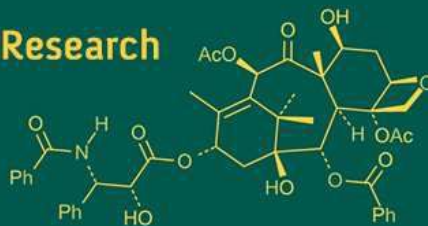
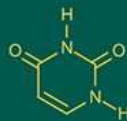


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## An indigenous value fruit of Indian drylands: Phalsa

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### Abstract

India, one of the mega plant biodiversity centres, endowed with rich fruit heritage. *Grewia subinaequalis* L. (Phalsa; Family: Tiliaceae) native fruit plant of India, grows wild throughout much of India. Hardy bush can be grown as rainfed crop in tropical and arid locations. Nutritious and therapeutic phalsa has been linked to a wide range of health benefits. According to the ancient Indian treatise on medicine Ayurveda, phalsa fruits are cooling tonic and aphrodisiac. Pleasant acid flavoured ripe berries of phalsa contain a high amount of vitamins A, and C approximately (16.11, and 4.38 mg respectively), minerals (Calcium 820.32 mg/100 g, Phosphorous 814.5 mg/100 g and iron 27.10 mg/100 g), and fibre but low in calories, fat and glycaemic index. Throughout the fruiting season in hot summer months, a refreshing fruit drink is prepared, commonly known as phalsa sherbet popular in local areas. Fruit can be made into beverages and value added products and preserved. India can harness its rich biodiversity by promoting the cultivation and value addition of underutilized fruits like phalsa, to strengthen both domestic and international markets.

**Keywords:** Anaemia, antioxidant, diabetes, phalsa, health benefits, therapeutic, vitamins

### Introduction

Phalsa, a fruit of Indian origin, commonly known as Indian Sherbet fruit. In Telugu it is called as Phutiki. Fruit is mentioned in Vedic literature as having certain medicinal properties. It is commercially cultivated in limited area around big cities of Punjab Hariyana Gujarat, Maharashtra and Bihar for ready quick sale in cities owing to its poor keeping quality. Phalsa is a flowering plant with small berry fruit conventionally blooms in summer and quiescent in winter. Primarily phalsa is cultivated for its nutritious and therapeutic fruits. It is also grown as intercrop in aonla Mango ber and bael. Phalsa fruit is bestowed with a treasure of nutrients such as carbohydrates, proteins, vitamins A, B3 and C and minerals like potassium, calcium, iron and phosphorus. It also contains ample amounts of phytochemicals including anthocyanins, tannins, phenols and flavonoids to deliver incredible health benefits. Fruits are highly perishable need to be processed immediately after harvest. The pigment responsible for the colour of Phalsa fruit is Anthocyanin, viz. Delphinidin-3-glucoside and Cyanidin-3-glucoside. Both seed coat and kernel are rich in linoleic acid. Many studies revealed that fruit is good for wound healing, anaemia, diabetes control, controlling urinary tract infections. Scope of utilization, value addition practicability and economic potential of the phalsa fruit is for further study.

Composition of phalsa fruit (per100 gram) Gaurishankar, 2002

|                    |      |                 |      |
|--------------------|------|-----------------|------|
| Moisture (%)       | 80.8 | Vitamin- C (mg) | 22.0 |
| Protein (g)        | 1.3  | Ca (mg)         | 129  |
| Carbohydrate (g)   | 14.7 | P (mg)          | 39   |
| Fibre (g)          | 1.2  | Fe (mg)         | 3.1  |
| Fat (g) 0.9        | 0.9  | Mg (mg)         | 72   |
| Total minerals (g) | 1.1  | K (mg)          | 351  |
| â-carotene (µg)    | 419  | Na              | 4.0  |
| Niacin (mg)        | 0.3  |                 |      |

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### Description

It is a short scraggly shrub of 4 m height, yields small purplish-red, soft, tender round drupaceous fruits with soft, fibrous greenish-white with purple stained pulp. Fruits have

different intensity of coloration at successive stages. Ripe phalsa fruits are purplish black in colour, subacidic in flavour and good source of vitamin A and C. The edible portion of phalsa (*Grewia subinaequalis*) fruit varies from 69-93 per cent (Roy *et al.*, 1995) [10]. Because of its pleasant flavour and attractive deep crimson-red colour and exceptional refreshing qualities, the phalsa fruits are excellent for making juice and squash. However, it is mostly used as fresh fruit and has cooling effect. Fruit ripens in 60 days from fruit set. Fruit ripening start from 2nd week of April. Though high in nutritional value, it is cultivated on a small scale in each state due to the small size of the fruit, repeated harvesting, and prolonged ripening periods (Das *et al.*, 2012) [4]. Inconsistent fruit ripening, several harvestings, Poor post-harvest management, and high perishability are additional constraints (Jayswal *et al.*, 2017) [7]. Phalsa is most delicate and highly perishable fruit constant protection during handling and prompt cooling of fruits is essential if the potential shelf life of phalsa is to be realised. Storage life depends on the stage of harvest. Fruits harvested at red ripe stage can be stored for only one day. Hence marketed immediately in local markets. Fruits harvested at colour turning stage can be stored for 2-3 days at room temperature and about 7 days in cold storage.



**Canopy management and Pruning:** Phalsa is a bushy plant grows into a tree if left unpruned. Since Phalsa bear fruits on current season growth, regular and severe annual pruning is needed before the on-set of spring. Yearly pruning encourages new shoots from the base at ground level and higher yield of marketable fruit than those of more drastic trimming. The Phalsa plant may be easily reproduced by rooting hardwood cuttings or layering.

#### Edaphoclimatic adaptability

Phalsa is not very exacting in its soil requirement, thus can be grown on a wide range of soils, even on alkaline soils. Phalsa can be grown successfully even waste lands where other fruit crops are unsuccessful. However, well drained, loamy soils are suitable. Under waterlogged conditions plants become chlorotic. Without much care and maintenance, Phalsa could be cultivated in wasteland (Nand, 1993) [9] and in unamended sodic soils upto 30 per cent exchangeable Na (Ali and Pathak, 1991) [1]. Phalsa is one of the most hardiest fruits drought resistant, requires little care. It is a subtropical crop prefer dry weather and bright sun, performs well in distinct summer. The better quality yield is obtained in such regions having no winter. Plant does not shed leaves and produce flowers more than once in such

regions. The plants can tolerate temperature as high as 44°C and high temperature favours ripening of the fruits.

In North India it sheds its leaves in peak winter enters into dormancy. Plants have some special adaptations in dry lands particularly like, sunken stomata, hairyness and waxy coatings on leaves to avoid heavy transpiration and deep rootsystem to draw water from deeper layers. It requires clear weather at the time of flowering. Rain during flowering adversely affect fruit set. Full grown plants can tolerate freezing temperature for a short period.

#### Propagation of phalsa

It is commercially propagated by seed but seedling plants are fairly true to type. Propagation by hard wood cuttings and layering is possible with growth regulators IBA 2500 ppm. Freshly extracted seeds should be used for raising seedlings. Seeds lose their viability after 90-100 days under ordinary storage. The viability of seeds can be retained for a period of 6 months under cool storage. Seeds germinate 15-20 days after sowing and seedlings get ready for planting in the field by 3-4 months. Germination percentage was highest (76%) and the germination period shortest (16 days) with seeds sown immediately after extraction (Singh and Jindal, 1979) [12]. The Phalsa plant may be easily reproduced by rooting hardwood cuttings or layering. An experiment conducted at CHES (ICAR-CIAH), Vejalpur on effect of IBA concentrations on semi-hard wood cuttings of phalsa cv. Thar Pragati. Results revealed that semi hardwood cuttings treated with IBA 2000 ppm resulted in the highest survival percentage (50.20%) length of sprout (76.30 cm), number of primary roots (16.30) number of secondary roots (32.20), number of leaves/plant (15.21), number of sprout/plant (3.90) and girth of sprout (1.90 cm) 150 days after treatment, it was followed by IBA 1000 ppm.

#### Varieties

There is no distinct cultivar available in phalsa. Some growers have, however, given names as 'Local' and 'Sharbati'. Two phalsa types, i.e. Dwarf and Tall were recognized, of which the former is more productive studied differences in physical parameters, chemical composition and electrophoretic patterns of seed proteins in 2 distinct phalsa types, i.e. tall and dwarf.

Thar Pragati, a recently released variety by CIAH. Fruit ripens in 60 days from fruit set. Fruit ripening start from 2nd week of April. Yield: 3-4 kg per plant, Fruit weight: 2.1 g, pulp weight: 1.9 g, Pulp: 90.4%, fruit shape: Round, Fruit Color: Deep purple, TSS: 20.12 OBrix, Acidity: 3.12%, Total sugar: 12.42%, Reducing Sugar: 8.10%, Vitamin C: 19.12 mg/100 g. Plant height: 2.20 m, spreading growth habit, thick stem, dense foliage and drooping branches. Fruit ripens in 60 days from fruit set. It is dwarf, early precocious bearer (Bearing in 3<sup>rd</sup> year), drought tolerant and suitable for high density planting. It is suitable for table and processing purpose.

#### Nutritional facts

Fruits are highly nutritious, packed with vitamins, iron antioxidants and several bioactive compounds like anthocyanins, phenolics, flavonoids, tannins which exhibit very high antioxidant activity. Fruits contain 50-60 per cent juice; 10-11 per cent sugar and 2.0-2.5 per cent acid fair sources of phosphorus and iron. The presence of glucose, fructose and maltose has also been reported in ripe fruits.

Among the organic acids, citric acid is predominant with traces of malic acid. Phalsa fruit contains numerous amounts of vitamins. The vitamin Vitamin C content present in phalsa is around (4.38 mg/100 g) which promotes the synthesis of collagen, aids in wound healing, and enhances the absorption of iron from food. The seed coat and the kernel contain 2.0 and 23.7 per cent oil respectively which is rich in linoleic acid. The pigment responsible for the colour of phalsa fruit is anthocyanin, viz, delphinidin-3-glucoside

and cyanidin-3-glucoside. The phalsa seed contains 7.17 per cent crude fat with a typical odour. The composition of fruit (per 100 gram) is as follows (Gauri Shankar, 2002) <sup>[6]</sup>. Fruit has been found to contain a variety of secondary metabolites, including myricetin, naringenin, cyanidin, pelargonidin, and hydroxyl methyl furfural, hydroxyl benzoic acid (Choudhary *et al.*, 2018) <sup>[2]</sup>. Fruit pulp and seeds contain essential amino acids like threonine and methionine, respectively.

Table outlines key bioactive components, their nutritional roles, functional properties, and applications in dietary products and supplements

| Bioactive components                   | Role in human nutrition                                                                       | Functional properties                       | Applications                             |
|----------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------|------------------------------------------|
| Antioxidants (Vitamin C, Polyphenols)  | Protects cells from oxidative damage, supports immune system, may reduce chronic disease risk | Antioxidant, anti-inflammatory, anti-cancer | Dietary supplements, functional foods    |
| Dietary Fiber                          | Aids digestion, promotes bowel regularity, supports weight management                         | Digestive health, satiety                   | Fiber supplements, bakery products       |
| Phenolic Compounds                     | Antioxidant, anti-inflammatory, potential anti-cancer effects                                 | Antimicrobial, anti-inflammatory            | Nutraceuticals, herbal medicines         |
| Minerals (Calcium, Iron, Potassium)    | Essential for bone health, blood circulation, nerve function                                  | Electrolyte balance, enzyme cofactors       | Fortified foods, mineral supplements     |
| Carotenoids (Beta-Carotene)            | Precursors to vitamin A, important for eye health                                             | Antioxidant, vision support                 | Nutritional supplements, baby foods      |
| Tannins                                | Astringent taste, potential antimicrobial effects                                             | Antioxidant, anti-inflammatory              | Traditional medicines, food preservation |
| Phytochemicals (Quercetin, Kaempferol) | Antioxidant, anti-inflammatory, potential anti-cancer effects                                 | Antimicrobial, immune support               | Herbal remedies, dietary supplements     |
| Vitamins (B-Complex, Vitamin K)        | Essential for energy metabolism, blood clotting, and overall health                           | Coenzymes, bone health                      | Nutritional supplements, fortified foods |
| Omega-3 Fatty Acids                    | Heart health, cognitive function                                                              | Brain development, anti-inflammatory        | Fish oil supplements, functional foods   |
| Protein                                | Building blocks for tissues, enzymes, and hormones                                            | Muscle repair, enzyme function              | Protein supplements, sports nutrition    |

Source: Simrat Kaur *et al.*, 2024 <sup>[15]</sup>

**Therapeutic facts:** Fruit is beneficial in the human diet over the last decades due to the higher content of bioactive compound such as anthocyanin, flavonoids, phenolic compound, tannin (D.K. Tiwari *et al.*, 2014) <sup>[15]</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) <sup>[13]</sup>.

Fruits are used against throat trouble, to remove biliousness, constipation, cure inflammation, heart, liver, blood disorders and fevers. Dead foetus removal, anorexia, indigestion, thirst, toxemia, spermatorrhoea, diarrhoea, tuberculosis, and sexual debility troubles are some of the other healing properties of Phalsa fruit (Khan *et al.*, 2019) <sup>[8]</sup>. Phalsas' medicinal value is because of the presence of different metabolites including saponins, coumarins, and anthraquinone. The ripe fruit of this plant is used as herbal medicine for stomach upset, diarrhoea, intestinal infection, cough, and jaundice treatment. Wani *et al.*, (2015) <sup>[16]</sup>. Phalsa fruits are well-known for their anti-inflammatory properties and are frequently used to treat respiratory, aging, diabetes, cardiovascular, rheumatoid arthritis, and atherosclerotic illnesses. Phalsa fruit has traditionally been utilized for its radioprotective, anti-inflammatory, anti-microbial, and anticancer properties, including the treatment of heart disease (Simrat Kaur *et al.*, 2024) <sup>[14]</sup>. Plant-based alternatives to manufactured pharmaceuticals are regarded to offer better disease-prevention capabilities. 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 substituted with natural plant-remedies. (Chirumbolo, 2012) <sup>[3]</sup>.

**Value addition:** Fruits harvested at red ripe stage can be stored for only one day. Hence, processed into quality beverages. The fruit juice of phalsa is used as a refreshing drink. Several beverages, viz., nectar, concentrate, squash and crushed phalsa packed in glass bottles, which remain acceptable upto 8 months in cool storage (Roy *et al.*, 1995) <sup>[10]</sup>. 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) <sup>[16]</sup>. The fruits are highly perishable and need to be processed immediately after harvesting (Roy *et al.*, 1995) <sup>[10]</sup>. RTS syrup, squash and carbonated beverages and preserved with sodium benzoate. Soft drinks prepared of phalsa are enjoyed in India during hot summer months as it has cooling tonic and aphrodisiac effects which overcomes thirst and sensation. When ripen, phalsa berries are frequently eaten fresh after a quick wash, in sweets, or after being transformed into different drinks and beverages contributing nutritious value and health-promoting properties and sensory characteristics (Donno *et al.*, 2019) <sup>[5]</sup>. Phalsa can be used to prepare various value-added products in order to increase its shelf life, like fruit jam with fully ripe fruits and pickle with raw unripe berries. Phalsa pickles can be prepared by immersing mature, somewhat unripened entire fruit (Green in color) into vinegar or oil. By gently boiling the unripe fruit in sugar syrup, it can also be used to make phalsa preserve. Throughout the summer, phalsa berry-based beverages and fresh juice are highly popular in the local markets of the Indo-Pak Subcontinent. After being separated, the pulp is diluted in water with sugar and salt. The beverage is thought to provide a cooling effect against the humid tropical weather (Tiwari, *et al.*, 2014) <sup>[15]</sup>.

Fermentation is extremely fast in phalsa juice, and the only way to prevent this is by processing. using artificial preservatives like potassium metabisulphite or sodium benzoate halt fermentation (Donno *et al.*, 2019) <sup>[5]</sup>. So, sodium benzoate as a preservative regarding phalsa holds goods.



### Traditional uses

Phalsa juice can be blended and warmed with carom seeds to alleviate abdominal pain. Mix phalsa juice with rose water and sugar to offer respite from vomiting and nausea. Phalsa juice combined with ginger and rock salt helps to relieve spasms and repeated muscle cramps.

### Uses of plant parts

The shoots of the plants after pruning can be utilized either for making baskets or supporting vegetable crops. Pruning of one full grown plant is sufficient for making one large or two small baskets. Phalsa baskets are fairly strong and can be used for transporting fruits and vegetables. Ropes can also be made from the fibre obtained from the bark after treatment. Waskar and Khurdiya (1993) <sup>[17]</sup> worked on the utilization of phalsa pomace (Waste product after juice extraction). It is suggested that pomace could be utilized as an animal feed.

### Conclusion

Expansion of cultivation in dry degraded lands with under-utilized fruits like Phalsa is the need of hour. Developing phalsa based cropping models to conserve natural resources and maximize gains from arid wastelands. Promoting nutritive significance and processing feasibility of phalsa by developing post-harvest and value addition techniques help enhance revenues.

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