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## An overview of nutritional and bioactive potential of Phalsa

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#### Abstract

Phalsa (*Grewia asiatica* L.) as the only fruit of *Grewia* family cultivated in the Southeast Asian. Raw Phalsa fruit is consumed, and it is also added to beverages and foods. Additionally, investigations conducted *in vivo* and *in vitro* have discovered that extracts from strong antioxidant, anti-inflammatory, antibacterial, radio protective, antidiabetic, cardio protective and anticancer effects can be found in many parts of Phalsa plants, especially the fruit. Phalsa has been linked to a wide range of nutritional and health benefits.

**Keywords:** Nutritional value, therapeutic use, preservation, health benefits, shelf stability

#### Introduction

The fruit berry plays a major role in our daily life and considered as a beneficial fodder with hidden health benefits. These berries contain a number of nutrients which are crucial for an active and healthy living or entirely serve as abundant source of energy in human diet over the last few years. These berries contain higher content of bioactive compounds such as anthocyanin, flavonoids, and tannin which are regarded with health benefits and encourage health properties by slowdown in the maturing process and reduce the chance of numerous diseases including cancer, cardiovascular disorder, rheumatoid arthritis, lung disease. According to the Veberic, Slatnar cities, berries are “edible with spherical, tiny shaped fruits along with a seed inside a flesh having typically sweet-sour taste, and having various intensity of hue (Khan *et al.*, 2019) [7].

Phalsa “*Grewia asiatica* L.” which is also known as star apple with (*Grewia*) genus yields edible fruit (Sinha *et al.*, 2015) [12] belongs to the family *Tiliaceae* which has about 150 species *Grewia* with medium to small shrubs and it is being indigenous to sub-tropical and tropical regions of the world (Khan *et al.*, 2019; Ullah *et al.*, 2012) [7, 14]. Besides number of species of *Grewia* are wild (in-edible) so being considered in fuel, fodder and crafting. Whereas, Phalsa is the only species of *Grewia* family being consumed as an eatable berry (Sinha *et al.*, 2015) [12]. Delicate nature of fruit berry arises in India and most of parts of southeast Asia along with Bangladesh, Pakistan, and Sri-Lanka with inefficient supply chain (Wani *et al.*, 2015). It was first introduced into the Philippine before 1914 and also naturalized in Australia as a woody fossil of this plant from the Deccan intertrappean beds of India (Shukla *et al.*, 2016) [10]. It has been known with many names like Phalsa (Hindi, Marathi), Shukri (Gujarati), Unnu (Tamil), phulsa (Kannada), Shukri (Bengali) (Singh *et al.*, 2018) [11]. The production of phalsa is restricted to small area in India about less than 1000 hectare due to its shorter shelf life, uneven ripening and small berries which make difficult to pick for individuals. Phalsa is a species of flowering plant with high nutritional value and is being grown on a very small proportion in each state due to small size fruit, extend ripening time, periodical harvesting (Das & Mitra 2012) [2]. Phalsa being a rich source of Vitamin C, calcium, phosphorus, carbohydrate approximately 4.385%, 136%, 24.2%, 21.2% respectively and very low in fat percentage (Nandal & Bhardwaj 2014) [9]. Amino acid present in phalsa fruit and seed indicates the presence of both essential amino acids and non-essential amino acids.

In India 2 different kinds are grown i.e., tall and short (dwarf) are grown. In tall type yield of juice is somewhat higher as it is precisely related to eatable portion, besides more non-reducing and total sugars were found in the dwarf type (Mehmood *et al.*, 2020) [8]. Whereas, tall type had more amount of titrable acidity, reducing sugars and higher percentage of seed protein present in dwarf type. In Kanpur areas, two varieties are grown: Local and Sharbati.

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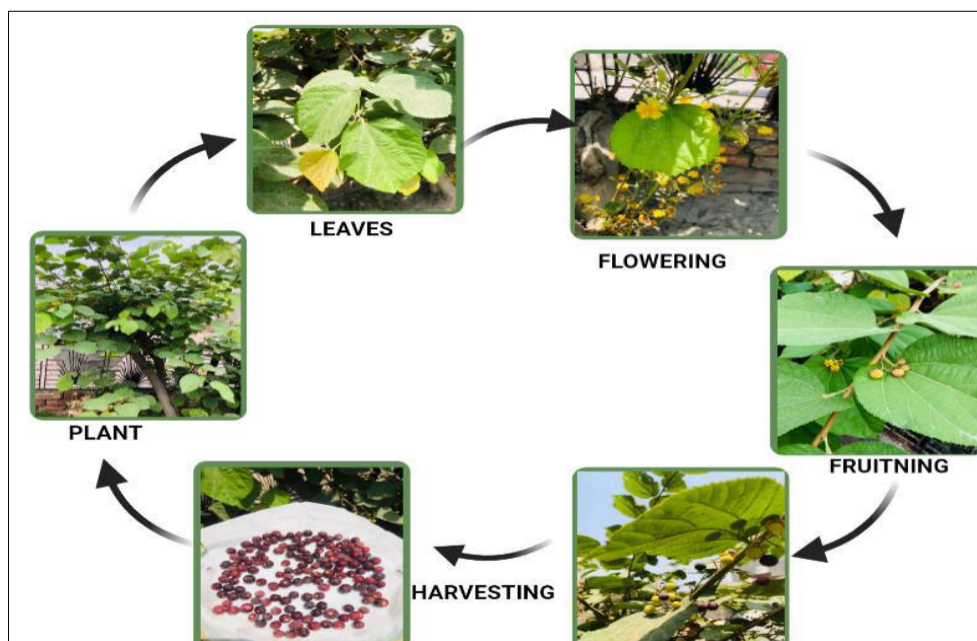
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### Morphology

Phalsa plant is a tiny, shaggy tree or shrub that can reach a height of 12 to 14 feet. It has huge, heart-shaped leaves that are 5 to 18 cm long and 9 to 14 cm wide. Small flowers are grouped together in axillary fascicles, or the forks of the leaves. Each cluster has two to ten peduncles. Three to five flowers are carried on small stalks, or pedicels, by each of the branches. Flowers feature many stamens and are either bright yellow or reddish-purple. It has small, spherical, edible fruit that ranges in size from 1.25 to 1.8 cm, has a seed inside the

flesh, and has varying degrees of colouring and a sweet-sour flavour. The fruit's skin colour changes as it ripens from light green to cherry-red or purplish red, and then becomes dark purple. The fruit becomes delicate and sensitive, and merged in a thin film, pale blush. Greenish-white in colour, the thin, fibrous flesh turns purplish-red as the seed approaches the skin. Bark is thick, fibrous, stiff, and leathery. It is greyish green on the outside and reddish brown on the inside. Fruit skin begins to shrivel as a result of moisture loss once the overripe fruit flesh becomes purple (Fig. 1) (Hiwale 2015) <sup>[6]</sup>.



**Fig 1:** Diagrammatic representation of cultivation of Phalsa plant

### Nutritive value of Phalsa

Ripe fruits of Phalsa contain a high amount of vitamins A, and C, minerals (calcium, phosphorous, and iron), and fiber however, low in calories and fat. For a healthy life, each of these elements is necessary (Nandal & Bhardwaj 2014) <sup>[9]</sup>. The complete nutrient composition of underutilized fruit with respect to different studies is provided in (Table 1).

**Table 1:** Nutritional profile of Phalsa fruit (Nandal & Bhardwaj 2014) <sup>[9]</sup>

Nutrients	Georgia (Port valley)
Calories (Kcal)	90.5
Moisture (Kcal)	76.3
Fat	<0.1
Protein	1.57
Dietary fiber	5.53
Carbohydrates	21.1
Ash	1.1
Potassium	372
Calcium	136
Iron	1.08
Sodium	17.3
Phosphorus	24.2
Vitamin B1	0.02
Vitamin B3	0.825
Vitamin A	16.11
Vitamin B2	0.264
Vitamin C	4.385

Vitamin C promotes the synthesis of collagen, speeds up the absorption of iron from food, and aids in wound healing. An exclusive source of sodium, it functions as an electrolyte, a critical ion to support the function of the muscles, enzymes, and blood control. While, potassium as well as protein help in the development of healthy muscles and strengthen them. An enough fibre intake helps to reduce the risk of obesity, diabetes, cardiovascular disease, and several malignancies. Phalsa fruit has a total sugar level of 7.95%, non-reducing sugar content of 6.96% and reducing sugar content of 0.99% (Nandal & Bhardwaj 2014) <sup>[9]</sup>.

Oil in phalsa seed is of a bright-yellow color and occupies about 5% oil in terms of free fatty acid, with a high concentration of oleic acid (13.4%), stearic acid (11%), palmitic acid (8.3%), Unsaponifiable material (2.8%), Linolic acid (64.5%) (Zia-ul-Haq *et al.*, 2015) <sup>[17]</sup>.

### Bioactive compounds in Phalsa

#### Anthocyanin

Total anthocyanin content in Phalsa fruit extract is that it is a rich source of anthocyanin and that it has potent antibacterial properties against four separate gram-positive and gram-negative bacterial species (Talpur *et al.*, 2017) <sup>[13]</sup>.

#### Flavonoid

Executed research on flavonoid content by in different parts of phalsa extract obtain from stem, leaf according to vivo and vitro studies. Flavonoid content in phalsa pomace assessed to be 12.42±0.56 (CE mg/g) (Gupta *et al.*, 2014) <sup>[5]</sup>.

## Tannin

Tannin content in Phalsa pomace is recorded as  $0.5 \pm 1.25$  (g/100g) by Gupta *et al.*, 2014<sup>[5]</sup> while Elhassan & Yagi, 2010 reported that the total tannin in Phalsa fruit is 1.13 to 2.46%. In Phalsa fruit it seems that methanol and acetone extract in tannin inhibit the growth of micro-organisms.

## Pharmacological activities of Phalsa

In both nutrition and medicine, Phalsa is a plant that has been shown to have a range of beneficial impacts on human health (Zia-ul-Haq *et al.*, 2013)<sup>[16]</sup>. Over the past few years, investigations on the pharmacological and dietary benefits of the Phalsa fruit plant have been conducted (Sinha *et al.*, 2015; Goyal, 2012)<sup>[12]</sup>. Traditional medicine has also employed the fruit of the Phalsa to cure a variety of illnesses, respiratory issues, inflammatory illnesses, heart, and blood. It was shown that a number of the Phalsa plant's polyphenolic components have potent antioxidant properties (flavanols, anthocyanins, and phenolic acids). Due to consumers' increased hostility to using drugs to address medical conditions, the healthcare industry is noticing a change in the effectiveness of drug intake, with fabricated pharmaceuticals being recover with natural plant-remedies treatments more frequently (Chirumbolo, 2012)<sup>[1]</sup>. Plant-based alternatives to manufactured pharmaceuticals are regarded to offer better disease-prevention capabilities due to their high phytochemical content. A multitude of diseases have historically been treated using Phalsa fruit due to its anti-inflammatory, radio protective, anticancer and anti-microbial, properties (including heart disease). While, Phalsa considered as an herbal medicine for Recuring number of illnesses include fever, rheumatism, ageing, cancer, and diabetes. Additionally, plant of *Grewia* has anti-oxidant and radio protective properties. Along with offering vital nutrients, its fruits exhibit varying degrees of antioxidant activity. So, exhaustive investigation of this fruit must be carried in the best possible way. While the studies mainly focused on the fundamental pharmacological and chemical properties of Phalsa fruit (Zia-Ul-Haq *et al.*, 2013)<sup>[16]</sup>.

## Conclusion

Phalsa fruit has recently demonstrated great potential as a conventional and practical food ingredient for the development of innovating food preserves and beverages. At present, fruit of Phalsa plant is primarily employed for the formulation of popular goods on a domestic level. Berries of Phalsa plant are most frequently grown as wild or only for shorter period it appears in the market due to 1-2 days of life period. Additionally, creation of recently cultivars for larger fruits, quality, increased yield, flavour; sweetness, ability to cultivate in colder climates and insect resistance. Despite minimal efforts to increase an appropriate cold supply network to ensure supply to far-off markets. Many biologically active components of Phalsa plants have been found in different parts of the plant, and research suggests that these components aid in anticancer, radio protective, anti-microbial, antidiabetic and antihyperlipidemia activities. However, despite the fact that study has revealed the functional significance of a number of Phalsa's bioactive components (such as flavonoids, saponins and phenolic), the plant is still of high functional value.

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