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**Pratik R Wankhade**

Department of Quality Assurance Smt. Kishoritai Bhoyar College of Pharmacy, Kamptee Rashtrasant Tukadoji Maharaja University, Nagpur, Maharashtra, India

**Rani D Gupta**

Department of Quality Assurance Smt. Kishoritai Bhoyar College of Pharmacy, Kamptee Rashtrasant Tukadoji Maharaja University, Nagpur, Maharashtra, India

**Renuka J Das**

Department of Quality Assurance Smt. Kishoritai Bhoyar College of Pharmacy, Kamptee Rashtrasant Tukadoji Maharaja University, Nagpur, Maharashtra, India

**Nishant B Awandekar**

Department of Quality Assurance Smt. Kishoritai Bhoyar College of Pharmacy, Kamptee Rashtrasant Tukadoji Maharaja University, Nagpur, Maharashtra, India

**Milind J Umekar**

Department of Quality Assurance Smt. Kishoritai Bhoyar College of Pharmacy, Kamptee Rashtrasant Tukadoji Maharaja University, Nagpur, Maharashtra, India

**Corresponding Author:**

**Pratik R Wankhade**

Department of Quality Assurance Smt. Kishoritai Bhoyar College of Pharmacy, Kamptee Rashtrasant Tukadoji Maharaja University, Nagpur, Maharashtra, India

## Review on pharmacological and phytochemistry of *Embelia ribes* plant

**Pratik R Wankhade, Rani D Gupta, Renuka J Das, Nishant B Awandekar and Milind J Umekar**

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### Abstract

*Embelia ribes* is a kind of *Embelia*. *Burm. f.* is a member of the *Myrsinaceae* family, which grows in hilly areas of India up to 1500 metres in elevation, from the outer Himalayas to the Western Ghats. *Embelia ribes* *Burm. f.* is a rare medicinal plant that has been studied extensively for its diverse medicinal characteristics. The use of medicinal plants in therapeutics is perhaps as old as recorded history. *Embelia ribes* is one of most significant medicinal plant. Nearly each part of this plant contains varied chemical constituents and is utilized within the treatment of various. Broad inquire about work has been detailed in last few decades on this important plant of *Embelia ribes* berries contain a few chemical constituents like embelin, volatile oil, fixed oil, resin, tannin, christembine, phenolic acids like caffeic acid, vanillic acid, chlorogenic acid, cinnamic acid, o-cumaric acid 4.33% of the embelin content is observed within the berries of *Embelia ribes* *Burm. F.* It is a critically endangered medicinal plant known for its digestive, carminative, and laxative effects. *Embelia ribes* also has the following properties: Antihelminthic, antibacterial, antioxidant, anti-diabetic, anticonvulsant, anti-cancer, and antihyperlipidemic, Antifungal, Antihyperhomocysteinemic, Molluscidal, Wound healing, Antifertility, Antihyperglycemic, Antitumor and anti-inflammatory, Chemotherapeutic, Contraceptive, Anxiolytic, Antidepressant, Antimitotic, Cardio protective effect, Antiobesity, and Antihyperlipidemic are all treated with it. *Embelia ribes* was studied for its hepatoprotective and analgesic properties.

**Keywords:** *Embelia ribes*, pharmacognosy, phytochemistry, pharmacological activity

### Introduction

The *Embelia ribes* *Burm. f.*, also known as *Vidanga* or *Baibidanga* in Ayurvedic medicine, has been an essential ingredient in a variety of ayurvedic compositions <sup>[1]</sup>. The three ancient Indian ayurvedic books, *Charakh Samhita*, *Sushurta Samhita*, and *Ashtanga hridayam*, all reference *Vidanga*. *Vidanga* is also stated to be employed in *Unani* (*Baobarang*), *Siddha* (*Vaivilangam*), *Folk*, *Tibetan* (*Byi dan ga*), and *Homeopathic* (*Embelia ribes*) medicinal systems, in addition to *Ayurveda*.

*Vidanga* has been linked to the herb *Embelia ribes* *Burm. f.* by many *Ayurvedic* and *botanists*. *Vidanga* was first listed as an official medicament in the *Indian Pharmacopoeia* in 1966, with the botanical origin being limited to the fruits of *E. ribes*. Since then, the dried berries of *E. ribes* fruits belonging to the *Myrsinaceae* family have been largely regarded as the botanical source of the narcotic *Vidanga*. Although *E. ribes* has been used in various therapeutic systems such as *Unani*, *Homeopathy*, and others, it has not been proven to be effective <sup>[2]</sup>.

In *Sanskrit*, this plant is known as *Krimighna*, *Vidang* in *Assamese*, *Marathi*, *Oriya*, *Bengali*, *Vavding* in *Gujarati*, *Vayavidanga* in *Hindi*, *Kannada*, *Babading* in *Kashmiri*, *Vizhalari* in *Malayalam*, *Babrung* in *Punjabi*, *Vayuvidangam* in *Tamil*, *Vayuvidangalu* in *Telugu*, and *Baobarang* in *Urdu* <sup>[3]</sup>. *Embelia ribes* *Burm. f.* Is also known as *White flowered Embelia* and *False Black Pepper*. At an altitude of 1,500 metres, *E. ribes* grows in semi-evergreen and deciduous forests in the middle and lower Himalayas, *Arunachal Pradesh*, *Assam*, *Bengal*, *Orissa*, *Andhra Pradesh*, and *Madhya Pradesh* <sup>[4]</sup>.

*Vidanga* is a scrambling shrub that resembles a climber. The roots are brownish grey in colour, with reddish roots that are hairy. With a mature girth of 45-72 cm, the stem is pale grey and studded with lenticels. Coriaceous leaves are elliptic, lanceolate, 6-14 cm long and 2-4 cm wide, alternating, acuminate entire, absolutely hairless, and petiole 1-0.8 cm

marginated. Flowers are pentamerous, small, white or yellow, and pentamerous. Fruits are small, 2.4-4 mm in diameter, ovate to subglobular in shape, tapping with style, smooth, juicy, wrinkled, and lacking a calyx. The seeds start off reddish, but as time goes on, they turn slightly black. Seeds are contained in brittle pericarp, which is covered by a thin membrane that, when removed, reveals a bright spot on the seeds that disappears following immersion in water. The seeds are hairy, have ruminated endosperm, and are depressed at the base. Aromatic and astringent, with a hint of pungency in the finish. The fruits, leaves, and roots of this plant are used to treat a variety of ailments [5]. The entire plant is used to cure rheumatism and fever, as well as abdominal and lung illnesses, constipation, indigestion, fungal infections, mouth ulcers, sore throats, pneumonia, heart disease, and obesity [6].

The fruit has a harsh taste, makes a nice appetiser, and is used to treat tumours, ascites, bronchitis, jaundice, and mental illnesses [7]. The fruit of *Embelia ribes* has been noted as having the best krimighna (wormicidal) properties against infections in Ayurvedic texts [8]. Seeds have antibacterial, anthelmintic, antituberculosis, alterative, and stimulative properties [2]. The leaves are astringent, demulcent, and depurative, and can be used to treat pruritus, sore throats, mouth ulcers, indolecent, skin disorders, and leprosy [9]. *Embelia ribes* fruits contain the quinone derivative embelin (3-undecyl 2, 5- dihydroxy, 1,4-benzoquinone), the alkaloid christembine [10] and the volatile oil vilangin; its chemical components are 2,5-dihydroxy-4-undecyl-3,6-benzoquinone, 2,5-dihydroxy-4-undecyl-3,6-benzoquinone, and the alkaloid [11]. Embelic acid, tannins, christembine, and embelin [1] are all prominent ingredients of the fruit. There's also vilangin, 2, 5-isobutylamine salts, quercetol, and volatile oil [11-14]. Embelin was antibacterial as well as anticonvulsant. *Embelia ribes* extracts demonstrated strong anthelmintic [17-20] antioxidant [21-22], neuroprotective [23], antifertility, and antiestrogenic activities [24].

### *Embelia ribes*

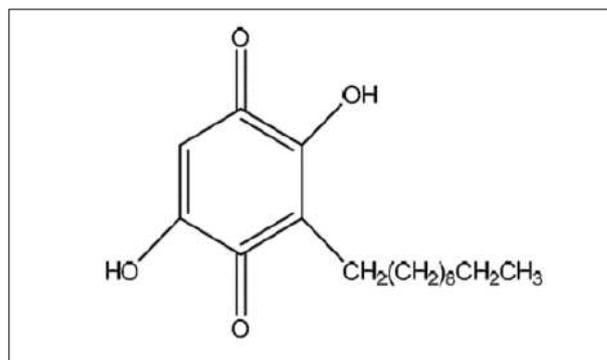
*Embelia ribes* Burm F. is large scandent shrub, disturbed throughout India and has a place to the family Myrsinaceae. It is commonly known as false black pepper or Vidanga. E. [25] Ribes grows in semi-evergreen and deciduous timberlands at an height of 1,500m found in central and lower Himalayas, Arunachal Pradesh, Assam, Bengal, Orissa, Andhra Pradesh and Madhya Pradesh all through India [26].



**Fig 1:** Fruiting of *Embelia ribes* Brum f.

### Phytochemistry

The ripe fruits of *E. ribes* are the most commercially valuable component of the plant because they contain Embelin, the active chemical [27].



**Fig 2:** Chemical Structure of Embelin

*Embelia ribes* berries contain several chemical constituents such as embelin, volatile oil, fixed oil, resin, tannin, christembine, phenolic acids such as caffeic acid, vanillic acid, chlorogenic acid, cinnamic acid, and o-cumaric acid, and phenolic acids such as caffeic acid, vanillic acid, chlorogenic acid, cinnamic acid, and o-cuma. The berries of *Embelia ribes* Burm F have 4.33 percent of the embelin content. Potassium embelate, methylenebis (2, 5-dihydroxy-4-undecyl-3-6-benzoquinone), embelin, quercitol, fatty components, and vilangin are all found in the plant. Along with embelin, three novel compounds were recovered from the seeds of *Embelia ribes*: embelinol, embeliaribyl ester, and embeliol [28]. The seeds of *E. ribes* were also found to include Cr, K, Ca, Cu, Zn, and Mn, as well as a high carbohydrate content [25-29].

N-(3-carboxylpropyl)-5-amino-2-hydroxy-3-tridecyl-1, 4-benzoquinone, an uncommon nitrogen-containing 3-alkyl-1, 4-benzoquinone derivative, and a gomphilactone derivative, 5,6-dihydroxy-7-tridecyl-3-[4-tridecyl-3-hydroxy-5-oxo 2(5H)-furylidene] -2-oxo-3(2H) Ethanolic extract was used to isolate -benzofuran from the roots of *E. ribes* [28].

The aqueous and alcoholic extracts were subjected to a qualitative analytical test to evaluate the presence of several phytoconstituents such as alkaloids, carbohydrate, saponins, phenolic compounds, proteins, oil and fats, and mucilage for preliminary phytochemical screening. The fruit powder of *Embelia ribes* was subjected to a qualitative photochemical screening [29].

**Table 1:** Phytochemical Screening of *Embelia ribes* [29].

S. No.	Test	Alcoholic Extract	Aqueous extract
1.	Test For Carbohydrates	+ve	+ve
	Test for Gum	+ve	+ve
	Test for Mucilage	+ve	-ve
2.	Test For Proteins	-ve	-ve
3.	Test For Amino acid	+ve	+ve
4.	Test For Steroid	+ve	-ve
5.	Test For Glycoside		
	Test For Anthraquinone Glycoside	+ve	+ve
	Test for Flavonoids	+ve	+ve
	Test for Saponin Glycoside	+ve	+ve
6.	Test For Alkaloids	+ve	+ve
7.	Test For Tannins and Phenolic compound	+ve	+ve

**Pharmacological Activity**



**Fig 3:** Pharmacological Activity of *Embelia ribes* brum f.

*E. ribes* is being studied scientifically to prove its potential to cure and treat many ailments, based on folk and

traditional applications [30]. Table 2 lists some of the documented pharmacological activities of *E. ribes* [31].

Activity/ Disease	Extract/derivatives/Salts	Tested Organism	References
Analgesic activity	Embelin Embelin- desalts Potassium embelate	Rat	[32] [33] [34]
Anthelmintic activity	Aqueous and alcoholic extracts	<i>Pheritima posthuma, Haemonchus contortus, Taenia canina, Phamphistomum cervi</i>	[35, 36, 37, 38,]
Antianxiety activity	Embelin	Rat	[39, 40, 41]
Antibacterial activity	Aqueous and ethonolic extracts aryl substituted benzoxadiazine	<i>Bacilus subtilis, Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa</i> <i>Bacillus polymyxa</i> and <i>Proteus vulgaris</i>	[42, 43] [44]
Antinematodal activity	Seed oil	Goat	[45]
Ascaricidal properties	Seed oil	Taenia and Hookworm	[46]
Anticancer activity	Embelin	fibrosarcoma cell line	[47]
	5-O-ethylembelin, 5-O-methylembelin(derivatives)	HeLa cell line	[48, 49]
	Embelin	PC-3 xenograft model	[50]
	Embelin	HepG2 cells	[51]
	Embelin	Wistar rats	[52]
	Embelin	MCF-7 cancer cells	[53]
	Embelin	Human leukaemic cells (K562) and Dalton's Lymphoma ascites cells (DLA)	[54]
osteoporosis and cancer-linked bone loss	Embelin	Breast cancer cells	[55, 56]
Anticonvulsant activity	Embelin	Rat	[57]
Antidepressant activity	Embelin	Mice	[58]
Antifertility activity	Embelin	male albino rats	[59, 60, 61, 62, 63]
	<i>E. ribes</i> berries	male bonnet monkeys	[64]
	Embelin	rabbits	[65]
	Embelin	female Sprague-Dawley rats	[66, 67]
Antifungal activity	Seed Extract	<i>Colletotricum crassipes, Cladosporium, Armillaria mellea, Colletotricum capsici, Aspergillus niger, Rhizopus oryzae, Aspergillus terreus</i> and <i>Candida</i>	[68]

	Embelin	<i>Candida species</i>	[69, 70, 71]
Antigenotoxicity activity	Embelin	mouse bone marrow cells	[72]
Antihistamic activity	Embelin	guinea pigs	[73]
Antimitotic activity	2-hydroxy-5-substituted-3-undecylcyclohexa-2,5-diene-1,4-diones (derivatives)	Bengal gram seeds and germinating Onions	[74]
Antioxidant and Neuroprotective activity	Embelin	Rat	[75, 76]
	ethonolic extracts	Male Wistar albino rats	[77,78]
	Embelin	peripheral blood human lymphocytes	[79]
Cardioprotective activity	Aqueous and alcoholic extracts	Rat	[80, 81, 82]
Cosmetic agent	Embelin	-	[83]
Wound healing activity	ethonolic extracts, Embelin	Swiss Albino Rats	[84, 85]
Nephroprotective activity	ethonolic extract, Embelin	albino rats	[86, 87]
Antidiabetic activity	ethonolic extract, Embelin	Wistar rats	[88, 89, 90, 91, 92]

### Analgesic activity

Embelin is a centrally acting non-narcotic analgesic that can be taken orally. It has a distinct core site of action than naloxone and is not antagonistic to it. Because of its great oral efficacy, therapeutic index, and lack of abstinence syndrome, it is more tolerable than morphine. Naloxone has been shown to block  $\mu$  ()-receptor-mediated action in narcotic analgesics [93-94].

### Anthelmintic activity

When *Embelia ribes* seed oil was given in different doses, such as 10 mg/ml, 50 mg/ml, and 100 mg/ml, the worms died (*Pheretima posthuma*). But reaction of worms to different doses differed in the time of paralysis parameter. The time of paralysis was reported to be shorter as the dose was increased. When compared to conventional piperazine citrate (10 mg/ml), the results are considerable. In goats with mixed gastrointestinal nematode infections, *Embelia ribes* fruit extract combined with *Veronica anthelmintica* seed extract administered at 1g/kg resulted in a significant reduction in the number of faecal eggs per gramme (EPG) [95, 96].

### Antianxiety activity

Behavioral parameters were used to assess anxiolytic action in the elevated plus maze test, open field test, and light and dark test. The number of entries and percentage of time spent in open arm increased in the elevated plus maze. Embelin has a notable anxiolytic effect [97], which lowers the natural aversion to light and increases the duration spent in the illuminated compartment in a dose-dependent manner. The agonistic impact on the GABA/benzodiazepine receptor combination could explain the observed activity [98].

### Anti-bacterial activity

When compared to the conventional medicine nitrofurazone, which has a 22 mm diameter of zone of inhibition against the test organism *Bacillus subtilis*, *Embelia ribes* at a dose of 500 mg/50ml reported a 12 mm diameter of zone of inhibition. *Embelia ribes* had no antimicrobial or inhibitory activity against *Pseudomonas aeruginosa*, *Staphylococcus aureus*, or *Escherichia coli* [99-100].

### Antinematodal activity

In goats, the antinematodal action of a combination of *Veronia anthemintica* seed (Kali zeeri) and *Embelia ribes* fruit (Babrang) was tested. EPG (Egg per gramme) counts were performed in the faeces before and on the 3rd, 10th, and 15th days of treatment with the powder in 0.5, 1, and 2 g/kg body weight doses, as well as water and methanol

extracts equivalent to 2 g/kg of the original powder. On the 15th day after treatment, data analysis revealed that 2 extract and 0.01 g/kg morantel tartrate are equally efficacious and safe in treating natural gastrointestinal nematodes in local goats [101].

### Ascaricidal properties

*Embelia vibrations* (fruit) is used to treat goats with gastrointestinal nematode infections by administering seed oil extract to *Taenia* and Hookworm [46].

### Anti-cancer activity

In rats with experimental fibrosarcoma, embelin has been shown to reduce tumour size and block the increase in activity of serum enzymes such as acid phosphatase, -glutamyl transferase, lactate dehydrogenase, aldose, and others. In tumor-bearing mice, Embelin disrupts glucose and amino acid metabolism. In adult male Wistar rats, embelin 50 mg/kg/day in conjunction with curcumin 100 mg/kg/day reduced N-nitrosodiethylamine-induced hepatic hyperplastic nodules, body weight loss, increases in hepatic diagnostic markers, and hypoproteinemia. The osteoclasts are the ones who cause the osteolysis seen in tumour bone metastases. RANKL (receptor activator for nuclear factor kB ligand), a member of the TNF superfamily and a signalling pathway activator, has emerged as a prominent mediator of bone loss, which is usually associated with cancer and other chronic inflammatory illnesses [102-103].

### Anticonvulsant activity

Embelin i.p. (intraperitoneal) treatment at doses of 2.5, 5, and 10 mg/kg body weight effectively reduced seizures caused by electroshock and pentylenetetrazole, with action comparable to phenytoin and diazepam. Significant reduction in motility demonstrated C.N. S depressive action. The finding implies that embelin has anticonvulsant properties in both grand mal and petit mal epilepsy [105].

### Antidepressant activity

Antidepressant action was achieved by injecting embelin into mice via the intraperitoneal route 30 minutes before the onset of experimental depression. Embelin has been discovered to have therapeutic potential in the treatment of mental depression [104].

### Antifertility activity

*Embelia ribes* Burm was used to extract the embelin. At doses of 0.3, 0.4, and 0.5 mg/kg body weight applied subcutaneously for 35 days, berries changed testicular histology and glycogen, gametogenic counts, and accessory

sex gland fructose. The chemical is thought to have anti-androgenic properties. An oral herbal contraceptive would allow couples to control their fertility without having to contact a doctor, resulting in a significant increase in the number of couples using family planning. *Davcus carota*, *Butea monosperma*, and anti-implantation action); and *Mentha arvensis* (pregnancy prevention) (leaves have anti-implantation effect). There are numerous references in India to plants that have antifertility characteristics <sup>[105]</sup>.

#### Antifungal activity

The test technique NCCLS was used to evaluate the antifungal activity of *Embelia ribes* utilising standard in vitro antifungal susceptibility (The national committee for clinical laboratory standard M27-A2 Protocol). The NCCLS approach demonstrated that the methanol extract of *Embelia ribes* and embelin had the lowest MIC50 range of 120 mg/L against *Candida albican* (MTCC no. 183) and that embelin had the highest MIC50 range of 120 mg/L among the four *Candida* species tested MIC50 <sup>[106]</sup>.

#### Antimitotic activity

Embelin and Embelin derivatives have antimitotic properties <sup>[107]</sup>.

#### Antioxidant property

The levels of pancreatic superoxide dismutase, catalase, and glutathione in streptozotocin (at a dose of 40 mg/kg, intravenously as a single dose) induced diabetic rats were significantly reduced by an aqueous extract of *Embelia ribes* administered orally at doses of 100 mg/kg and 200 mg/kg body weight. In streptozotocin-induced diabetic rats, its antioxidant activity protects the pancreatic  $\beta$ -cells from loss <sup>[108]</sup>.

#### Cardio protective effect

*E. ribes* aqueous extract significantly reduced systemic blood pressure and heart rate. Elevated blood creatinine kinase, serum lactate dehydrogenase, and dramatically increased myocardial endogenous antioxidants levels are other possible outcomes <sup>[109]</sup>.

#### Wound healing property

Both *Embelia ribes* ethanolic extract (30 mg/ml) and embelin showed considerable wound healing efficacy. The epithelialization of the incision wound was faster in embelin-treated groups (4 mg/ml of 0.2 percent sodium alginate gel) with a high rate of wound contraction. The incision wound's tensile strength was substantially higher than that of the ethanol extract. In addition, the weight of the granulation rose in the deed space model, indicating a rise in collagenation. Histological analysis of the embelin-treated group's granulation tissue revealed enhanced cross-linking of collagen fibres and the absence of monocytes. The results are compared to those of framycetin, a common skin treatment <sup>[110]</sup>.

#### Anti-diabetic activity

In streptozotocin (administered at a dose of 40 mg/kg, intravenously single dose) induced diabetic rats, aqueous extract of *Embelia ribes* fruits at doses of 100 and 200 mg/kg orally fed for forty days caused a significant (p0.01) decrease in heart rate, systolic blood pressure, blood glucose, blood glycosylated haemoglobin, serum lactate

dehydrogenase. In this investigation, gliclazide is employed as a control. Further research found that an ethanolic extract of *Embelia ribes* fruits reduced pancreatic thiobarbituric acidreactive substances (TBARS) in diabetic rats' pancreatic tissue considerably (p0.01) <sup>[111]</sup>.

#### Antihyperglycemic activity

Oral herbal medicines based on folk medicine have been used to treat diabetes mellitus. The anthelmintic action of *Embelia ribes* burm (Myrsinaceae), also known as vidanga, was used in Ayurveda. Vidanga is pungent, according to Ayurveda. Increases digestive fire, which relieves gas and colic. In a single study, the antihyperglycemic activity of *E. ribes* decoction in glucose-induced diabetes in rats was studied, as well as the lipid-lowering and antioxidant capacity of ethanolic extract of *E. ribes* Burm in streptozotocin (40 mg/kg, IV, single injection)-induced diabetes <sup>[112]</sup>.

#### Antihyperlipidemic activity

When compared to pathogenic diabetic rats induced by streptozotocin (at a dose of 40 mg/kg intravenously), ethanolic extract of *Embelia ribes* administered orally at a dose of 200 mg/kg for 20 days showed a significant (p0.01) decrease in blood glucose, serum total cholesterol and triglycerides, and an increase in HDL-cholesterol levels. The extract also reduced thiobarbituric acid reactive substances in the liver and pancreas. (TBARS) values (p<0.01) when compared to TBARS values of liver and pancreas of the pathogenic diabetic rats <sup>[113]</sup>.

#### Antihyperhomocysteinemic activity

The anti-hyperhomocysteinemic activity of *Embelia ribes* was tested in adult male Wistar rats with hyperhomocysteinemia. Methionine therapy (1 g/kg p.o.) for 30 days was used to generate hyperhomocysteinemia. The administration of *Embelia ribes* aqueous extract (100 and 200 mg/kg p.o.) to hyperhomocysteinemic rats for 30 days decreased homocysteine, LDH, total cholesterol, triglycerides, LDL-C, and VDL-C and elevated HDL-C levels in serum substantially (p0.01). The results are comparable to the standard antihyperhomocysteinemic drug folic acid <sup>[114]</sup>.

#### Molluscicidal activity

*Embelia ribes* fruit powder was employed against *Lymnea acuminata* in binary and tertiary combinations with *Azadirachta indica* and *Cedrus deodara* oil, as well as synergists MGK-264 and piperonyl butoxide (PB) in binary and tertiary combinations. The hazardous effects of these mixes were found to be time and dose dependent. In comparison to the single treatment of plant-derived molluscicides with synergists, the binary and tertiary combinations of plant-derived molluscicides with synergists were more harmful <sup>[115]</sup>.

#### Antiproliferative activity

The biological activity of 5-O-ethyl-embelin (1) and 5-O-methyl embelin (2), both 1, 4-benzoquinone derivatives, were studied. When compared to normal marsupial kidney cells, both displayed antiproliferative efficacy against a panel of human carcinoma cell lines (Ptk2). In a dose- and time-dependent manner, they arrested HL-60 cells in the G (0)/G (1) phase of the cell cycle. Exposure to 100 microM

of 1 or 2 for 6 hours caused total breakdown of the microtubule network in HeLa cells, as well as an increase in the number of cells halted in mitotic phases. In HL-60 cells, treatment with 10 microM of 1 and 2 for 24 hours caused apoptosis. This evidence suggests that both 1 and 2 are promising novel antimetabolic and anticancer molecules targeting microtubular proteins [116].

#### Antispermatic activity

The active principle of *Embelia ribes* Burm seeds, Embelin, has been isolated and its purity verified. The substance inhibited: a) epididymal motile sperm count, b) fertility indices such as pregnancy attainment and litter size, and c) the activities of glycolysis and energy metabolism enzymes after daily subcutaneous treatment of 20 mg/kg body weight to male albino rats for 15 or 30 days. After 15 and 30 days of recuperation, these modifications were reversible. When embelin was added to epididymal sperm suspensions, it inhibited spermatozoal motility and glucose metabolism enzyme activity in a dose and duration-dependent manner. [117].

#### Antitumor and anti-inflammatory activities

Embelin, a plant-based benzoquinone derivative, was reported to have anticancer effect in albino rats with methylcholanthrene-induced fibrosarcoma, as well as increasing their survival time. The medicine also has a significant anti-inflammatory and pain-relieving effect. The effects of tumour treatment on DNA, RNA, and protein levels in various organs were also investigated. [118]

#### Chemotherapeutic activity

Identifying the active chemical constituents of ancient medications, as well as their molecular targets, is an appealing therapeutic goal. Embelin, a substance derived predominantly from the *Embelia ribes* plant, has been found to have chemopreventive, anti-inflammatory, and apoptotic properties via an unknown mechanism. Because nuclear factor kappaB (NF-kappaB) regulates multiple genes linked to apoptosis, researchers hypothesised that embelin's activity could be mediated via NF-kappaB activation [119].

#### Contraceptive activity

Plants were identified and collected around India in the hunt for historically medicinal plants with contraceptive potency, most of which were purchased from Ayurvedic remedy sellers. Different organic solvents were used to air dry, cut, and process the plants. Rats, mice, and hamsters were used to test the herbs' contraceptive qualities. Orally administered doses of 100-200 mg/kg of 137 plants were given to 5-6 animals per plant. 27 appeared promising enough to warrant additional investigation, with adult rats receiving 2-3 extracts from each plant. 14 plants were shown to have contraceptive properties. *Artabotrya odoratissima* Linn and *Embelia ribes* Burm were discovered to exhibit fascinating biologic features but string hazardous consequences [120].

#### Anti-obesity activity

Ethanol extract of *E. ribes* reduced serum levels of leptin by 45 percent, insulin by 37 percent, glucose by 28 percent, total cholesterol by 18 percent, and triglycerides by 24 percent, while increasing HDL-C by 31 percent. Furthermore, in obese rats, extract of *Embelia ribes* reduced

myocardial lipid peroxidation and enhanced antioxidant levels [121].

#### Hepatoprotective activity

In mice, an extract of *E. ribes* showed hepatoprotective action. Paracetamol was found to cause hepatocellular damage. The amount of SGPT in mice treated with extract is reduced in a dose-dependent manner [122].

#### Conclusion

The medicinal scrambling shrub climber *Embelia ribes* Burm f. belongs to the Myrsinaceae family. Phytochemical screening of *Embelia ribes* Burm f. were used as standardising parameters in the current study. Identification of plants has become a key challenge in Ayurveda, Siddha, and other Indian traditional systems of medicine, as our source of information. The traditional use and research work on biological activity of *Embelia ribes* suggest that it could be used in treatment of several diseases such as Anthelminthic, Anti-bacterial, Antioxidant property, Anti-diabetic, Anticonvulsant, Anti-cancer, Antihyperlipidemic, Ascariocidal properties, Antifungal, Wound healing, Antihyperhomocysteinemic, Molluscicidal, Antifertility, Antihyperglycemic, Antinematodal, Antiproliferative, Antispermatic, Antitumor and anti-inflammatory, Chemotherapeutic, Contraceptive, Anxiolytic, Antidepressant, Antimetabolic, Cardio protective effect, Anti-obesity, Hepatoprotective, Analgesic activity and also more research work should be carried out on isolated constituent.

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