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## ABSTRACT

Functional foods use is increasing due to their ability to provide additional health benefits besides the basic nutritional need. The design of functional foods entails the addition of new ingredients (such as dietary fibres, oligosaccharides, polyphenols, vitamins, protein, minerals and many more) or improvement of existing part(s) of foods. This review evaluates literature data on the fortification of yoghurt with moringa extracts based on data originated from 4 databases (Scopus, Web of Science, PubMed, and Science Direct) published in the period from 1990-2019 with emphasis on the chemical and biological effect of adding Moringa to yoghurt.

## Introduction

Moringa (*Moringa oleifera*) also known as drumstick is a fast-growing, drought-resistant tree of the family Moringaceae, rich in polyphenols with all its vegetative part found to be useful. *Moringa oleifera* is a plant abundant in nutrients and bioactive compounds, which is, consumed either fresh or cooked.

Studies on the extracts of this plant have shown antimicrobial, antioxidant, anti-inflammatory activities etc. Moringa, which is, indigenous to Indian (Kou et al., 2018) has been used for traditional medicine in the south eastern Asian for decades.

The need for wholesome and nutritious food products as played a role in consumer's consumption of yoghurt. Yoghurt is an affordable, fermented dairy product created through the activity of lactic acid bacteria and *Streptococcus*. Due to the acceptability of yoghurt among different cultures, ages, and socioeconomic classes, various studies have investigated the fortification of yoghurt with different ingredients (chemical, microbial, plant and animal-based) to improve the nutritional value of yoghurt. An example of such fortificant (ingredient) is Moringa, which, on account of its nutritional and phytochemical composition can be introduced to yoghurt to improve the nutritional makeup.

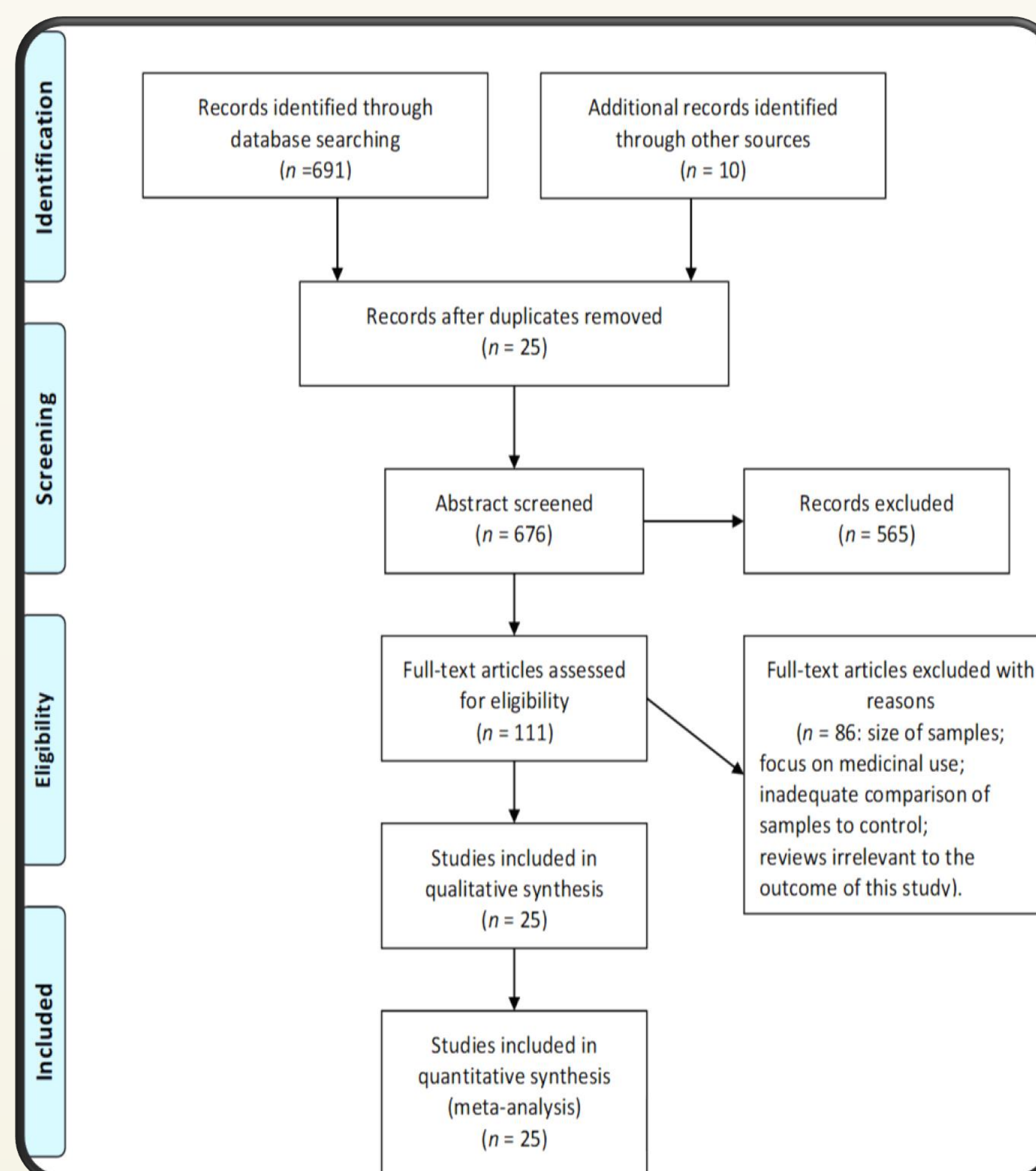
This review evaluates different data on fortification of Yoghurt with moringa highlighting the different methods applied in the studies.

## Methods

- ❖ A systematic review was piloted to evaluate different literature on the effect of fortifying yoghurt with Moringa. The studies investigated the potentials of Moringa as a fortificant in Yoghurt. Studies that reported on the extraction of bioactive compounds were also considered.
- ❖ The studies considered a range of methodology, with emphasis on;
  - ❑ Part of the plant used; (flower, seeds and leaves, etc.)
  - ❑ Type of solvent used for extracting; (water, ethanol etc.)
  - ❑ Techniques for extraction (ultrasonic assisted extraction, microwave assisted extraction etc.)
  - ❑ The quantity of Moringa extract recommended to be added to yoghurt.
  - ❑ Time of addition of the extract (before or after fermentation).

## Preliminary Results

### PRISMA flow chart



### Why Moringa in yoghurt?

Moringa is extremely high in nutritive value; the leaves contain substantial concentrations of the fat-soluble vitamin B complex and the water-soluble (A and C), iron, calcium, proteins, zinc, selenium, and the ten essential human amino acids, which is a rare phenomenon in a plant.

Previous studies revealed its therapeutic effect including antidiabetic, diuretic, and hepatoprotective effects.

Moringa is a drought-resistant plant, and its parts- flowers, leaves, seeds, pods- can be used as food.

Moringa contains bioactive compounds such as lignans, flavonoids, phenolic acids (Fig 1).

Moreover, many developing nations have access to this plant, and introducing it into programme fighting malnutrition means that emphasis can be placed on the available local resources

### Benefits of Fortification of yoghurt with Moringa

- ❖ Previous studies showed that there was an increase in the fermentative and antioxidant activity of yoghurt fortified with Moringa (Zhang et al., 2019).
- ❖ A study that investigated utilizing Moringa as a nutritional supplement for severely undernourished children showed that the consumption of Moringa was effective against malnutrition (Zongo et al., 2013).
- ❖ Fortifying yoghurt with Moringa increased the nutritional composition of yoghurt. Some authors showed that incorporating Moringa to yoghurt increased the total protein, total solids, and fat. And 17 amino acids were present in the yoghurt as compared with yoghurt without Moringa (Hassan et al., 2016).
- ❖ It improves the textural and chemical properties of yoghurt (El-Gammal et al., 2017).

### What are the challenges?

- ❖ The addition of Moringa to yoghurt at higher concentration produces an off sensory property (Hassan et al., 2016) attributed to several phenolic compounds present in the plant: thereby marring the product.
- ❖ Because of this off sensory property, there is an inadequate study on the recommended daily intake of yoghurt with Moringa.
- ❖ Insufficient studies on the categorization of bioactive compounds and unidentified phenols in the plant.

## References

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## Conclusion

- ❖ Fortifying yoghurt with moringa may be the key to increased bioactivity and prebiotic activity of yoghurt; since Moringa has been shown to be rich in fibre, lignin and other phenolic compounds. Thus, demonstrating potential scope for expansion of moringa-yoghurt fortification.
- ❖ Further studies to elucidate the optimal fortification levels of moringa in yoghurt in order to improve sensory parameter, physicochemical, and antioxidant properties of the final product are encouraged, as this will ease the commercialization of the product.

Fig 1: Bioactive compounds of Moringa

