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Review Article

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Role of Grewia Asiatica as Nutraceutical in the Best Opportunity for Nutraceutical Industries

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ABSTRACT

Berry fruits have lately been discovered to be a rich source of bioactive food elements, which can be used to generate healthy food items known as functional foods, according to research and development. Grewia asiatica is one of the therapeutic berry herbs which is used in the nutraceutical industry nowadays on a large scale. Grewia asiatica belongs to the family Tiliaceae and the plants part used are leaves, bark, flowers, and fruits. This review article is to investigate the nutraceuticals potentials of undiscovered berry fruit i.e. Grewia asiaticain order to respond to its developing trends in food science and technology. This review contain the basic knowledge of Grewia asiatica in the field of nutraceutical technology, the challenges face by the Grewia asiatica in manufacturing of nutraceuticals, marketed nutraceutical products of Grewia asiatica, taxonomical classifications of Grewia asiatica, nutritional value of Grewia asiatica, types of species found in Grewia asiatica, geographical distribution.

Keywords: *Grewia asiatica, nutraceuticals, potential berry, economic uses, antioxidant, functional food.*

INTRODUCTION

Fruits are recognised as a significant dietary product with possible health advantages, as they are high in carbs, vitamins, antioxidants, and minerals, all of which are necessary for a healthy and active lifestyle. Many fruits include non-nutritive components such as flavonoids and other phenolic compounds, which may protect against chronic diseases through a variety of mechanisms that are still unknown (Tanka et al., 1993).

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Fruit'srevelence in a healthy diet is well acknowledged; the world health organization (WHO) as well as other food standard authorities advises daily fruit-eating to improve health. Fruit has a large number of bioactive chemicals, according to research. Furthermore, several studies on bioactive chemicals in plants have been undertaken in the last two decades, discovering some of their associated health advantages. Not only berries plants like Navagraha plants (Parihar & Sharma, 2021)- Achyranthes Aspera, Fiscus racemose, Butea monosperma, Fiscus religosa, Calotropisprocera, Acaciacatechu, Imperata cylindrica, Prosopis cineraria, cynodondactylon (Parihar & Sharma, 2021) etc can also be used as nutraceutical industries for the production of nutraceutical food and products. According to Fabric, Slantr berry fruits are "delicious round-shaped little fruits with a seed within the flesh, tasting normally sweet to sour, and having varying intensities of colouring. ''Due to these functional characteristics, a rise in demand for functional beverages made from berry fruits such as blackberry, American cranberry, gooseberry, Lingonberry, and blackcurrant has been recorded in the food industry 1,2. Grewia species have great therapeutic value and are commonly used to treat a variety of ailments (Sharma & Patani, 2013). Grewia is a genus of about 150 tiny trees and shrubs of the Tiliaceae family that can be found in subtropical and tropical regions of the world. Nehemiah Grew, one of the inventors of plant pathology, was given the name Grewia. Grewia is a genus of shrubs and trees found primarily in warmer climates. G. tenax, G. hirsute, G. damine, G. lasiodiscus, G. optiva, G. Biloba, G. bicolor, G. tiliaefolia, G. flavescens and many others are among the 40 species found in India (Sinha et al., 2015). These species are used in the trade of medicinal and aromatic herbs, they provide a source of revenue for low-income families (Szajdek et al., 2008). This family of plants is extremely useful commercially and provides a good source of naturally occurring fibres. Only Grewia asiatica, the most important species in the genus Grewia, produced edible fruits of the Tiliaceae family. In India, 2 varieties, tall and dwarf, have been produced, each with its own set of chemicals and physical features. The tall has a little larger outputscince it is directly tied to the edible component, whereas the dwarf type has more sugar and nonreducing sugars. Taller plants exhibited more sugars and titrable acidity, as well as more seed protein, than dwarf plants (Dhawan, 1993). The vernacular names of G. asiaticais given in the table-1.

Table 1. The vernacular names of *G. asiatica* (Bennet, 1987; & Paul, 2015).

S.No.	Language Name	Vernacular Name
1	Hindi	Pharsa, Phalsa, Shukri, Pharoah, Phulsa
2	Bengali	Phalsa, Shukri
3	Kannad	Buttiyudippe, Tadasala
4	Malayalam	Chadicha
5	Marathi	Phalsa, Phalsi
6	Punjabi	Phalsa
7	Tamil	Tadashi, Palisa
8	Teague	Putiki, Phutiki, Jana, Nallajana
9	Oriya	Pharasakoli
10	Persian	False
11	Santhal	Jang Olat
12	Sind	Pharaoh, Phalsa
13	Urdu	Phalasah
14	Punjabi	Phalsa

Macroscopical description of G. asiatica

G. asiatica is a shrub that grows to be 4 -5 metres tall. Macroscopical description of *G. asiaticais* given in the table-2. Ethnobotanical description of G. asiatica is given in table-3.Economic uses of *G. asiatica* is given in the table-4. *G. asiatica* has many uses for poor peoples of the society.

Table 2. Macroscopical description of *G. asiatica* (Dey & Das, 1995; Sastri et al., 1956; Gupta et al., 2006; Hiwale et al., 2015; & Kirtikar et al., 2000).

S.NO.	PLANT PARTS	MACROSCOPY
1	Leaves	Leaves size is 5-18 centimetre long and wide. Shortly petioled, heart-shape leaves. The upper surface is stellately pubescent, and the lower surface is tomentose. The leaves have parallel venations.
2	Flowers	The blossom is around 2 cm in diameter (Sastri, 1956). Individual blooms are yellow in color, containing 5 big sepals with 12 micrometre and 5 smaller petals with 4-5 micrometre and are grouped together in cymes.
3	Fruits	Fruits are fleshy fibrous drupe that matures to greyish purple color, with black round depression areas on the surfaces. The rest of the surface is covered with large stellate trichomes and small stellate trichomes.
4	Seeds	Seeds are one, two in numbers, pointed from the ends and grooved surfaces, with hard seed covering. They have 2 chambers and oily endosperm.
5	Bark	The bark is grey-green on the outside, red-brown from inside, and cream colour from outer side. The bark is thick, fibrous, tough, and leathery

Macroscopical description of *G. asiatica* (Joshi et al., 2013)

It consist of following:-

- Prismatic crystals
- Rosette crystals
- Parenchymatous cells
- Crystal fibres
- Spiral vessels
- Epidermal cells
- Starch grains
- Aleurone grains
- Stellate hairs

Table 3. Ethnobotanical uses of *G. asiatica* (Morton et al., 1987; Lin et al., 2012; & Zia-Ul-Haq et al., 2013)

S.NO.	PLANT PART	USES
1	Unripe fruit	Prevent data, Kapha, biliousness, inflammation, respiratory disorders, cardiac disorders, blood related issues, fever
2	Roots	Rheumatism
3	Ripe fruits	Astringent, stomachic
4	Bark	Rheumatism
5	Bark infusion	Febrifuge, demulcent, diarrhoea
6	Leaves	Antibiotic, skin eruptions

Table 4. Economic uses of *G. asiatica* (Yadav et al., 1999; & Morton et al., 1987)

S.NO.	PLANT PART	USES
1	Ripe fruit	Eaten fresh fruit by people, soft drinks, squash are made during summer season in India
2	Fresh leaves	Animal fodder
3	Bark	Soap substitute in Burma
4	Mucilaginous extract	Used to clarify sugar
5	Fibre	Used to make Rope
6	Wood	Making archer's bows, poles for carrying of leads on shoulders, shingles

Harvesting and production yield of *G. asiatica*

Phalsa's fruit-bearing season is the summer. Fruits have short self-life and must be sold with in 24 hrs of purchase. In one season the average production per phalsa plant is 9-11 kg (Morton et al., 1987).Chemical constituents present in the plant G. Asiatica are given in the table-5.Nutraceutical value of Grewia Asiatica is given in the table-6.

Table 5. Chemical constituents present in the plant G. asiatica (Aggarwal et al., 1979; Khurdiya et al., 1981; Srivastava et al., 1953; Ali et al., 1982; Laxmi et al., 1976; Thripathi et al., 1976; & Josi et al., 1980)

S.NO.	PLANT PART	NAME OF CHEMICAL COMPOUNDS
1	Leaves	Quercetin, Quercetin glycosides, Kaempferol
2	Fruit	Quercetin, Quercetin glycosides, Quercetin-3-O-Beta-D-glucoside, naringenin, naringenin glycosides, naringenin-7-O-Beta-D-glucoside, delphinidin-3-glucoside, pelargonidin-3-5-diglucoside, cyanidin-3-glucoside, and catechin(Sharma et al., 2008; Gupta et al., 2006; Chatopadhya et al., 1975).
3	Flower	Quercetin, Quercetin glycosides, Quercetin-3-O-Beta-D-glucoside, naringenin, naringenin glycosides, naringenin-7-O-Beta-D-glucoside, beta-sitosterol, 3,4-altrosan, 4H-pyran-4-one, hexadeconic acid, tetradecanoic acid, lupenone, tetradecanoic acid, grewinol, 3,21,24-trimethyl-5,7-dihydroxyhentriacontanoic acid sigma lactone, 2-hydroxy-3-methyl,
4	Stem	β -sitosterol, β -amyrin, taraxerol, lupeol, friedelin, botulin, erythrodiol, lupenone

Table 6. Nutraceutical Value of *Grewia asiatica*

S.NO.	NUTRIENTS NAME	PER 100 GRAM
1	Calories	72 Kcal
2	Carbohydrates	21.1 g
3	Proteins	1.6 g
4	Fat	0.1 g
5	Fibre	5.53 g
6	Calcium	136 mg
7	Iron	1.08 mg
8	Thiamine	0.03 mg
9	Riboflavin	0.01 mg
10	Vitamin C	4.38 mg
11	Sodium	4.4 mg
12	Potassium	372 mg

Images of different nutraceuticals products of *G. asiatica*available in market

Figure-1 (Jam of G. asiatica)(https://www.flipkart.com/nattfru-combo-pack-aampanna-bael-phalsa-juice-powder/p/itm260d11e01c463)

Figure-2 (Juice of G. Asiatica)(https://www.masalamonk.com/product/phalsa-chutney/)

Figure-3 (Sharbat of G. asiatica)(https://www.masalamonk.com/product/phalsa-sharbat/)

Figure-4 (Squash of G. Asiatica)(https://lmbsweets.com/shop/rajasthani-delight/sharbat/phalsa/)

Figure-5 (Powder of G. Asiatica) (https://www.nattfru.com/nutritional-facts-about-phalsa/)

Figure-6 (Picture of G. Asiatica) (https://www.indiamart.com/proddetail/falsa-plant-22540976312.html)

Drawbacks of cultivation of G. Asiatica at commercial scale

1. The raw berry fruits has shorter life so, it is very difficult to process and transform berry into functional and nutraceutical foods like jams and juices.
2. The mature berries cannot be preserved for more than 48 hours and kept in refrigerator.
3. The phalsa is grown in India and Pakistan abundant, but these countries has lack of cold supply and post-harvest techniques to preserve it for long period.
4. The fruit becomes flaccid and bitter due to fermentation if not stored in cold storage facilities.
5. Harvesting is done numerous times due to uneven and continuous growth and ripening of the fruits, which is time consuming and labour hard and reduce farmers profits.
6. Insect attack is also the major problem of this crop like caterpillar attack the plant foliage (Khana et al., 2018; Verma & Gaur, 2006; Tiwari, 2014; Nandal & Bhardwaj, 2014; & Mukhtar et al., 2012).

Techniques used to develop the yield and shelf life of the G. Asiatica

1. Cutting, grafting and layering vegetative methods are utilized to mitigate the problem of yield.
2. Treating G. asiaticacuttings with indole butyric acid for twenty-four hours results in 70% of yield.
3. Softwood grafting has 100% yield rate.
4. Macronutrients such as iron and zinc are used to increase berry size and juice yield.
5. Shelf life of berry can be increased by coating it with edible coatings made of soy protein isolate, potassium sorbate, propyl methylcellulose, and olive oil.
6. In diverse agro-conditions 100ppm of gibberellic acid boosts the yield of berry (Dave, 2016; Wasker, 1985; Ray & Bala, 2016; & Sharangi & Batta, 2015).

CONCLUSION

This review article is to investigate the nutraceuticals potentials of undiscovered berry fruit i.e Grewia asiaticain order to respond to its developing trends in food science and technology. Grewia asiatica is a less marketable product than certain other produced goods, its potential benefits should not be overlooked. Grewia asiatica is being processed in varieties of marketable goods on a modest scale, including jams, juices, squash, and beverages. However, the development of Grewia asiatica-based goods is hampered by lack of the necessary technologies to fully exploit the plant's potential benefits. So, further study and government publications on the Grewia asiaticaplant are needed, particularly on the implementation of creative approaches to improve its quality and culinary value.

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