VALORIZATION OF MANILA TAMARIND PEEL (*PITHECELLOBIUM DULCE*) AS A MEAT PRODUCT ADDITIVE

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I. INTRODUCTION

The meat industry repeatedly explores natural alternatives to improve the quality and stability of meat products. Food additives play a determining role here since they provide physicochemical, technofunctional, and preservative characteristics. These substances are specially added to foods to improve their characteristics throughout production, processing, and storage [1,2]. The manila tamarind (*Pithecellobium dulce*) is a tree in the Fabaceae family native to Mexico and Central America. This tree produces curved, twisted pods with black seeds surrounded by edible white, pink, or reddish pulp. The pulp has a sweet and slightly sour taste and is often eaten fresh as a seasonal fruit. In addition to its culinary uses, the pods and other parts of the manila tamarind tree are also used in traditional medicine [3]. The aim of this study was to investigate the potential of powders extracted from manila tamarind peel as a natural additive for meat products to improve their quality and safety.

II. MATERIALS AND METHODS

The manila tamarind peel was collected from plants located in the municipality of Concordia Sinaloa, Mexico. The plant material was sanitized, dried at room temperature (35°C), and pulverized in an electric grain mill (20 mesh particle size). The powder was subjected to physicochemical (pH and Hex color) and technofunctional characteristics (WHC water retention capacity, OHC oil retention capacity, SWC swelling capacity, and GFC gel formation capacity); texturized soy was used as a commercial standard. Additionally, in vitro, TTC-tannins, TPHC-total phenolic, and CGA-chlorogenic acid contents, as well as FRSA-free radical scavenging activity and FRAP-ferric reducing antioxidant power, were evaluated in an aqueous extract obtained from manila tamarind (MTAE). MTAE was incorporated in a pork meat system (incubated at 65 °C/1 h) and evaluated for lipid oxidation through the TBARS-thiobarbituric acid reactive substances assay. Butylhydroxytoluene (BHT) was used as a positive control [4]. Obtained data (n=6) were subjected to t-tests at $P<0.05$ (NCSSv11).

III. RESULTS AND DISCUSSION

Table 1 shows that manila tamarind powder showed lower pH values than texturized soy ($P<0.05$). Hex color codes indicate that manila tamarind and texturized soy powder color names were Pale Taupe and Tan, respectively. Concerning technofunctional properties, manila tamarind powder showed the highest WHC and OHC values, while texturized soy showed the highest ($P<0.05$) SWC and GFC.

Table 1 – Physicochemical and technofunctional characterization of manila tamarind powder.

Item	pH	HEX Color	WHC	OHC	SWC	GFC
Manila tamarind	5.80±0.01	#c3a390	78.60±0.55	59.90±0.50	56.00±1.01	N.D.
Texturized soy	6.48±0.01	#d7c4a1	70.15±1.10	48.01±0.90	84.80±0.65	57.19±0.30

P-value	<0.05	<0.05	<0.05	<0.05	<0.05

Table 2 shows the presence of polyphenol compounds (TTC, TPHC, and CGA) in the aqueous extract of manila tamarind powder. Concerning antioxidant assays, non-differences were found in TTC and TPHC of Pleurotus powders, while TFC was not detected (N.D.) ($P>0.05$). Also, the highest FRSA and FRAP values were displayed by BHT ($P<0.05$). Furthermore, pork meat with manila tamarind aqueous extract exhibited the lowest ($P < 0.05$) lipid oxidation levels.

Table 2 – Polyphenol content, antioxidant activity, and lipid oxidation inhibition of MTAE.

Item	TTC	TPHC	CGA	FRSA	FRAP	TBARS
Manila tamarind	67.00±3.54	27.70±0.90	100.20±3.22	43.03±1.10	0.50±0.05	0.27±0.01
BHT	-	-	-	79.90±0.61	1.99±0.05	0.40±0.02
P-value				<0.05	<0.05	<0.05

According to the current results, powders from natural sources with pH values close to neutrality and flours in low concentrations may not affect their physicochemical and technofunctional characteristics [5,6]. Also, phenolic compounds in manila tamarind samples have been demonstrated to be associated with their bioactivity [1]. Also, it has been reported that phenolic compounds from natural products reduce lipid oxidation in meat and meat products [6]. However, the preservative effect on food systems of manila tamarind, has not been reported.

IV. CONCLUSION

Physicochemical results indicate that manila tamarind powder showed pH values near neutrality and a Pale Taupe color. The results evidence that the evaluated powder exerts technofunctional properties, including WHC, OHC, and SWC. The presence of polyphenol compounds and their antioxidant activity were also demonstrated. Additionally, MTAE showed the highest effect against lipid oxidation in a meat system. Based on the above, manila tamarind powder can be proposed as a natural additive for meat products.

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REFERENCES

1. Grasso, S.; Estévez, M.; Lorenzo, J.M.; Pateiro, M.; Ponnampalam, E.N. (2024). The utilisation of agricultural by-products in processed meat products: Effects on physiochemical, nutritional and sensory quality-Invited Review. Meat Science, 109451.
2. Sun, B.; Wang, J. (2017). Food additives. Food Safety in China: Science, Technology, Management and Regulation, 186-200.X
3. Murugesan, S.; Lakshmanan, D.K.; Arumugam, V.; Alexander, R.A. (2019). Nutritional and therapeutic benefits of medicinal plant *Pithecellobium dulce* (Fabaceae): A review. Journal of Applied Pharmaceutical Science, 9: 130-139.
4. Castillo-Zamudio, R.I.; Vargas-Sánchez, R.D.; Sánchez-Escalante, A.; Esqueda-Valle, M.; Torres-Martínez, B.D.; Torrescano-Urrutia, G.R. (2024). Metabolite content and antioxidant activity of spent coffee grain fermented with *Pleurotus pulmonarius* mycelium. Agrociencia, 58: 288.
5. López-Marcos, M.C.; Bailina, C.; Viuda-Martos, M.; Pérez-Alvarez, J.A.; Fernández-López, J. (2015). Properties of dietary fibers from agroindustrial coproducts as source for fiber-enriched foods. *Food and Bioprocess Technology*, *8*: 2400-2408.
6. Maqsood, S.; Benjakul, S.; Abushelaibi, A.; Alam, A. (2014). Phenolic compounds and plant phenolic extracts as natural antioxidants in prevention of lipid oxidation in seafood: A detailed review. Comprehensive Reviews in Food Science and Food Safety, 13: 1125-1140.