EFFECT OF FRESH DATE BAGASSES ON THE PHYSICOCHEMICAL AND SENSORY PROPERTIES OF BEEF BURGER

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I. INTRODUCTION

The trend towards healthy and sustainable food encourages the design of meat products that benefit both human health and the environment. In meat products, to achieve these objectives, using agrifood-coproducts could be a successful strategy. Meat products are enriched with several nutrients and health benefits. This approach aligns with the efficient use of co-products within the circular economy.

Dates are noted for their high nutritional profile, rich in dietary fiber, minerals (K, Ca, Mn, etc.) unsaturated fatty acids (oleic and linoleic acids), micronutrients (riboflavin, niacin, tocopherols), and bioactive phytochemicals (phenolic acids, polyphenols and carotenoids). These bioactive components significantly improve their functional properties, antioxidant activity, and healthy benefits [1]. Non-commercial dates have the potential to emerge as natural, functional, and sustainable food ingredient, possessing significant nutritional and bioactive attributes. In meat products, the concentration of added functional ingredients, normally changes their physicochemical and sensory properties. Thus, it is necessary to find an appropriate concentration to avoid undesirable changes in the characteristics that the product is well appreciated.

The aim of the study was to evaluate the addition of fresh date bagasse at different concentrations (4%, 5% and 6%) as a natural ingredient to improve the physicochemical and sensory properties of beef burgers.

II. MATERIALS AND METHODS

Preparation of natural ingredient from non-commercial date bagasse. Date bunches were harvested, and the non-commercial dates were selected, peeled and pitted. The sugar content of the bagasse was reduced by water extraction until the bagasse reached ≤8° Brix. pH and color coordinates were determined.

Burger's manufacturing process. Four independent batches of beef burgers were prepared with different concentration of date bagasse: 0%, 4%, 5% and 6%. All burgers had the following formulation: beef meat (100%), salt (1.5%), parsley (0.5%) and garlic powder (0.05%). After meat grinding, meat and the other ingredients were mixed for 3 min, and then, separated into 4 batches until the incorporation of the different percentages of date bagasse. Finally, they were shaped into pieces (90g).

The physicochemical properties of each batch were analyzed: pH (GLP 21 pH meter), CIEL*a*b* color coordinates (CM-700d spectrophotometer) and texture profile (TA-XT2i Texture Analyzer). For texture analysis, cooked burger pieces (2 cm \times 2 cm \times 2 cm) were submitted to two-cycle compression to 75% and a constant velocity of 1 mm/s. The parameters determined were hardness (kg), springiness, cohesiveness, and chewiness (kg×cm). Sensory analysis was carried out with an untrained panel (*n*=20). A seven-point hedonic scale was used, and the panelists were asked to

score the cooked beef burgers from 1 (dislike extremely) to 7 (like extremely) on six attributes: visual aspect, global color, global flavor, hardness, taste and general acceptability. Statistical analyses were carried out using the statistical package SPSS v. 24 for Windows (SPSS INC., Chicago, IL, USA).

III. RESULTS AND DISCUSSION

The natural ingredient from non-commercial date bagasse presented a pH of 7.48±0.23, L* of 35.6 ± 1.23 , a* of 4.63 ± 0.36 and b* of 9.19 ± 1.34 . The raw and cooked beef burgers characterization is shown in Table 1. The addition of date bagasse affected L* (raw burger), b* (cooked burger), hardness and springiness (*p*<0.05), and did not affect the rest of parameters under study. The non-meat ingredients can affect meat products color [1,2]. The date addition at 4 and 5 % decreased the L*value while at a concentration of 6% the L* value was similar to raw burgers control values. After cooking, only b* was affected, decreasing with the date bagasse's addition. Hardness decreased when the lowest date concentration was added (4%) (*p*<0.05), but no differences were observed at higher concentrations (*p*>0.05). For springiness, there was only a difference between 4 and 6% addition.

		Batches			
		A (control)	B (4% added date)	C (5% added date)	D (6% added date)
Raw burgers	pН	6.08±0.09	6.09±0.08	6.08±0.02	6.08±0.01
	L*	45.58±2.17 ^a	49.06±0.77 ^b	48.93±0.78 ^b	44.01±2.09 ^a
	a*	5.93±1.76	8.71±0.48	7.10±1.24	6.30±1.70
	b*	7.75±1.53	9.33±0.61	8.72±0.65	6.66±1.62
Cooked burgers	L*	42.52±5.24	41.41±1.30	40.76±1.88	42.71±0.77
	a*	3.85±0.75	3.83±0.81	3.18±0.50	4.81±0.29
	b*	7.27±0.53 ^b	4.83±1.34 ^a	4.51 ± 0.50^{a}	5.50±0.56 ^a
	Hardness	4.12±0.87 ^b	2.45±0.54 ^a	4.85±0.73 ^b	3.60±0.94 ^{ab}
	Springiness	0.42 ± 0.04^{ab}	0.35±0.07 ^a	0.44±0.03 ^{ab}	0.45±0.10 ^b
	Cohesiveness	0.35±0.09	0.50±0.14	0.34±0.04	0.41±0.06
	Chewiness	6.21±2.59	4.21±1.32	7.07±1.16	6.82±2.72

Table 1.- Physicochemical properties of raw and cooked beef burgers with different fresh date bagasse concentrations (4, 5 and 6%)

Date presented as mean ± standard deviation. In each row, values followed by different letter are significantly different according to the Tukey test (p≤0.05): Samples without letter did not show significant differences (p>0.05).

For all six sensorial attributes, burgers with added dates were better evaluated, and was proportional to the percentage of dates added.

IV. CONCLUSION

The use of fresh date bagasse as food ingredient in meat products is a viable technological strategic for reformulation of healthier and sustainable meat products. The addition of up to 6% did not affect the quality characteristics and improved the sensory evaluation and acceptance of this meat product.

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REFERENCES

- 1. Muñoz-Tebar, N., Viuda-Martos, M., Lorenzo, J. M., Fernandez-Lopez, J., & Perez-Alvarez, J. A. (2023). Strategies for the valorization of date fruit and its co-products: A new ingredient in the development of value-added foods. Foods, 12(7), 1456.
- 2. Munekata, P. E. S., Rocchetti, G., Pateiro, M., Lucini, L., Domínguez, R., & Lorenzo, J. M. (2020). Addition of plant extracts to meat and meat products to extend shelf-life and health-promoting attributes: An overview. *Current Opinion in Food Science*, *31*, 81-87.