



UNIVERSITY OF LIFE SCIENCES  
"KING MIHAI I" FROM Timisoara  
**Multidisciplinary Conference on  
Sustainable Development**  
21 – 22 May 2026



## MANGO AND PAPAYA SEED FLOUR – FROM AGRI-FOOD TO FUNCTIONAL FOOD

Melania Florina Munteanu<sup>1</sup>, Iulia Gabriela Cresneac<sup>1</sup>, Elena Narcisa Pogurschi<sup>2</sup>, Gentiana Camelia Ciubuc (Jurj)<sup>1</sup>, Corina Dalia Toderescu<sup>1</sup>

<sup>1</sup>Vasile Goldis Western University of Arad, Faculty of Pharmacy, 310048, 86 Liviu Rebreanu Street, Arad, Romania  
<sup>2</sup>University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, 011464 Bucharest, Romania; Faculty of Animal Productions Engineering and Management

**Abstract:** Flours obtained from mango seeds (Mango) and papaya seeds (Papaya) are increasingly recognized as valuable functional food ingredients derived from agro-food by-products. Recent studies show that these flours are rich in dietary fiber, proteins, lipids, phenolic compounds, and bioactive substances with antioxidant and antimicrobial properties. Mango seed flour has demonstrated significant antibacterial activity, while papaya seeds contain enzymes such as papain with important health-related effects. Their high water and oil retention capacity, emulsifying stability, and fiber content make them suitable for bakery and fortified food products. In addition, the valorization of these fruit by-products supports circular economy principles by reducing food waste and promoting sustainable food production. The incorporation of seed flours into cereal-based products may improve nutritional quality, mineral content, and antioxidant activity, with potential benefits for metabolic health. Further clinical and technological studies are still necessary to confirm their long-term effects and optimize their industrial applications.

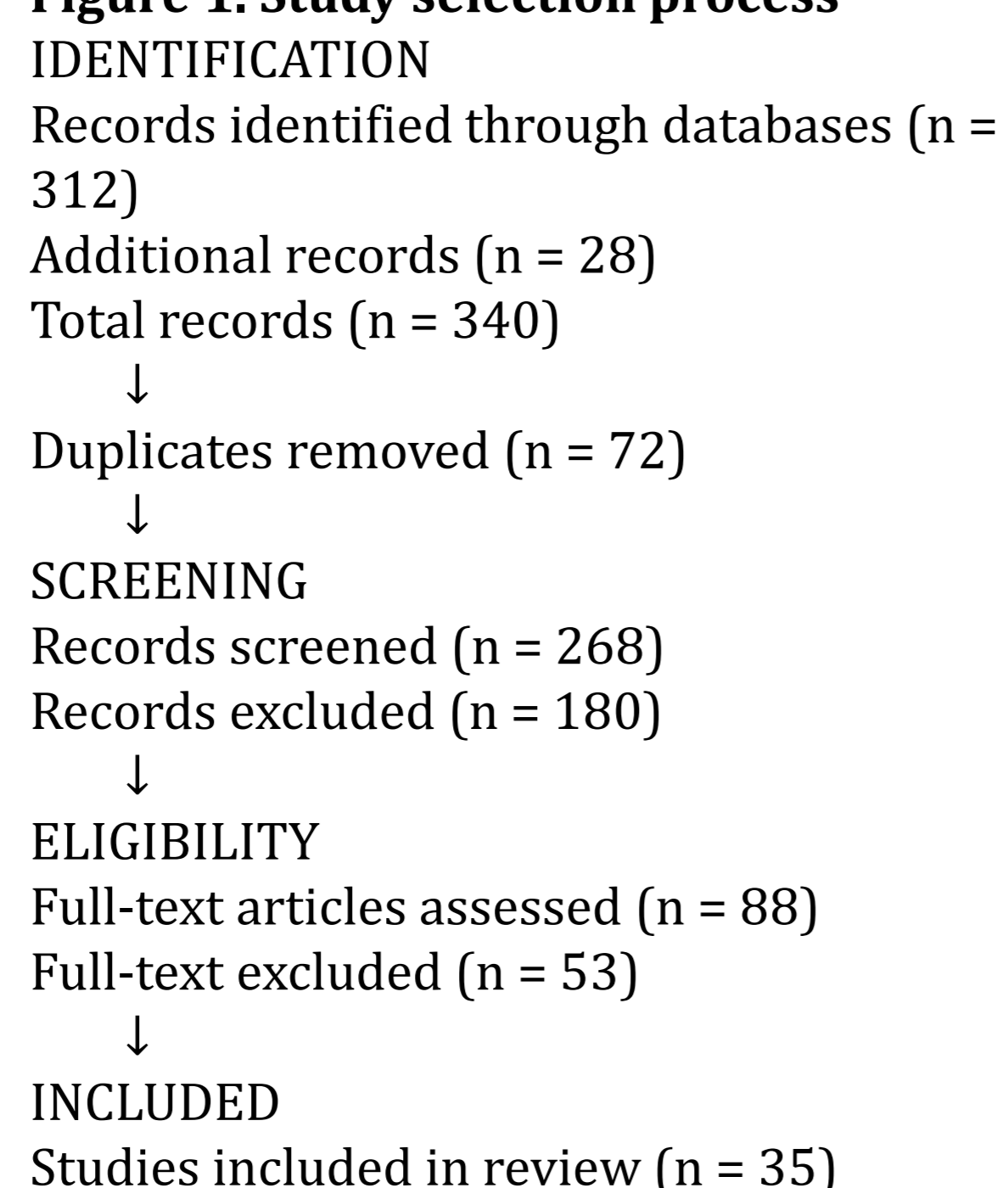
### • Introduction

Over the past decade, the food industry has increasingly focused on valorizing agro-food by-products to support sustainability and circular economy practices. Mango and papaya seeds, once considered waste, are now recognized as rich sources of dietary fiber, proteins, lipids, and bioactive compounds with antioxidant and antimicrobial properties. Mango seeds contain phenolic compounds such as gallic acid and catechins, while papaya seeds are rich in flavonoids, glucosinolates, and enzymes like papain. Recent studies show that flours produced from these seeds possess important functional properties, including high water- and oil-holding capacity, making them suitable for bakery and composite flour applications. Their incorporation into foods can improve fiber, mineral, and antioxidant content and may support metabolic health. In addition, utilizing fruit seed by-products helps reduce food waste and environmental impact. However, further research is still needed regarding processing optimization, safety, sensory acceptability, and clinical validation of their health benefits.

### • Material and method

This systematic literature review, following PRISMA 2020 guidelines, synthesizes evidence from 2015 to 2025 regarding the use of mango and papaya seed flours as functional food ingredients. By analyzing peer-reviewed studies from databases including Scopus, Web of Science, and PubMed, the research evaluates the nutritional, functional, and bioactive properties of these agro-waste by-products.

#### Figure 1. Study selection process



### • Conclusions

This systematic review highlights the potential of mango and papaya seed flours as sustainable functional food ingredients. Research shows that these by-products are rich in dietary fiber, proteins, lipids, phenolic compounds, and enzymes with antioxidant and antimicrobial properties. Both seed flours possess favorable technological characteristics, such as high water and oil retention capacity, making them suitable for bakery and cereal-based products. Their incorporation into foods can improve nutritional value, shelf life, and product stability while supporting waste reduction and circular economy practices. However, challenges related to processing standardization, sensory acceptability, and limited clinical evidence still need to be addressed. Overall, mango and papaya seed flours represent promising ingredients for future sustainable food applications.

### • Results and discussions

A total of 35 studies published between 2015 and 2025 were included in this systematic review, most of them experimental (~70%) and focused on the characterization of mango and papaya seed flours. Mango seed flour was identified as a rich source of dietary fiber and phenolic compounds with strong antioxidant activity, while papaya seed flour showed higher protein and lipid content, along with valuable bioactive compounds. These results support the potential of fruit seed flours as nutrient-dense ingredients for fiber enrichment and protein supplementation (Kumar et al., 2024; Nguyen et al., 2025).

Table 1. Nutritional Composition of Mango and Papaya Seed Flour (Reported Ranges)

Component	Mango Seed Flour	Papaya Seed Flour
Dietary fiber	40 – 60%	30 – 50%
Proteins	6 – 10%	20 – 30%
Lipids	8 – 15%	25 – 30%
Phenolic compounds	High	Moderate–High

Mango seed extracts demonstrated strong antioxidant and antibacterial activity, particularly against common foodborne pathogens such as E. coli and S. aureus. Papaya seeds showed additional enzymatic activity (papain), contributing to digestive benefits and antimicrobial effects.

Table 2. Bioactive Properties Identified

Property	Mango Seed Flour	Papaya Seed Flour
Antioxidant activity	Strong	Strong
Antimicrobial activity	Yes	Yes
Anti-inflammatory	Moderate	Reported
Enzymatic activity	Low	High (papain)

These properties support their use as natural preservatives and functional ingredients in food systems (Acta Scientific, 2025; Guan et al., 2024). Studies reported improved texture, shelf life, and nutritional quality when seed flours were incorporated into food products (Ehis-Eriakha et al., 2025).

Table 3. Functional Properties

Property	Functional Role	Observations
Water-holding capacity (WHC)	Moisture retention	High
Oil-holding capacity (OHC)	Flavor retention	High
Emulsifying capacity	Stability of mixtures	Good
Swelling capacity	Texture improvement	Moderate–High

Mango and papaya seed flours have strong potential to become key ingredients in next-generation functional foods.