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Development of functional fruit jam using black persimmon and black currant and unveiling its nutritional value, phytochemical profile, and consumer appeal

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1. INTRODUCTION & AIM

Globally, the demand of functional food is rising due to their positive role in the management of numerous health issues. Fruits play a pivotal role in maintaining a healthy lifestyle by offering essential nutrients and aiding in illness prevention. Several fruits are reutilised in the production of value-added products like jams to extend their shelf life and for off-season consumption. In this regard, we sought to formulate a novel and nutritionally dense mixed fruit jam by combining black persimmon (*Diospyros lotus* L.) and black currants (*Ribes nigrum* L.) due to their high phytochemical profiles and potential as anti-oxidant and anti-inflammatory agents[1]. *Diospyros lotus* is cultivated in various regions, particularly in subtropical areas of southwest Asia and southeast Europe[2].The global production of *Ribes nigrum* is significant, with the planted area and annual production reaching approximately 41,860 hectares and 118,002 tons of fresh fruit, respectively[3]. Black currants are valued for their high vitamin C content and antioxidant properties, making them popular in the food and beverage industry[4]. Developing a jam from these fruits provide delicious and healthful alternative to conventional jams.

Aims and objectives

- Development of black persimmon and black currant based functional jam for its utilization as healthy spread round the year
- Assessment of nutritional and anti-oxidant potential of functional jam
- Assess the consumer hedonic responses of developed product through sensory analysis

2. STUDY DESIGN AND METHODOLOGY

Functional jam was prepared by using modified method of Narain *et. al.*, 2010[5]. All ingredients were weighed separately and process for jam production (Figure 1). Black currants were gradually replaced with different blended preparations of black persimmon in order to make different jam formulations.

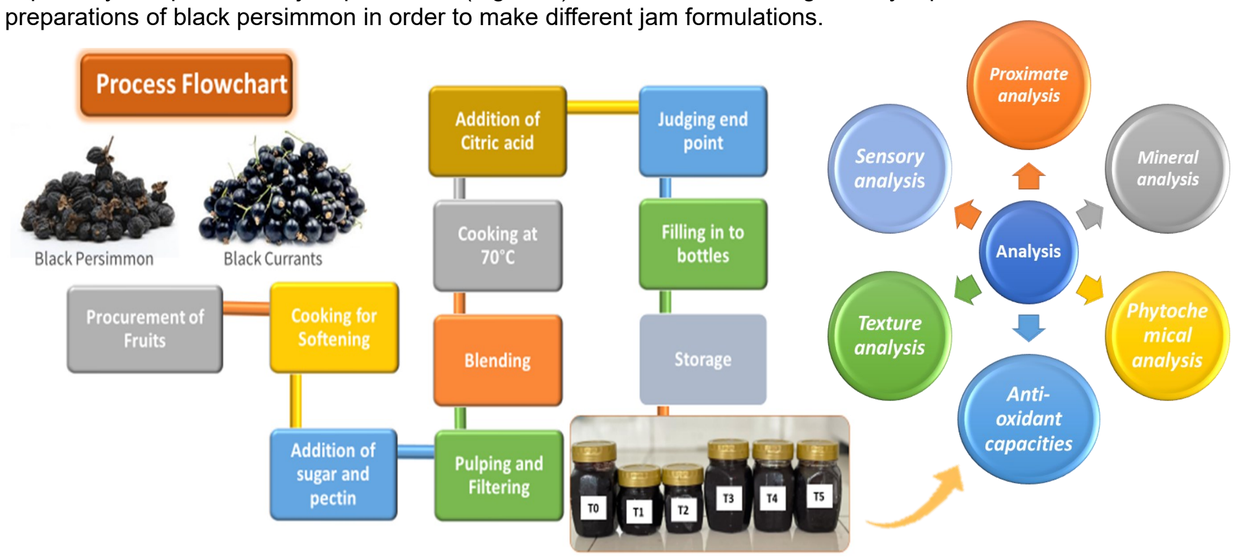

Figure 1: *Flowchart of functional jam preparation using black persimmons and black currants fruits and schematic diagram showing the study design and analyses of prepared function jam.*

3. COMPOSITIONAL ANALYSIS OF FRUITS & FUNCTIONAL JAM

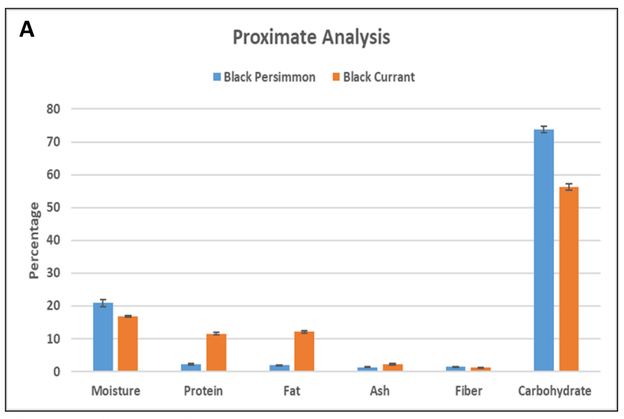

Figure 2 (A): *Black persimmons and black currants had the greatest carbohydrate content ranging from 73.73% to 56.2%, with moisture content between 20.8% and 16.77%. Protein, fat, ash, and fiber were determined to be 2.21, 11.57, 1.92, 12.07, 1.33, 2.2, and 1.49, 1.183% respectively.*

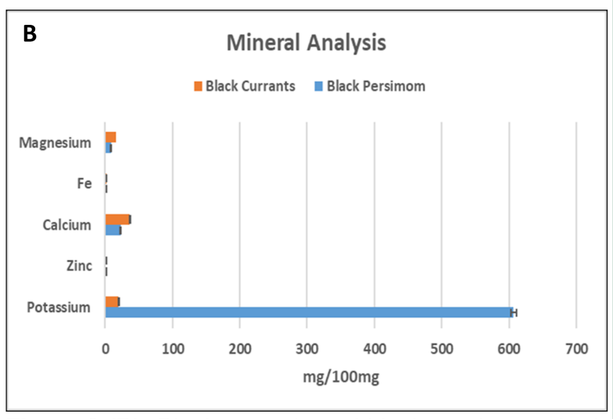

Figure 2 (B): *Black currants and black persimmon had greater calcium and potassium contents, with 19.5 and 608.66 mg/100g, respectively. Magnesium ranged 8.42 and 15.59 mg/100g. Iron and Zinc concentrations in black persimmon and black currant were 0.992 and 1.54, and 0.11 and 1.0434 mg/100g , respectively.*

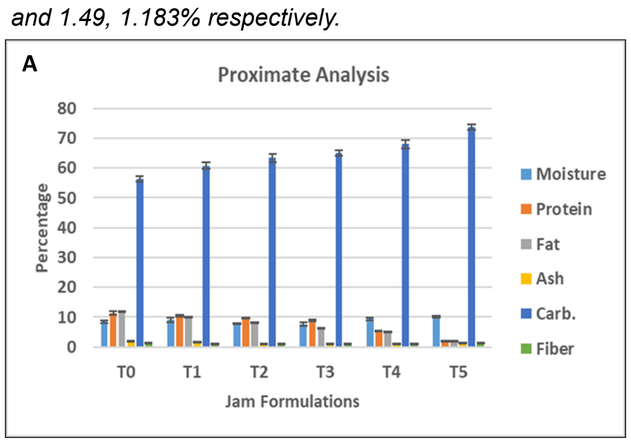

Figure 3 (A): *The proximate composition of all jam formulations indicated that carbohydrates were the predominant component, ranging from 56.2 to 73.33%, whereas protein ranged from 2.21 to 11.24%.*

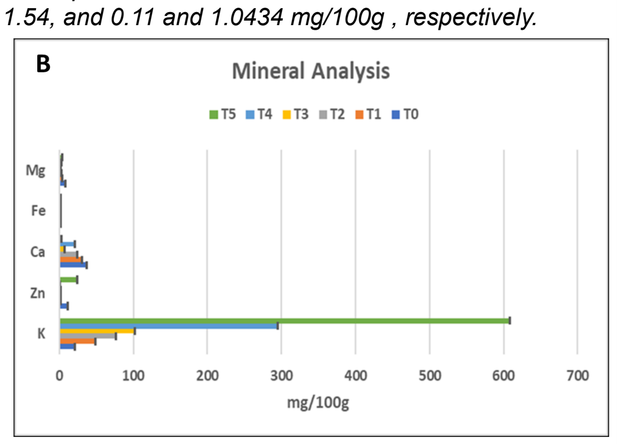

Figure 3 (B): *The mineral analysis revealed a significant concentration of potassium (20.21-608.66 mg/100g), along with calcium, magnesium, zinc, and iron, illustrating the jam's capacity to retain nutrients.*

4. PHYTOCHEMICAL ANALYSIS OF FUNCTIONAL JAM

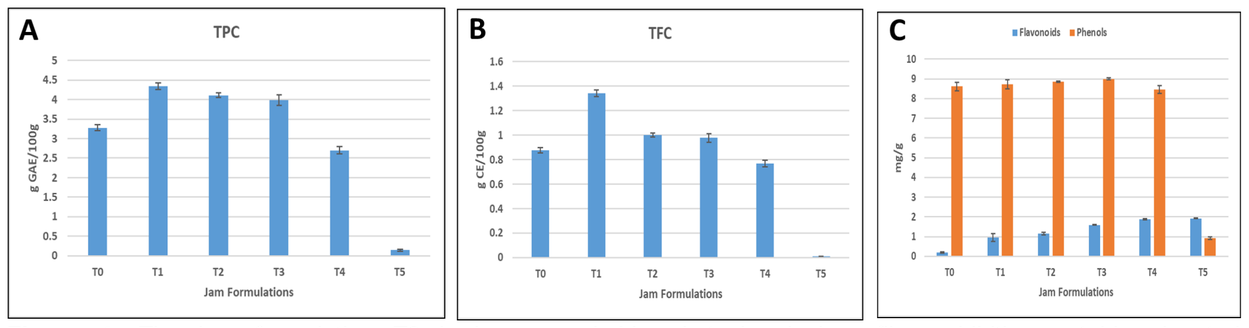

Figure 4: *The jam formulation T3 had a remarkable phytochemical profile, exhibiting notably elevated concentrations of total phenolic content of 3.99 g GAE/100g (A), total flavonoid content of 0.98 g CE/100g (B), flavonoids 1.59 mg/g (C), and phenols 8.9 mg/g (C) in comparison to the control formulations (T0 and T5).*

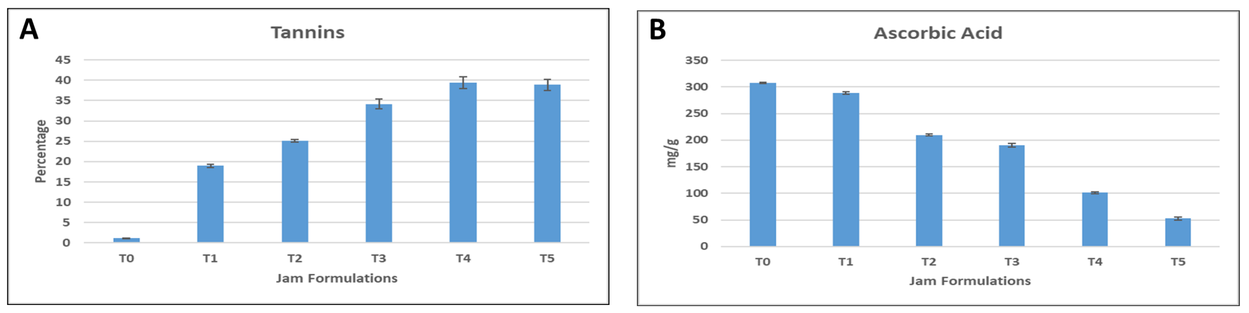

Figure 5: *Tannins content ranges between 1.2-38.8% among different jam treatments. The minimum value of tannins content was observed in T0 made of 100% of black currant and the maximum value was seen in T5 made of 100% black persimmon **(A)**. T3 exhibited ascorbic acid (190.64 mg/g) as compared to all other jam formulations, while T1 showed the highest level of ascorbic acid **(B)**.*

5. PHYSICOCHEMICAL ANALYSIS

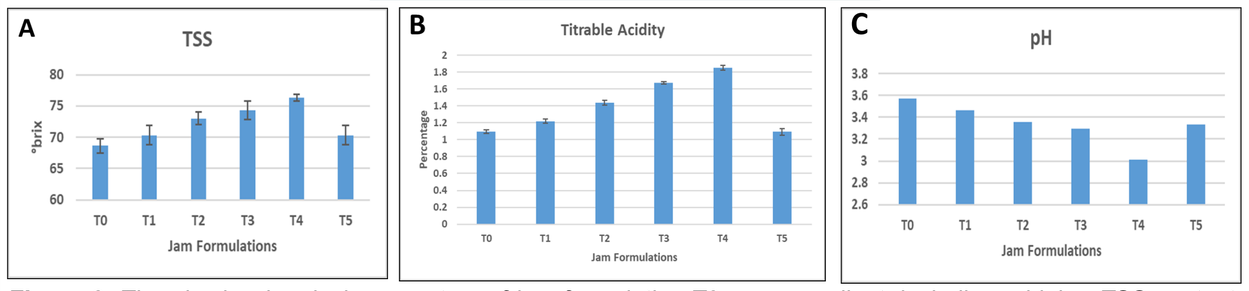

Figure 6: *The physicochemical parameters of jam formulation T3 were excellent, including a higher TSS content (74°brix) **(A)**, titratable acidity (1.63%) **(B)**, and ideal pH (3.29) **(C)** in comparison to all other jam formulations.*

6. ANTI-OXIDANT ANALYSIS

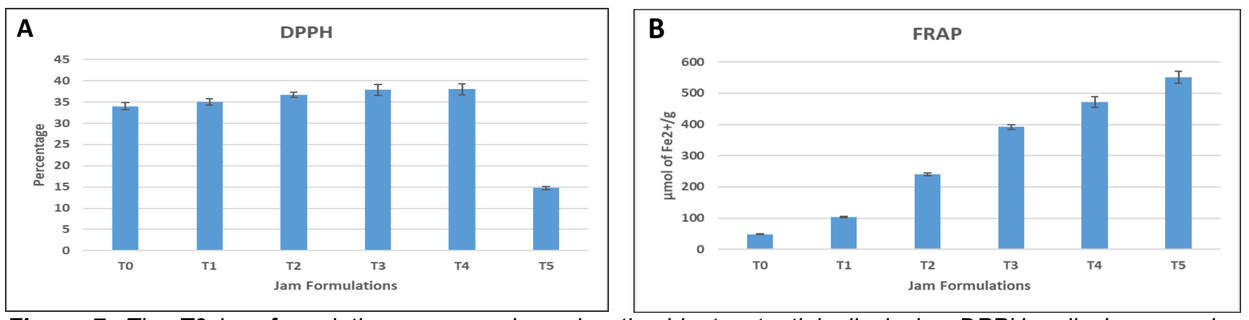

Figure 7: *The T3 jam formulation possessed good anti-oxidant potential, displaying DPPH radical scavenging activity of 37.99% **(A)** and FRAP with 388.98µmol of Fe2+/g **(B)** among all jam formulations*

7. SENSORY ANALYSIS

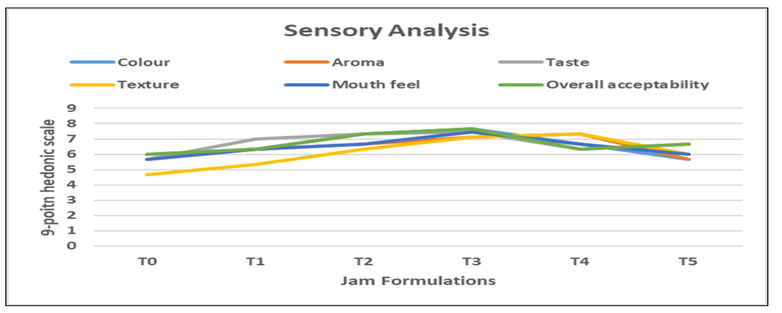

Figure 8: *Sensory evaluation was carried out by assessing aroma, color, taste, texture, mouth feel and overall acceptability. Sensory assessment showed that T3 received the highest acceptability score and T3 made of 40% black currants and 60% black persimmon meets the best results in sensory evaluation with overall acceptance (7.666) on 9-point hedonic scale system*

8. CONCLUSION AND FUTURE PERSPECTIVE

- The successful development of a functional fruit jam with enhanced nutritional and phytochemical properties demonstrates its ability to retain key nutrients
- The jam formulation, T3, composed of 40% black currants and 60% black persimmon, achieved the highest ratings in sensory evaluation, with excellent overall consumer acceptance
- The functional jam exhibited strong antioxidant potential, further highlighting its health benefits
- The positive consumer response indicates promising market potential for this nutrient-rich product, suggesting its viability as a functional food with both health and commercial appeal

Future Directions

- Further research on long-term storage stability and consumer preferences and customization
- Exploration of other functional ingredients for jam development

9. REFERENCES

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