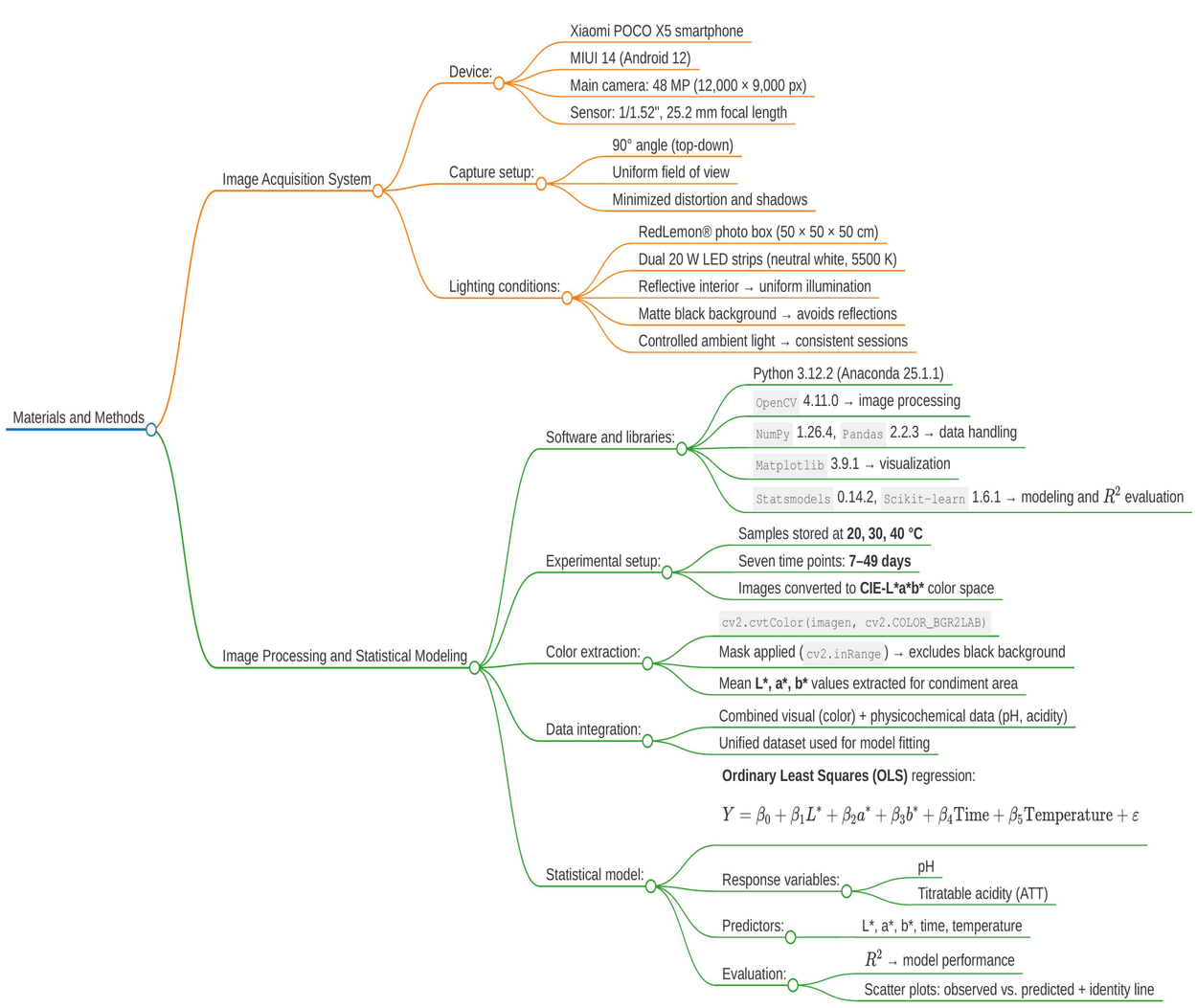
INTRODUCTION & AIM



METHOD



RESULTS & DISCUSSION

Tables 1 and 2 present the results of the multiple linear regression (OLS) models for pH and total titratable acidity (TTA), respectively.

In the **pH** model, only temperature showed a **significant effect (p = 0.006)**, with a negative relationship and a **moderate fit (R^2 adjusted = 0.403**).

In contrast, the **acidity** model displayed a **much higher predictive capacity (R^2 adjusted = 0.779)**, with positive and highly significant effects of time and temperature ($p < 0.001$), confirming that TTA increases with storage duration and thermal exposure.

Table 1. Results of the multiple linear regression model for the variable pH.

Parameter	Coefficient	Standard Error	t	p	95% CI Lower	95% CI Upper
Intercept	29.616	15.498	1.911	0.075	-3.417	62.649
L^*	-0.0172	0.0092	-1.869	0.081	-0.0369	0.0024
a^*	-0.2120	0.137	-1.552	0.141	-0.503	0.079
b^*	0.0298	0.0418	0.712	0.488	-0.059	0.119
Time	-0.0059	0.0046	-1.293	0.216	-0.0159	0.0040
Temperature	-0.0211	0.0065	-3.227	0.006**	-0.0349	-0.0074

Table 2. Results of the multiple linear regression model for the variable total titratable acidity.

Parameter	Coefficient	Standard Error	t	p	95% CI Lower	95% CI Upper
Intercept	-0.2670	0.356	-0.749	0.465	-1.026	0.493
L^*	0.0003	0.0002	1.455	0.166	-0.0001	0.0010
a^*	0.0029	0.0032	0.924	0.370	-0.0039	0.0097
b^*	-0.0008	0.0010	-0.781	0.447	-0.0031	0.0014
Time	0.0005	0.0001	4.963	< 0.001**	0.0003	0.0008
Temperature	0.0008	0.0001	5.474	< 0.001**	0.0005	0.0011

Figure 1 illustrates the correspondence between experimental and predicted values, showing a tighter fit for acidity compared to pH. Overall, these results indicate that titratable acidity is a more sensitive indicator of product behavior under different storage conditions, and that color parameters contribute to improving the prediction of the physicochemical properties of the chinicuil condiment.

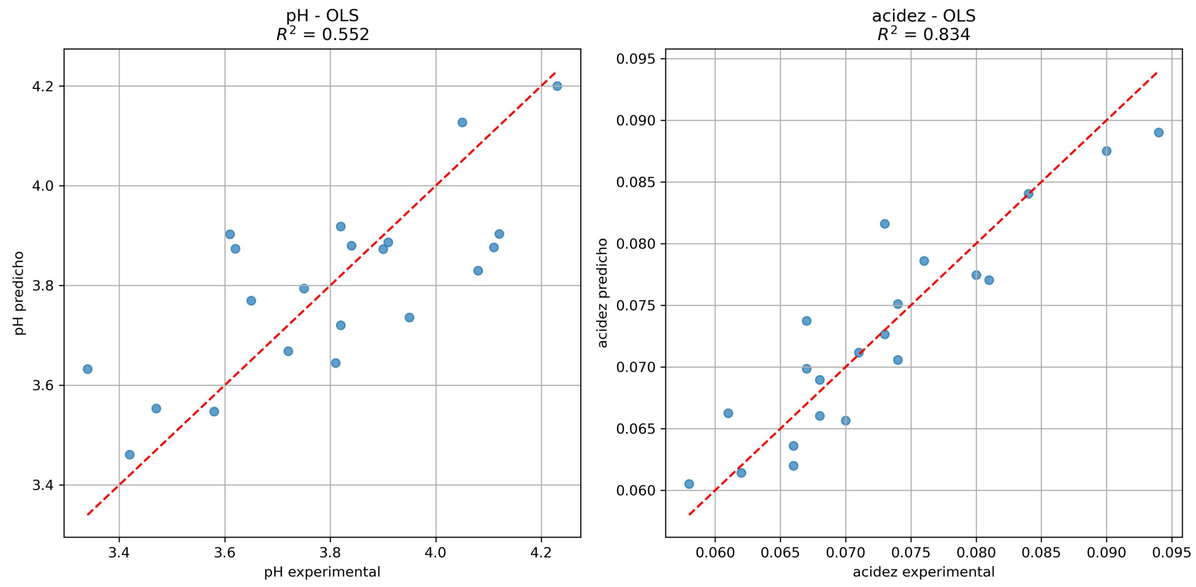


FIgure 1. Comparison between the experimental values and the values predicted by multiple linear regression (OLS) for the variables pH and titratable acidity of the chinicuil condiment. The dashed line represents perfect equality between observed and predicted values (y = x)

CONCLUSION

Color parameters (L*, a*, b*) extracted from standardized images were integrated with time and temperature into OLS models. The pH model showed moderate predictive capacity, while the TTA model achieved higher accuracy, with significant effects of time and temperature. These findings confirm that acidity is more sensitive to storage and visual changes, supporting the use of image-based color descriptors for non-invasive quality monitoring and as a foundation for automated assessment systems in powdered food products.

DIGITAL POSTER

FUTURE WORK / REFERENCES