Dietary supplementation of orange peel ingredient in lactating ewes: Effect on yoghurt sensory characteristics

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INTRODUCTION

- SSheep farming faces challenges from rising demand for animal products, shifting welfare standards, and climate change.
- Farmers depend on expensive imported feed, making them vulnerable to market speculations.
- Food by-products serve as viable secondary feeds in the Mediterranean region, offering nutritional benefits and availability.
- Orange juice production generates significant by-products, which are high in digestibility and energy. These by-products, comprising up to 60% of the total fruit weight.
- Sheep milk yoghurt is a favorite food product in Greece due for its rich and creamy texture, as well as its distinct flavour.

SCOPE

To assess the effect of dietary supplementation with dried ingredients produced from orange peels on the sensory traits of sheep milk yoghurt.

MATERIALS AND METHODS

- **Animals and diets**
  - Chios breed dairy ewes distributed into three treatments (12 animals) based on previous milk yield and lactation number
    - Group 1: Control
    - Group 2: Unprocessed Orange Peels (UOP) - 11% of DM intake
    - Group 3: Processed Orange Peels (enzymatically hydrolysed) (POP) - 11% of DM intake
  - Isonitrogenous and isoenergetic diets formulated by substituting conventional feed ingredients to meet nutrient requirements.
  - Animals fed over 84 days, from post-weaning to the 16th week of lactation.
- **Yoghurt production and analysis**
  - Traditionally produced yoghurt from bulk – tank milk (3 batches on separate days) refrigerated for 21 days
  - Proximate composition – standard methods
- **Physicochemical characteristics**
  - An eight-member student panel assessed the yoghurt samples.
  - Samples were stored for seven days prior to analysis.
  - Products evaluated on appearance, colour, aroma intensity, aroma, taste intensity, taste, acidity, texture (spoon and mouth), syneresis, aftertaste, and overall acceptability using a 7-point hedonic scale
- **Statistical analysis**
  - One-way analysis of variance (ANOVA) was conducted to assess the statistically significant differences in the sensory characteristics of the three types of yoghurt.

Table 1. Yoghurt chemical composition

Variable (%)	C	UOP	POP	Significance
Moisture	83.39^{b}	82.32^{a}	82.76^{a}	**
Ash	0.81^{a}	0.89^{b}	0.88	*
Protein	5.42	5.93^{b}	5.53^{a}	*
Fat	6.06	6.79^{b}	6.24^{a}	*
Carbohydrate	4.32	4.06	4.60	NS

*C control; UOP unprocessed orange peel; POP processed orange peel; * = P<0.05; ** = P<0.01; NS = Non-significant; Superscripts a, b differ at P<0.05.

RESULTS AND DISCUSSION

- Significant differences (P<0.01) in moisture content and (P<0.05) in ash, protein, and fat contents were observed (Table 1).
- Milk from ewes fed diets with orange peels (UOP and POP) had lower moisture content and higher ash, protein, and fat contents.
- No significant differences (P>0.05) were found between treatments in all examined sensory traits (Figure 1).
- Samples from all treatments scored above the acceptability limit (score = 4) for all examined characteristics, except for syneresis.
- Syneresis, an undesirable characteristic in yoghurts, was below the acceptability limit, indicating minimal separation of the liquid phase during storage (7 days) and at spoon cutting.
- Differences in yoghurt composition, which resembled commercially available sheep milk yoghurts in Greece, did not affect the sensory characteristics.

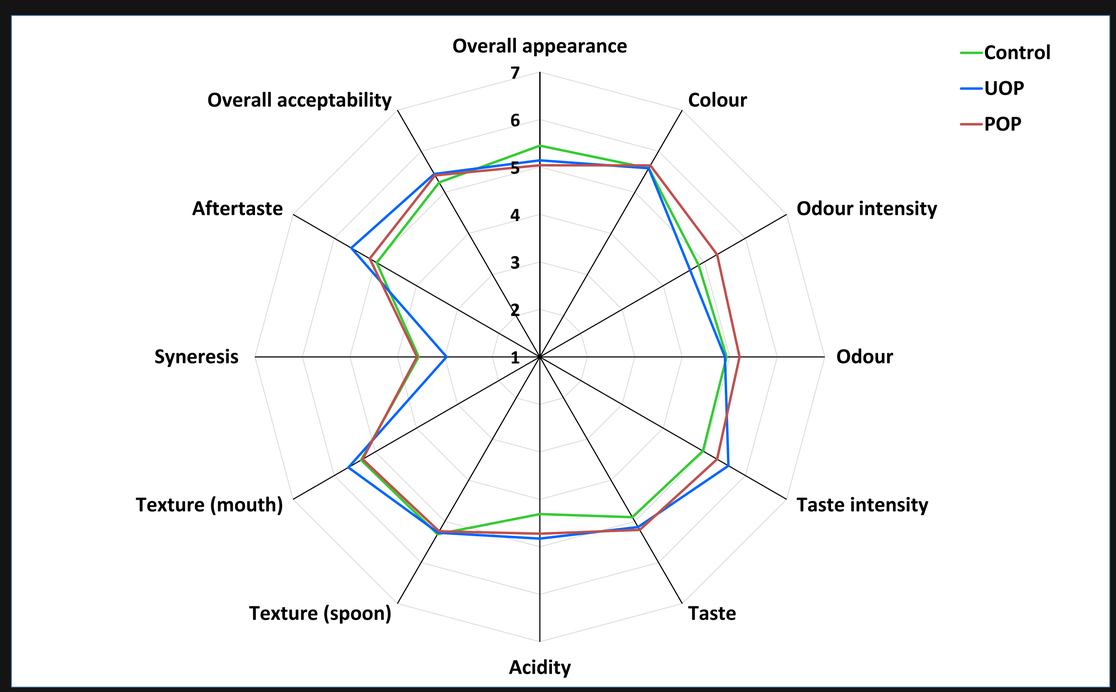
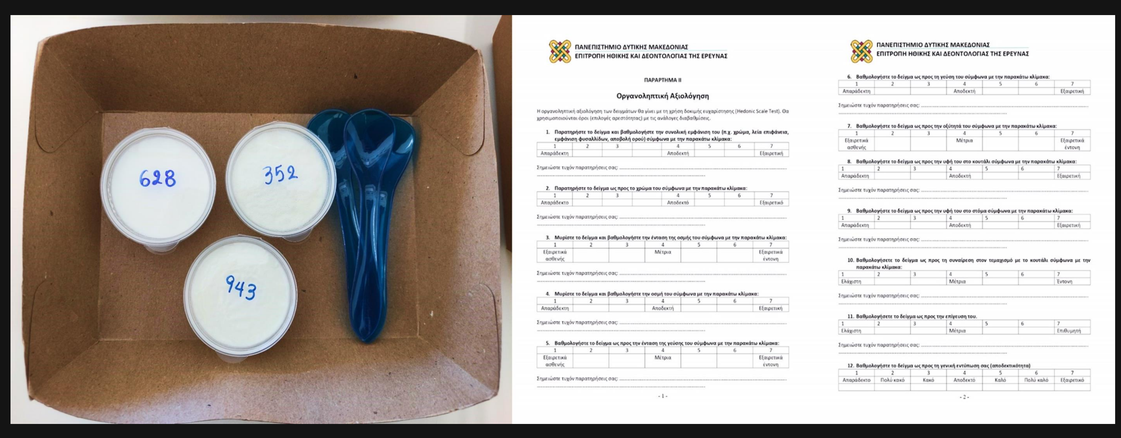


Figure 1. Taste panel scores for yoghurt sensory analysis.



CONCLUSIONS

- Incorporating orange peels in ewe diets led to differences in yoghurt composition, with lower moisture content and higher ash, protein, and fat contents.
- Sheep milk yoghurt maintained high quality and acceptability even with the inclusion of orange peel by-products in the diet.
- The findings emphasize the sustainable and cost-effective nature of integrating orange peel by-products as a secondary feed source for lactating ewes, contributing to the circular economy and offering nutritional benefits.

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