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PHYTOCHEMICALS AND HEALTH BENEFITS OF SUPERFRUITS OF WEST BENGAL

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ABSTRACT

Nutrition scientists refer superfruits as "super" because of the fruit's affluence of phytochemicals, antioxidants, fiber, vitamins, minerals, and other substances that promote good health. The health benefits and the nutritional composition of tropical fruits especially from India, have not been well studied yet. Tropical fruits are little known about their benefits, and hence they are underutilized. In India, traditional fruits, such as **asnoni, black Plum, guava, bael** and so many indigenous minor fruits, are rich in phytochemicals and antioxidant compounds that include them in the list of superfruit. The objectives of this study are, i) To critically review the bioactive phytochemicals present in these superfruits ii) To find out the antioxidant potential of superfruits, iii) To find out the various health benefits of superfruits; iv) To introduce Asia's underutilized exotic fruits to the world. To write this review paper secondary data is collected from journals and online sources. Findings are reached after analysing the data found from various reputed journals. With advancing in food processing techniques, a wide variety of superfruits and their combinations are now available in supermarkets. Correct nutrition labelling of superfruit-based foods and their products helps consumers make healthy food choices. Superfruits can be considered as valuable sources of functional food ingredients based on their phytochemical composition and related antioxidant activity. The phenolic compounds of superfruits are bioaccessible and bioavailable in humans with some major health benefits, including antioxidant, anti-inflammatory, prebiotic, anti-microbial, chemo preventive, and hypocholesterolaemic activities.



KEYWORDS: Super-fruits, Phytochemicals, Antioxidant, Human health.

INTRODUCTION:

Nutrient-based studies have given a lot of attention to vegetables and fruits as they have the potential to decrease the risk of various non-communicable diseases (Shahidi, F., & Ambigaipalan, P. 2015). Superfoods are foods that are high in nutrition value due to a high concentration of nutrients. In contrast, they have great biological values as they contain satisfactory bioavailability and bioactivity within the body due to a variety of bioactive ingredients (Devalaraja, S., Jain, S., & Yadav, H. 2011). According to various scientific studies superfruits are able to increase vitality of the human body and can be a good choice for improving the overall health by strengthening the immune system (Wolfe, D. 2009). The most significant bioactive constituents of superfoods that are beneficial for human body are polyunsaturated fatty acids (ω -3, ω -6), vitamins, minerals, probiotic micro-organisms, antioxidants,

essential amino acids, polysaccharides and various enzymes. Numerous phytochemicals in fruits work as potent antioxidants to prevent free radicals from harming cells and organs by neutralizing their damaging effects. Phytochemicals are the physiologically active components of plants that give them color, flavor, odor & protect them from illnesses. It also gives defence to human in order to prevent degenerative diseases. Hundreds of such plant substances are being investigated now for their role in preventing cancer and other degenerative diseases. Some of the promising phytochemicals which act as antioxidants are bioflavonoids (Vitamin P), phenolics, lycopene, carotenoids, antioxidant Vitamins (C and E), and glucosinolates.

The world fruit market has evolved significantly over the past two decades. As a marketing technique to highlight the health benefits of some fruits that are not widely recognized, such **noni, black Plum, guava, bael** etc. The phrase "superfruits" has acquired increasing usage and attention in recent years. Tropical fruits are growing wild with certain climate conditions in specific ecosystem, where they are cultivated on a small scale of which little is known about their benefits, and hence they are underutilized. These fruits are usually called "exotic fruits". This definition is suitable for exotic fruits, as they have the following features such as, unusual shape, uncommon color, or flavor in comparison to what consumers are used to. Superfruit peel by-products can be used as agro-industrial ingredients. It also helps to improve nutritional value in beverages and provides industrial bioactive compounds for improve food quality. The health benefits and potential applications of superfruits could be better exploited if more research is available (de Souza Sant'Ana, A. 2011).

A critical evaluation of the term "super-fruit" is made here while keeping in mind its exceptional nutrient richness and capacity to treat a wide range of human health risks. The main goal of this study is to inform the common public about locally available fruits that have such extraordinary therapeutic qualities, which could become a means of eradicating malnutrition in developing nations on the Indian subcontinent.

REVIEW OF LITERATURE:

- a) It is estimated that up to 80% of cardiovascular disease, 90% of Type II diabetes, and one-third of cancers can be avoided by changing lifestyle, including diet [WHO. Diet Nutrition and the Prevention of Chronic Diseases, Report of a Joint WHO/FAO Expert Consultation, WHO Technical Report Series 916. Geneva: World Health Organization; 2003].
- b) Superfruits are able to increase vitality of the human body and can be a good choice for improving the overall health by strengthening the immune system (The food and medicine of the future. California: North Atlantic Books).
- c) Exotic fruits have shown to be highly relevant to small farmers' survival and might also help in the fight against undernutrition among indigenous communities (Sant' Ana 2011).
- d) Research on properties and characterization of superfruits is a promising field to be explored by food and nutritional scientists, where it can lead to numerous benefits to mankind, if managed in a sustainable and responsible manner (Clerici and Carvalho-Silva 2011; Sant'Ana 2011).

Definition of Important Terms:

Superfruits: Nutrition scientists refers superfruits as "super" because of the fruit's affluence of phytochemicals, antioxidants, fiber, vitamins, minerals, and other substances that promote good health.

Exotic Fruits: The definition suitable for "exotic fruits", is Some types of fruits that have unusual shape, uncommon color, or flavor in comparison to common fruits; what we are used to.

Objectives of the study are:

- i) To critically review the bioactive phytochemicals presents in these four super fruits (noni, black Plum, guava, bael).
- ii) To find out the antioxidant potential of superfruits
- iii) To find out the various health benefits of superfruits
- iv) To introduce India's underutilized tropical exotic fruits to the world.

Population and Sample:

Population of study is all Indian superfruits. Sample is taken from West Bengal only.
[Considered superfruits- Noni, Black Plum, Guava & Bael]

Data and Sources Data:

Secondary data is collected from renowned research journals, books and online resources.

Methodology:

The study is descriptive type & qualitative in nature. Findings are reached after analysing the data.

Analysis and Findings:**Botanical Characteristics of Chosen Superfruits:****Noni:**

Noni fruit scientifically called as *Morinda citrifolia* L., is grenade-formed and fleshy with lumpy marks at the surface. The fruit is semi-translucent and turns yellow when it ripens, after which it turns to whitish grey, and finally to brown whilst it senesces. It includes small reddish-brown buds. The gelatinous pulp with a mild yellow or whitish shadeation is juicy with a sour and sturdy rancid Odor¹⁰. Currently, noni products, which include juices and encapsulated powders, are famous purposeful ingredients in Asia & its native countries (Motshakeri, M., & Ghazali, H. M. 2015).

Black Plum:

Black plum or jamun, scientifically called as *Syzygium cumini*, belongs to the Myrtaceae family. It is originated from Asia, specifically India and Southeast Asia. The fruit is ovoid in form with a purple to black shadeation peel and the pulp has a greyish white shadeation and carries a massive purple seed. The juice of unripe is frequently used to put together vinegar at the same time as the ripe fruit is used to supply preserves, squashes, and jellies. In folk medicine, this fruit has been used as anti-scorbutic, diuretic, and for the remedy of gastrointestinal diseases. The primary use of the black plum fruit pertains to its anti-diabetic features (Gordon, A., Jungfer, E., da Silva, B. A., Maia, J. G. S., & Marx, F. 2011).

Guava:

Guava is scientifically called as *Psidium guajava* Linn. It is an important perennial fruit crop of the tropical and subtropical regions of the world. It originated in tropical America and gradually became a commercial significant crop in several other countries due to its hardy nature, prolific bearing and high remuneration without much care. India, Bangladesh, the Philippines and the Netherlands are the major guava-producing countries in the world. Guava known as 'apple of the tropics', it is an important perennial fruit tree grown in tropical and subtropical regions of the world. Guava fruit contains high amounts of vitamins C, A, B1 and B2 and good amount of minerals (Hayes 1970). The nutraceuticals, viz. β -carotene, lycopene and phenolic compounds along with high vitamin C, all with antioxidant activities, are the major constituents of red fleshed guava. Guava belongs to family Myrtaceae which contains approximately 130 genera and 3000 species of trees and shrubs distributed in the tropical and subtropical regions of the world (Corrêa, L. C., Santos, C. A. F., Vianello, F., & Lima, G. P. P. 2011). Shining bark and greying brown colour that comes off in scales with angular young shoots bearing flower that contains numerous stamens with inferior ovary and fruit and many seeded berries are the main characteristics of Myrtaceae family (Hayes, W. B. 1957).

Bael:

Bael is scientifically known as *Aegle marmelos* L. corr. It is a native plant of India and a sacred plant for Hindus. It is a medium-sized deciduous tree belonging to the Rutaceae family. In nature, it is abundant in the states of Uttar Pradesh, Orissa, West Bengal and Madhya Pradesh. The fruits have a good taste and contain 40 percent TSS. Bael tree is one of the most useful medicinal herbs in India. Its medicinal properties are described in the ancient Sanskrit medical treatise "Charaka Samhita". All parts

of this tree, including stem, bark, root, leaves and fruit at all stages of maturity, have medicinal virtues and have long been used in indigenous medicine. The ripe fruit has considerable medicinal value when it is just beginning to ripen. Ripe fruits are aromatic, astringent, cooling and laxative. Unripe or half-ripe fruits are stomachic, scurvy and digestive. Ripe bael fruits are considered the best laxative (Kumar, K. S., Umadevi, M., Bhowmik, D., Singh, D. M., & Dutta, A. S. (2012). It cleans and refreshes the bowels. Its regular use for two or three months can get rid of even old accumulated feces.

Bio Active Phytochemicals Find in Super Fruits:

Noni:

Noni fruits grown in different parts of the world have different types and amounts of photochemical compounds. Several classes of compounds have been isolated from noni fruit. The main secondary metabolites of noni fruit are phenols, anthraquinones and flavonoids, which play a key role in its medicinal properties. The main anti-inflammatory compounds in noni are scopoletin, quercetin and ursolic acid (Yu, H., Li, S., Huang, M. T., & Ho, C. T. 2008). Scopoletin, has been shown to have analgesic and anti-inflammatory properties (Levand, O., & Larson, H. O. 1979). Noni fruits have been reported to contain a new component, proxeronine, a precursor of the alkaloid xeronine, as well as proxeronase, which has a wide range of biological activities, including cell-enhancing and revitalizing effects (Potterat, O., & Hamburger, M. 2007). Infertile iridoids have been shown to have potential antigenotoxic activity without toxicity in vivo and in vitro. The antigenotoxic effect may be due to deacetylasperulosidic acid, which is one of the most important bioactive compounds in the fruit (West, B. J., Deng, S., & Jensen, C. J. 2011). Deacetylasperulosidic corrosive filtered from Noni fruit juice is reported to decrease malondialdehyde concentration and increase superoxide dismutase movement in vivo without influencing serum glutathione peroxidase movement (Ma, D. L., West, B. J., Su, C. X., Gao, J. H., Liu, T. Z., & Liu, Y. W. 2007). Other important biologically active compounds such as rutin, β -sitosterol, asperuloside and ursolic acid are found in Noni fruit (Pawlus, A. D., & Kinghorn, A. D. 2007). Two flavonoids (kaempferol and quercetin) and lignin isolated from Noni fruit strongly inhibited MAO-A and B and showed antidepressant effects (Deng, S., & West, B. J. 2011). Two other flavonoids in the fruit, catechin and epicatechin, have been shown to have antioxidant activity (Zin, Z. M., Hamid, A. A., Osman, A., & Saari, N. (2006). Thirteen compounds isolated from Noni fruit, including iridoid, hemiterpene, and fatty acid glycosides, showed melanogenesis-inhibiting effects in a cell-based assay, resulting in a 34-49% reduction in melanin with little or no toxicity (Akihisa, T., Seino, K. I., Kaneko, E., Watanabe, K., Tochizawa, S., Fukatsu, M. & Kimura, Y. 2010).

Black Plum:

Studies have shown that Jamun pulp contains anthocyanins, delphinidin, petunidin, malvidin-diglucosides and is responsible for the bright purple color (Baliga, M. S., Bhat, H. P., Baliga, B. R. V., Wilson, R., & Palatty, P. L., 2011). The fruits are rich in raffinose, glucose, fructose (Siddappa, G. S., & Bhatia, B. S. 1954), citric acid, malic acid (Shahnawaz, M., Sheikh, S. A., & Nizamani, S. M. 2009), delphinidin-3-gentiobioside, malvidin-3-laminaribioside, petunidin-3-gentiobioside (Venkateswarlu, G., 1952), cyanidin diglycosidic (Sharma, J. N., & Sheshadri, T. R. 1955). Studies have shown that Jamun pulp is nutritious and contains minerals such as sodium, potassium, calcium, phosphorus, iron and zinc and water-soluble vitamins such as ascorbic acid, thiamine and niacin; carbohydrates such as glucose, mannose, sucrose, maltose, fructose, galactose and mannose; free amino acids such as alanine, asparagine, tyrosine, glutamine and cysteine, chrysanthemum (Bobbio, F. O., & Scamparini, A. R. P. 1982), cinnamaldehyde (cis/trans), cinnamyl acetate (cis/trans), cinnamyl alcohol (cis/trans), citronellol, geraniol, geranyl acetate, linalool, linalool oxide, nerol, phenylethanol β , phenylpropane, phenylpropanol, 3, iron oxide etc. (Vernin, G., Vernin, G., Metzger, J., Roque, C., & Pieribattesti, J. C. 1991).

Bio Active Phytochemicals Present in SyzygiumCumini / Black Plum:

SL. NO.	Name of the compound	Class	Activity
1.	Acetyl oleanolic acid	Triterpenoid	Free radical scavenging, anti-inflammatory
2.	Anthocyanins	Flavonoid	Anticancer/tumour, antiaging and neurological diseases, antiinflammation, Antidiabetes, antibacterial and fibrocystic
3.	Betulinic acid	Triterpenoid	antiretroviral, antimalarial, anti-inflammatory, anticancer agent, antitumour, chemo preventive
4	Bergenins	Iso-coumarin	Antinociceptive, antiarrhythmic, antioxidative, antimicrobial, hepatoprotective, protective against gastric ulcers, anti-inflammatory, Insulin enhancing and lypolytic, Enhances Wound Healing
5.	Cinnamaldehyde, (cis/ trans)	Phenylpropanoid	Lipoxygenase/XOD-Inhibitor, antihyperuricemia, Acaricide, Antienterococcic, Antiescherichic, Antimutagenic, Antisalmonella, Ant staphylococcic, Ant urease, CNS Depressant/Stimulant, Candidicide, Choleric, Chronotropic, Cytotoxic, Histaminic, Hypotensive, Insecticide, Monoaminergic, Nematicide, Vibriocide
6.	Cinnamyl alcohol, (cis/ trans)	Phenylpropanoid	Antimutagenic, Nematicide
7.	Citric acid	Alkane	Antidiabetic- Stimulatives of the insulin release
8.	Delphinidin-3- o- β -d- gentiobioside Delphinidin-3- gentiobioside	Flavonoid-anthocyanin	Antineoplastic, Chemopreventive
9.	Ellagic acid	Coumarin	Chemopreventive, Radioprotective
10.	Ferulic acids	Phenols	Antibacterial, Allelopathic, Antiallergic, Anticancer (Liver), Anticarcinogenic, Antihepatotoxic, Anti-inflammatory, Antimitotic, Antimutagenic, Antineoplastic, Antioxidant, Antitumor, Antitumor (Liver), Antitumor (Skin), Arteriodilator, Candidicide, Cardiac, Cholagogue, Choleric, Hepatoprotective, Hepatotropic, Immunostimulant, Insectifuge,

			Metal-Chelator, OrnithineDecarboxylase-Inhibitor, Phagocytotic, Preservative, Prostaglandigenic, Prostaglandin- Synthesis-Inhibitor, Sunscreen
11.	Gallic acid	Benzenoid	Antineoplastic, Chemopreventive, Radioprotective,
12.	Isoquercetin	Flavonoid	Antielastase,Antifeedant, Anti- inflammatory, Antioxidant, Antitumor, Capillarigenic, Hypotensive, Insectiphile
13.	Lauric acid	Lipid	Antioxidant, COX-1-Inhibitor
14.	Linalool oxide	Monoterpen	prevent DNA damage, Acaricide, Antiallergic, Antianaphylactic, Anticonvulsant, Antiedemic, Antihistaminic, Antiinflammatory, Antiseptic, Antishock, Bronchorelaxant, Insecticide, Insectifuge, Nematicide, Prooxidant, Sedative, Termitifuge
15.	Oleanolic acid	Triterpenoid	Antineoplastic, Chemopreventive, Radioprotective, antidiabetic
16.	α -terpinene	Monoterpene	ACE-Inhibitor, Acaricide, Aldose- ReductaseInhibitor, Insecticide, Insectifuge, P450-2B1-Inhibitor

[Reference: Pharmacological potential of *Eugenia jambolana*, Chemical nature, stability and bio-efficacies of anthocyanins from fruit peel of *Syzygiumcumini* Skeels]

Guava:

Guava is popularly known as poor man's apple in the tropical countries of Asia, it has a long history of conventional use for a wide variety its fantastic flavour and dietary benefits]Joseph (B., & Priya, M. 2011). Guavas are often included amongst super-fruits, being wealthy in nutritional fiber, Vitamins A and C, folic acid, and the nutritional minerals, potassium, copper, and manganese. Having a commonly broad, low-calorie profile of critical nutrients, one single guava fruit carries approximately four instances the quantity of Vitamin C as an orange (Hassimotto, N. M. A., Genovese, M. I., &Lajolo, F. M. 2005). Strawberry guava (*Psidium cattleianum*), extensively containing 90 mg of Vitamin C in one serving. It has approximately 25% of the quantity found in more common varieties, in general Vitamin C content material in a single serving provides 100% of the Dietary Reference Intake for adult males(Paniandy, J. C., Chane-Ming, J., &Pieribattesti, J. C. 2000). Guavas contain both carotenoids and polyphenols are the predominant instructions of antioxidant pigments giving them fantastically excessive capacity antioxidant price amongst plant foods. As those pigments produce the fruit pores and skin and flesh color, guavas which might be red-orange have extra pigment content material as polyphenol, carotenoid and pro-Vitamin A, retinoid reassets than yellow-in experienced ones (Kaljee, L. M., Thiem, V. D., von Seidlein, L., Genberg, B. L., Canh, D. G., Tho, L. H. & Trach, D. D. 2004).

Bael:

Bael has big medicinal values. All the components of the plant are beneficial and utilized in ayurvedic medicines. Ripe bael fruit is one of the best-known herbal laxatives. Unripe or half-ripe fruit is very beneficial in treating continual diarrhoea and dysentery. It is likewise used for the remedy of

hepatitis, tuberculosis, colitis, and dyspepsia. The fruit is likewise seemed as a coronary heart and mind tonic. The uncooked fruit is an appetizer. The pulp of uncooked end result is powerful in treating bleeding piles and bacillary dysentery. Some of the vital coumarins found in bael are marmelosin, marmesin, imperatorin, marmin, alloimperatorin, methyl ether, xanthotoxol, scoparone, scopoletin, umbelliferone, psoralen, and marmelide Farooq, S. (2005). Marmelosin, skimmianine, and umbelliferone are the therapeutically energetic concepts of bael (Sharma, P. C., Bhatia, V., Bansal, N., & Sharma, A. (2007). Bael stimulates the manufacturing of bile, restorative, increases body's resistance, immunity, and improves digestion. Bael extracts are used to manipulate cholesterol, blood urea and additionally beneficial in relieving constipation (Kumar, K. S., Umadevi, M., Bhowmik, D., Singh, D. M., & Dutta, A. S. 2012). Bael inhibited in vitro proliferation of human tumormobileular strains which include the leukemic K562, T-lymphoid Jurhat, Beta-lymphoid Raji, and Erythro leukemic HEL (Lampronti, I., Martello, D., Bianchi, N., Borgatti, M., Lambertini, E., Piva, R., ... & Gambari, R. 2003).

Antioxidant Potential of Superfruits:

Superfoods contain several beneficial ingredients that the human body uses to improve overall health and treat certain diseases. Even in small quantities, superfoods are beneficial to the human body due to the amount of useful substances they contain. Some of the main superfoods like bael, noni, black plum, guava, have become important for human health. The most important benefit of superfoods has been shown to be their high antioxidant content, such as carotenoids, vitamins A and E and polyphenols. The formation of free radicals in the body is a consequence of normal biological processes, but overproduction has a harmful effect that destroys healthy cells, accelerates the aging process and greatly increases the probability of various diseases. At this point, antioxidant components prevent and prevent this process, trying to eliminate free radicals and suppress the pathophysiological conditions associated with various degenerative diseases. In a study conducted at the Department of Chemistry of the National and Kapodistrian University of Athens (Proestos unpublished work), the total amount of antioxidants (measured by the Ferric Reducing Antioxidant Power, FRAP test) and the total amount of phenolic components (measured by the Folin Ciocalteu method) were determined after extraction with 50% methane. The results showed a high concentration of total phenolic compounds in the superfruits. The price was the highest, which can be explained by the high concentration of anthocyanins. All superfoods are rich in polyphenols and especially flavonoids, which have high antioxidant activity. This also explains the high antioxidant activity observed in the same study for most of the superfoods with the highest values, **noni, black plum, guava, bael**. The high antioxidant activity of superfoods results from the high concentration of polyphenols on the one hand, and from the synergistic effect of polyphenols with other antioxidants, such as carotenoids and vitamins A, C, D, and E, on the other.

Reported Antioxidant Activities in Selected Superfruits:

Name of Superfruits	DPPHa EC50 (g/g DPPH)	ABTSa mmol TE/g	FRAPa mmol Fe2SO4/g	b-Carotene bleachinga %	ORAC
Noni	25 ^m	nr	11.2-11.9 ⁿ	nr	11 ^g
Black plum	-0.80		0.9		
Guava	12.76	8.68	2.87		5.52
Bael	6.21 µg dw/ µg DPPH		(102.74 µM TE/g dw		

mData are expressed as IC50 (mg/mL) (Girones-Vilaplana et al. 2014).

nData are expressed as mM Fe2C/g fw (Kumar et al. 2014).

gData are expressed as mmol TE/100 g fw (both hydrophilic and lipophilic ORAC activities) (USDA 2010).

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Health Benefits of Superfruits:

Health effects	Super fruits	Mechanisms	References
Antioxidative	Noni	Neolignan, Americano A, 3,3'-bisdemethylpinoresinol, morindolin, and isoprinzepine	Chemical constituents of <i>Morindacitrifolia</i> fruits inhibit copper-induced low-density lipoprotein oxidation; Chemical constituents of the fruits of <i>Morindacitrifolia</i> (Noni) and their antioxidant activity. Journal of Natural Products
	Black plum	Bergenins Ferulic acids Isoquercetin Lauric acid	S Ramya et al. / Journal of Pharmacy Research 2012,5(8),4548-4553
	Guava	Vitamin-C	Antioxidant activity of dietary fruits, vegetables, and commercial frozen fruit pulps. J Agric Food Chem
Cancer preventive effect	Noni	(scopoletin)	Using quality of life measures in a phase I clinical trial of noni in patients with advanced cancer to select phase II dose S Ramya et al. / Journal of Pharmacy Research 2012,5(8),4548-4553
	Black plum	Anthocyanins Betulinic acid Delphinidin-3- <i>o</i> - β - <i>d</i> -gentiobiosid Delphinidin-3-gentiobioside Ferulic acids Gallic acid Oleanolic acid	
	Bael	Caryophyllene Cineol cis-Limonene oxide cis-Linalool oxide	"Phytopharmacological properties of <i>Aegle marmelos</i> as a potential medicinal tree: an overview," "An eye-catching review of <i>aegle marmelos</i> L. (golden apple),"

			"In-depth pharmacological and nutritional properties of bael (aeglemarmelos): a critical review"
Cardio-protective	Black plum	Ferulic acids	S Ramya et al. / Journal of Pharmacy Research 2012,5(8),4548-4553
Anti-diabetic	Noni Black plum	Xeronine&proxeronine Citric acid	Antidiabetic effect of Morindacitrifolia (noni) fermented by Cheonggukjang in KK-Ay diabetic mice S Ramya et al. / Journal of Pharmacy Research 2012,5(8),4548-4553
Immune-stimulating effect	Bael	Marmelosin, skimmianine, and umbelliferone	A review on Bael tree
Anti-inflammatory compounds	Noni Black plum	Scopoletin, quercetin and ursolic acid Acetyl oleanolic acid Betulinic acid Bergenins Ferulic acids Isoquercetin Linalool oxide	Anti-inflammatory constituents in Noni (Morindacitrifolia) fruits. In: American Chemical Society Symposium Series S Ramya et al. / Journal of Pharmacy Research 2012,5(8),4548-4553
Neuro-protective effect	Noni	Proxeronine	Noni juice composition and process therefor. U.S. Patent Application
Memory enhancing effect	Noni	Rutin and scopoletin	Protective effect of fruits of Morindacitrifolia L. on scopolamine induced memory impairment in mice: a behavioral, biochemical and cerebral blood flow study
Pain relieving effect	Noni Black plum	Improved pain and bleeding scores with no reduction in menstrual pain Bergenins	Morindacitrifolia (noni) as an anti-inflammatory treatment in women with primary dysmenorrhoea: a randomised double-blind placebo-controlled trial S Ramya et al. / Journal of Pharmacy Research 2012,5(8),4548-4553
Antidepressant effects	Noni	Two flavonoids (kaempferol and quercetin) and lignin	Antidepressant effects of Noni fruit and its active principals

FINDINGS:

- After analysing the data, we can find that numerous kinds of bioactive phytochemicals like, Scopoletin, Anthocyanins, Betulinic acid, Ursolic acid, marmelosin, marmesin, imperatorin etc. powerful in treating bleeding piles and bacillary dysentery & can act as energy providers. Polyphenol act as Anti-inflammatory and Anti-atherosclerotic substance. Acetyl oleanolic acid shows Free radical scavenging, anti-inflammatory activity etc.
- Various kinds of antioxidant like Vitamin C, Flavonoids, Phenols etc. presents in noni, black Plum, guava and bael helps in scavenging free radicals from the body.
- A diet rich in superfruits like noni, black Plum, guava and bael shown to be beneficial for prevention of numerous non-communicable diseases as well as long term health.
- This kind of superfruits are easily available in surroundings but they are little known about their benefits, hence they are underutilized. If we utilized it properly and consumed it in daily basis we can save us from the expansion of retrogressive diseases.

CONCLUSION:

A number of superfruits having exceptional nutrients and high contents of phytochemicals (particularly phenolic acids and flavonoids) with associated antioxidant activities have been increasingly utilized. The compiled results indicated that many of their bioactive compounds remain to be fully identified and characterized (phenolic acids, flavonoids, and anthocyanins), especially for **noni, black plum, guava, bael**. Therefore, superfruits can be considered as valuable sources of functional food ingredients based on their phytochemical composition and related antioxidant activity as presented in this review. The phenolic compounds of superfruits are bio accessible and bioavailable in humans with some demonstrated health benefits, including antioxidant, anti-inflammatory, prebiotic, anti-microbial, chemopreventive, and hypocholesterolaemic activities. Additional well designed human intervention studies and clinical trials are needed to validate the health benefits of superfruits.

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