wjpmr, 2024, 10(12), 60-71

SJIF Impact Factor: 5.922

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.wjpmr.com

Review Article

ISSN 2455-3301

WJPMR

A REVIEW ON *VIDANGA (EMBELIA RIBES* BURM. F.) IN BRIHTRAYI AND NIGHANTUS: AN OVERVIEW

Premlata[1]* and B. Ram[2]

[1]Senior Resident, Department of Dravyaguna, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India 221005.

[2]Professor, Department of Dravyaguna, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India 221005.

***Corresponding Author: Premlata**

Senior Resident, Department of Dravyaguna, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India 221005.

Article Received on 06/10/2024 **Article Revised on 26/10/2024** **Article Accepted on 16/11/2024**

ABSTRACT

Objective: This review article aims to reveal the classical uses of *Vidanga* for health and wellness in the various disorders. **Data Source:** The available literature on *Vidanga* was collected from original scriptures, classical Ayurvedic texts and scientific databases like PubMed, Google Scholar etc. with *Vidanga* and *Embelia ribes*. **Review Methods:** This article reveals the ancient inventiveness behind the therapeutic use of *Vidanga* from ancient india to contemporary science. The traditional application confirms that the principles of available *Ayurvedic* classics in various periods in India have been too scientific and authentic. **Conclusion:** In this research work, it was found that *Vidanga* overcome diseases of Mutravaha srotasa and also act as a rasayan. Various herbal, Herbo-mineral and Polyherbal compound formulations of *Vidanga* used to maintain the overall health of individual.

KEYWORDS: *Vidanga*; *Embelia ribes Ayurveda*, Briahtrayi, Nighantus etc.

INTRODUCTION

Vidanga has been identified as *Embelia ribes* Burm.f. (Family- *Myrsinaceae*), large scandent shrub distributed throughout hilly parts of India upto 1600m.[1] *Vidanga* was first listed as an official medicament in the Indian pharmacopoeia in 1966, with the botanical origin being limited to the fruits of *Embelia ribes*.[2] In *Caraka Samhita Sutra sthana* 25, *Vidanga* is known as best *krimighna*.[3] A large scandent shrub, branches long, slender, flexible, with long inter nodes, the bark studded with lenticels. Leaves coriaceous, 5-9 by 2-4cm, elliptic or elliptic lanceolate, shortly and obtusely acuminate, entire, glabrous on both surfaces. Shining above, paler, and somewhat silvery beneath, the whole surface covered with scattered minute reddish sunken glands, base rounded or acute, main nerves numerous, petioles 6-15mm long, more or less marginate, glabrous. Flowers 5 -merous, numerous, small, in lax panicled racemes which are terminal and form the upper axis, branches of the panicle often 8-10cm long with more or less glandular-pubescent rachises, pedicles 1.5-2mm long, glandular-pubescent, bracts minute, setaceous, deciduous. Calyx about 2mm long, sepals connate about 1/3 of the way up, teeth 5, broadly triangular-ovate, ciliate, petals 5, greenish-yellow free, 4mm long. Elliptic sub-obtuse, pubescent on both sides. Stemens 5, shorter than the petals, erect, filaments inserted a little below the middle of the petals. Fruit globose, 3-4mm in diameter, smooth, succulent, black when ripe, like a pepper-corn when dried, tipped with the persistent style enclosing a single seed covered with membrane. Flowering season: February-April.[4]

Fig. 1: Showing A. Plant of *Embelia ribes* Burm. f. B. Dry Fruit of *Embelia ribes* Burm. f.

Table 1: Ayurvedic Properties Of *Embelia Ribes.*[1]

Rasa	Tikta
Guna	Llaghu, Tikta
Virya	Ushna
Vipaka	Katu
Prabhava	Krimighana

2. MATERIAL AND METHODS

The full review of original classical Ayurvedic texts from different periods and scientific database was done.

2.1 Caraka Samhita (1000 B.C.E – 4th Cent.)

Vidanga is mentioned one among the nineteen most important phala dravya (C.Su.1/81). This is particularly suggested for the purpose of virechana (C.Su.1/87).[5] It is also one among Sirovirecana dravya and stated to be useful in Sirogaurava, Soola, etc.(C.S.2/3).[6] It is also one among Ṭrptighna mahakasaya (C.S. 4/11), Kusthaghna mahakasaya (C.S.4/13), krmighna mahakasya (C.S. 4/15) and Sirovirecanopagani mahakasaya (C.S.4/27).[7]

Following are the contexts in which *Vidanga* has been mentioned: Table 2.

S. N.	Preparation	Indication/Action	References
1.	Churna	Medoroga	C.Su.21/23[8]
2.	Vyosadhya Saktu	Prameha, Kustha, Arsha,Kamala	C.Su.23/19[9]
3.	Kaphaja pramehahara yoga	Kaphaja prameha	C.Ci.6/27-28[10]
4.	Madhvasava	Kaphaja and pittaja prameh, Panḍuroga	C.Ci.6/41[11]
5.	Vidangadi taila	Kustha, Arsa	C.Ci.4/18[12]

2.2 Sushruta Samhita (1000 B.C.E – 5th Cent.)

Earliest reference is of the use of Vidanga for gharshana when pracchanakarma fails in bloodletting (S.Su.14/35).[13] Vidanga, Pippali, Madhu,and Ghrta have been advocated for use after one year i.e. Puraṇa. All other drugs are suggested for use in fresh condition (S.Su.36/7-8).[14] Oil extracted from its fruit is effective in Krmi, Kustha, Prameha and Siroroga (S.Su.45/115).[15]

The following are the references of Vidanga: Table 3.

S. N.	Preparations	Indication/Action	References
1.	Dhanvantara ghrta	Meha, Gulma,, Asha Pliha,Vidradhi, Pidika	S.Su.12/5[16]
2.	Vidangadi taila	Anuvasana relives Pliha, Kaphaja roga, Prameha, Arsha	S.Su.37/39[17]
3.	Kalyanaka sarpi	Sarpaviṣa,ApasmÁra,Panḍuroga,	S.K.6/8[18]

2.3 Astanga Hridaya (7th Cent.)

In Astanga Hridaya katuskanda dravyas include Hingu, Maricha, Krmijita, Panchkola, Kuthera, Aruskara (A.H.Su.10/30).[19] Guda, Ghrta, Madhu, Dhanya, Pippali and Vidanga are advised to be used after one year of collection (A.H.K.6/6).[20]

References are enlisted below: Table 4.

S. N.	Preparations	Indication/Action	References
1.	Madhukasava	Grahani, Prameha	A.H.Su.10/47[21]
2.	Kasaya	Kaphaja Prameha	A.H.Su.12/7[22]
3.	Dhanvantara ghrta	Meha, Gulma, Arsha Pliha, Vidradhi, Pidika	A.H.Su.12/22[23]

2.4 *VIDANGA* IN NIGHANTU

2.4.1 SOUSRUTA NIGHANTU (7th CENTURY A.D.)[24]

Vidanga has been mentioned in surasadi gana. It has following synonyms- Vella, Govarniya, Citratandula and krmighnam (Surasadi gana/132) as described in this nighantu. Surasadi gana in general is stated to be effective against krimi, Pratishaya, Aruchi, Shvasa, Kasa and Vrana (Surasadi gana 140).

2.4.2 SIDDHASARA NIGHANTU (7TH CENTURY A.D.)[25]

It has been written by Ravigupta and presently available in the form of manuscript. In this manuscript only one synonym i.e. Krimisatru is found.

2.4.3 ASTANG NIGHANTU (8th CENTURY A.D.)[26]

The author *Acharya Vahata* adds the synonym Shvetatandula. The other synonyms are Krimijita, Valli, Kirita. This is included in Surasadi gana (15/133).

2.4.4 PARYAYA RATNAMALA (9TH CENTURY A.D.)[27]

The author of this nighantu is Acharya M*a*dhavkar. He mentioned the synonyms Jantughna, Bhashmaka, Vell*a*, Krimighna, Citratandula, Krimisatru, Gardabha and Kairala.

2.4.5 MADANADI NIGHANTU (10TH CENTURY A.D.)[28]

Viḍaṅga has been included in Madanadigaṇa by the author, Candranandana. He attributes the synonyms Krmijita, Vell*a*, Amogh*a*, Citratandula, Krmishatru, Krimihara, Jantughna, Krimin*a*shana. In addition he also described the properties of Vidanga. It has katu Vip*a*ka and Kaphav*a*taprashama property.

2.4.6 SHABDACANDRIKA (11TH CENTURY A.D.)[29]

The author being Cakrap*a*nidatta includes it in Vriksadi varga. Tandula and Krimighna are mentioned by him.

2.4.7 DRAVYAGUNA SAMGRAHA (11TH CENTURY A.D.)[30]

Vidanga has been placed in phalavarga. It is stated to have Ruksa, Usna, Katu Vip*a*ka, Laghu guna and V*a*takaphahara property with ishat tikta rasa.

2.4.8 SADARASA *NIGHANTU* (12TH-13TH CENTURY A.D.)[31]

Vidanga is included in Katuskanda dravyas. Also synonyms Krimijita, Vell*a*, Citratandula, Kairala, Jantuhrta and Rogatandulam are mentioned.

2.4.9 SHODHALA *NIGHANTU* (12TH CENTURY A.D.)[32]

Vidanga is mentioned in Shatapusp*a*di varga of N*a*msamgraha and Guṇasamgraha.

2.4.10 SIDDHA MANTRA PRAKASHA (13TH CENTURY A.D.)[33]

Acharya Keshava has included it in Kaphav*a*taghna varga.

2.4.11 HRDAYADIPAKA *NIGHANTU* (13TH CENTURY A.D.)[34]

Vidanga, Krimijita, Vell*a*, Jantughna and Krimihari are synonyms mentioned by Bopadeva.

2.4.12 MADHAVA DRAVYAGUNA (13TH CENTURY A.D.)[35]

M*a*dhavakara places the drug in Vividhausadhi varga.

2.4.13 MADANAPALA *NIGHANTU* (14TH CENTURY A.D.)[36]

Vidanga is mentioned in Sunthy*a*di varga. Synonyms of Vidanga like Jantuhanana, Krimighna, Bhut*a*gni, Tandula, Ghosa, Kar*a*la and Mrgag*a*mini are found in this *Nighantu*. It is said to have katu, Tikta rasa, Usna virya, Ruksa, laghu guna and pacifies V*a*ta and Kapha.

2.4.14 KAIDEVA *NIGHAÅÓU* (15TH CENTURY A.D.)[37]

Vidanga has been placed in Ausadhi varga. Krmijit, Vellam, Jantughnam, Mrgag*a*mini, Krimihrt, Krmihara, Citratandula, Amogh*a*, Taṇdula, Bhut*a*ghna. In addition to this, it has been used in Medoroga.

2.4.15 BHAVAPRAKASHA *NIGHANTU* (16TH CENTURY A.D.)[38]

It is placed in Haritaky*a*di varga.

2.4.16 RAJA *NIGHANTU* (17TH CENTURY A.D.)[39]

In Dharany*a*di varga, Narahari Pandit suggests the use of Pur*a*na Vidanga for better efficacy.

2.4.17 SHIVAKOSA *NIGHANTU* (17TH CENTURY A.D.)[40]

Shivadatta Mishra has mentioned Vidanga a in different contexts. Sivaprak*as*a commentary on Shivakosa includes following synonyms Krimighna, Krmisatru and Citratandula.

2.4.18 RAJAVALLABHA *NIGHANTU* (18TH CENTURY A.D.)[41]

Vidanga has been placed in Ṣaṣṭha parikṣeda. It is said to be slightly tikta and has krimighna and Visaghna action.

2.4.19 *NIGHANTU* ADARSHA (20TH CENTURY A.D.)[42]

The work is presented in a compilation form apart from authors experience. B*apal*a la Vaidya expressed same opinion as formed in earliar works. He places the drug in Vidangadi varga.

2.4.20 PRIYA *NIGHANTU* (20TH CENTURY A.D.)[43]

Acharya Priyavrita Sharma has placed the drug in Haritaky*a*di varga. It is Tiksna, Ruksa, Katu rasa.

3. DESCRIPTION OF *VIDANGA* IN THE AYURVEDIC PHARMACOPIEIA OF INDIA[1]

E. ribes is included as a monograph in the Ayurvedic Pharmacopoeia of India Part-1 & volume 1 and mentioned along with its definition, synonyms, macroscopic and microscopic description, identity, purity and strength, assay, constituents, properties and actions, important formulations, therapeutic uses and dose.

3.1 Purity and Strength

Foreign matter should not be more than 2%. Total ash value should not exceed more than 6% whereas acid-soluble ash should not exceed more than 1.5%.

3.2 Table 5: Active Constituents.[44,45,46]

S. N.	Active ingredients	
1.	Embelin (2, 5- dihydroxy-3- undecyl-2, 5-cyclohexadiene-1, 4- dione)	(Golden yellow needle like insoluble in water, soluble in alcohol/chloroform /benzene) dyes with silk & wool with alcoholic solution
2.	Christembine	Crystalline compounds of embolic acid with soda, Potash and ammonia
3.	Embelin dimer	-
4.	Embelin disalts	-
5.	Embelinol	-
6.	Embeliaribylester	-
7.	Embeliol	-
8.	Gomphilactone derivative	-
9.	Homoembelin	-
10.	Homorapanone	-
11.	onopotassium embelate	-
12.	New compounds	-
13.	A nitrogen containingalkyl1, 4-benzoquinone	-
14.	An unusual nitrogen-containing 3-alkyl-1,4- benzoquinone derivative	-
15.	N-(3-carboxylpropyl)-5- amino-2-hydroxy-3-tridecyl-1,4-benzoquinone	-
16.	Quarvital-1%	-
17.	Quercitol,	-
18.	Rapanone	-
19.	Resins	-
20.	Oleic	-
21.	linoleumacid	-
22.	Sitosterol	-
23.	Stable oil	-
24.	Tannins	-
25.	Daucosterol	-
26.	Vidangin	-
27.	Vilangine	-

3.3 Reported extracts of *Embelia ribes* and its use[47,48,49]

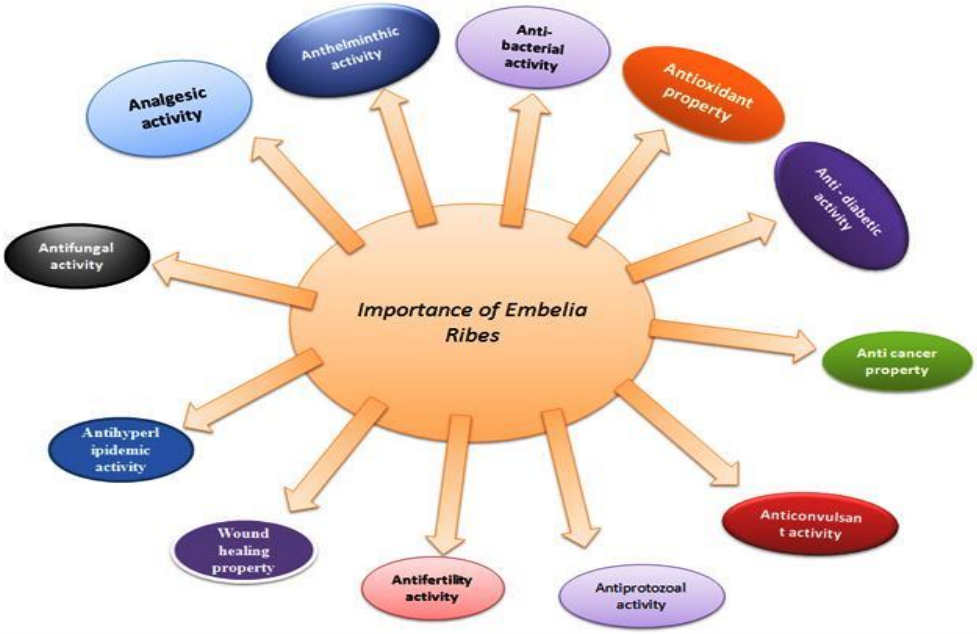
Extraction refers to processes for the isolation of the active ingridients from drug material by using selective solvents in standard extraction procedures. General methods of extraction are maceration, infusion, digestion, decoction, percolation, hot continuous extraction (Soxhlet), aqueous alcoholic extraction by fermentation, counter current extraction, ultrasound extraction (sonication). For *Embelia ribes* used hot continuous extraction and we get various activity in different solvent system are shown in **Table 6**.

S. N.	Extracts	Uses	Dosology
1.	Methanolic extract	Acetylcholinesteraseinhibitoryactivity	Root
2.	Aqueous-Ethanol extract	Anthelminthic	(fruits-berries)
3.	Methanol extract	Preventpregnancy75%	(fruits-berries)
4.	Ethanol extract	Hepatoprotective, Antifertility,	(fruits-berries)
5.		Uterineweightlevels	
6.	Butanolextract	Antifertility	-
7.	Butanolextract Benzene extract	Antifertility Antifertility 51%	- -
8.	Benzeneextract n-Hexane extract	Antifertility 51% Anthelminthic	- -
9.	Petroleumether extract	Tapeworm, (butnotround/hook) Preventpregnancy 75%	-
10.	Aqueous-Ethanol extract	No Antifertility, 37% Anthelminthic	-

11.	Aqueous-Ethanolextract Freshjuice	No Antifertility, 37% Anthelminthic Cooling, diureticandlaxative	- -
12.	Fresh juice Butanolextract	Cooling, diuretic and laxative No Antifertility, 37% Anthelminthic	- -
13.	Butanolextract Ethylacetate extract	Insecticidalactivity	- -
14.	Hexane extract	Antifertility	-
15.	Freshjuice	Cooling, diureticandlaxative	Leaves/fruit/root
16.	Powderedfruit	Antifertility	Fruit
17.	Milkextract	Digestive & upperrespiratory infection	Leaves/fruit/root
18.	Aqueous extract	Hypolipodemic Anthelminthic	Leaves

4. PHARMACOLOGICAL ACTIONS AND SCIENTIFIC EVIDENCE OF CLASSICAL USES OF *VIDANGA*

Embeila ribes Burm f. is having antibacterial, antifertility, antiprotozoal, abdominal disorders, lung diseases, constipation, indigestion, fungus infections, mouth ulcer, sore throat, pneumonia, heart disease and obesity, analgesic, antiinflammatory, antioxidant, anthelminthic, antidiabetic, anticonvulsant, anticancer, anti-hyper lipidemic, wound healing and mollusicidal activity which are depicted in Figure 2.



4.1. Analgesic activity

Embelin has non-narcotic orally effective analgesic property which acts centrally. It has a different central site of action and is not antagonized by naloxone. It is more acceptable than morphine due to high oral efficacy, high therapeutic index and absence of abstinence syndrome.[50]

4.2. Anti helminthic activity

Embelia ribes seed oil when administered at different doses like10 mg/ml, 50 mg/ml and 100 mg/ml reported death of the worms (*Pheretimaposthuma*). But response of worms to different doses altered in the time of paralysis parameter. Increase in dose reported a decreased time of paralysis. And the values are significant when compared with standard piperazine citrate (10 mg/ml).[51] *Embelia ribes* fruit extract in combination with *Veronica anthelmintica* seed extract administered at 1g/kg exerted a considerable decrease in the fecal eggs per gram (EPG) count in goats suffering from mixed gastrointestinal nematode infections.[52]

4.3. Anti-bacterial activity

Embelia ribes at a concentration of 500 mg/50 ml reported 12 mm diameter of zone of inhibition when compared to the standard drug nitrofurazone which has22 mm diameter of zone of inhibition against test organism *Bacillus subtilis. Embelia ribes* did not produce any inhibitory /anti-microbial activity against *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Escheresia coli.*[53]

At 100 mg/disc dose embelinreported more diameter of zone of inhibition than standard (kanamycin) used at 39 mg/disc when tested against Staphylococcus aureus, *Shigella flexneri* and *Shigella sonnei*. Same kind of response greater than standard (ciprofloxacin 5 mg/disc) is observed in *Pseudomonas aeruginosa* when embelin is

used at high dose of 100 mg/disc considerable antibacterial property is shown against test organisms like *Streptococcus pyogenes, Salmonella typhi, Shigella boydii, Proteus mirabilis*. And very mild antibacterial activity has been reported. When tested against Streptococcusfaecalis and Vibrio cholera.[54]

4.4. Antioxidant property

Aqueous extract of *Embelia ribes* administered orallyat doses 100 mg/kg and 200 mg/kg body weight significantly decreased the levels of pancreatic super oxide dismutase, catalase and glutathione in the streptozotocin (at a dose of 40 mg/kg, intravenously as a single dose) induced diabetic rats. This antioxidant activity further protects the pancreatic β-cells against loss in streptozotocin induced diabetic rats.[55]

4.5. Anti - diabetic activity

Aqueous extract of *Embelia ribes* fruits at doses 100 and 200 mg/kg orally fed for forty days produced significant ($p<0.01$) decrease in heart rate, systolic blood pressure, blood glucose, bloodglycosylated haemoglobin, serumlactate dehydrogenase, creatine kinase and increase in blood glutathione levels in streptozotocin (administered at a dose of 40 mg/kg, intravenously single dose) induced diabetic rats. Gliclazide is used as standard in this study. Further studies revealed that ethanolic extract of *Embelia ribes* fruits significantly ($p<0.01$) reduced the pancreatic thiobarbituric acid- reactive substances (TBARS) in pancreatic tissue of diabetic rats.[56]

Administration of ethanolic extract of *Embelia ribes*berriesorally for 6 weeks at a dose of 100 mg/kg and 200 mg/kg significantly ($p<0.01$) reduced the levels of blood glucose, heart rate(HR) and systolic blood pressure (SBP) in streptozotocin induced diabetic Wistar albino rats. Gliclazide at a dose 25 mg/day is the standard used in this study.[57]

4.6. Anticonvulsant activity

Embelin i.p (intraperitoneal) administration at doses 2.5, 5 and 10 mg/kg body weight significantly inhibited seizures induced by electroshock and pentylenetetrazole in a dose dependent manner and the activity was comparable to phenytoin and diazepam. C.N.S depressant activity was revealedbysignificantdecreaseinlocomotion. The observation suggests that embelin possess anticonvulsant activity against both grand mal and petit mal epilepsy.[58]

4.7. Anti-cancer activity

Embelin is reported to decrease tumor size and inhibit the increase in activity of serum enzymes, viz. acid phosphatase, τ-glutamyl transferase, lactate dehydrogenase, aldose, etc in rats with experimental fibrosarcoma. Embelin interferes with carbohydrate and amino acid metabolism in tumor bearing animals.

Embelin 50 mg/kg/day in combination with curcumin 100 mg/kg/day prevented the induction of hepatic hyper plastic nodules, body weight loss, increase in the levels of hepatic diagnostic markers, and hypoproteinemia induced by N-nitrosodi- ethylamine in adult male Wistar rats.[59]

Embelin has been reported to bind and inhibit XIAP protein and inhibit inflammatory pathways. The investigations whether embelin could inhibit osteoclastogenesis - associated bone loss induced by RANKL and by tumor cells in vitro reported that embelin suppressed the RANKL-induced differentiation of monocytes into osteoclasts. Thus, inhibitionsof RANKL - induced NF-kB activation have great potential as therapeutic agents for osteoporosis and cancer -linked bone loss.[60]

Furthermore, embelin down-regulated gene products involved in cell survival, proliferation, invasion, and metastasis of the tumor. This down-regulation was associated with enhanced apoptosis by cytokine and chemotherapeutic agents. Together, the results indicate that embelin is a novel NF-kappaB blocker and potential suppressor of tumorigenesis.[61]

In assessing the drug-induced cell toxicity, a fibrosarcoma cell line was exposed in vitro to increasing concentrations of embelin and simultaneously inoculated with [3H]-thymidine. The cells were examined for incorporation of the labeled thymidine in DNA, lipid peroxide and gluthathione levels for regular intervals. A dose- dependent decrease in labeled thymidine uptake, lipid peroxide and glutathione levels were observed on embelin administration.[62]

4.8. Antihyperlipidemic activity: Ethanolicextractof *Embeliaribes*administeredorally at a dose of 200 mg/kg for 20 daysreported significant ($p<0.01$) decrease inblood glucose level, serum total cholesterol and triglycerides and increase inHDL-cholesterol levels when compared to pathogenic diabeticrats whichare induced by streptozotocin (at a dose of 40 mg/kg intravenously). The extract further lowered the liver and pancreas thiobarbituric acid reactive substances (TBARS) values ($p<0.01$) when compared to TBARS values of liver and pancreas of the pathogenic diabetic rats.[63]

4.9. Antifungal activity: Antifungal activity evaluation of *Embelia ribes* using standard in vitro antifungal susceptibility was studied by test method NCCLS (The national committee for clinical laboratory standard M27-A2 Protocol). NCCLS method revealed that methanol extract of *Embelia ribes* and embelin had lowest MIC50 range of 120 mg/L against Candida albican (MTCC no. 183) and among four Candida species tested embelin had reported MIC_{50} values below 700 mg/L. Solvent ether extract, petroleum ether extract, methanol extract and embelin reported to have MIC_{50} in range of 300-700 mg/Lagainst *Candida albica* (MTCCno.227) and *Candida parapsilosis* (MTCCno.1744).

Petroleum ether extract shows lowest MIC50 range of 250 mg/L against *Candida parapsilosis* (MTCC no. 1744) and 360 mg/L against *Candida laurintis* (MTCC no. 2898) while water extract required higher MIC_{50} valueforallspecies. Thustheresultshows that the percentage growth was increased with the decrease in the concentration of the plant extracts, except for the water extract.[64]

4.10. Anti hyperhomocysteinemic activity

Anti-hyperhomocysteinemic activity of *Embelia ribes* was evaluated in hyper homo-cysteinemia induced adult male Wistar rats. Hyper homocysteinemia was induced by methionine treatment (1 g/kg p.o) for 30 days. Administration of aqueous extract of Embeliaribes (100and 200mg/kgp.o) for 30days to hyper homocysteinemic rats significantly ($p<0.01$) decreased the levels of homocysteine, LDH, total cholesterol, triglycerides, LDL-C and VDL-C andincreased the HDL-C levels in serum. The results are comparable to the standard anti- hyper homocysteinemic drug folic acid.[65]

4.11. Mollusicidal activity

Fruit powder of *Embelia ribes* in combination with Azadirachta indica and *Cedrus deodara* oil with synergists MGK-264, piperonyl butoxide (PB) in binary and tertiary combinations were used againstthe *Lymnea acuminata*. It was observed that the toxic effects of these mixtures were time and dose-dependent. The binary and tertiary mixtures of plant-derived mollusicides with synergists were more toxic with respect to the single treatment of the plant-dervied molluscides.[66] The order of toxicity of various tertiary combinations against *Lymnaea acuminate* was *Lawsonia inermis*seed+ *Cedrus deodara* + *Embelia ribes* >*Lawsonia inermis* seed + *Azadirachta indica* + *Embelia ribes* >*Lawsonia inermis* seed + *Polianthes tuberosa* + *Embelia ribes* >*Lawsonia inermis* seed + *Allium sativum* + *Embelia ribes*. The toxicity of tertiary combination (1:1:1) of *Lawsonia inermis* seed powder with Cedrus deodora oil and *Embelia ribes* fruit powder against *Lymnaea acuminata* was highest (24 hr LC50 14.80 mg/l) when compared to other combinations in this study.[67]

4.12. Wound healing property

Ethanolic extractof *Embelia ribes* (30 mg/ml) and embelin both reported significant wound healing activity. In embelin treated groups (4 mg/ml of 0.2% sodium alginate gel), epitheliazation of the incision wound was faster with a high rate of wound contraction. The tensile strength of the incision wound was significantly increasedthan the ethanol extract. Also in deed space model the weight of the granulation was increased indicating increase in collagenation. The histological examination of thegranulation tissue of embelin treated group reported increased cross-linking of collagen fibres and absence of monocytes. The results are comparatively evaluated with standard skin ointment framycetin.[68]

4.13. Antifertility activity

Embelin extracted from *Embelia ribes* Burm. Berries altered the testicular histology and glycogen, gametogenic counts and accessory sex gland fructose at the dose levels 0.3, 0.4 and 0.5mg/kg body weight administered subcutaneously for 35 days. The compound is suggested to possess anti- androgenic activity. An oral herbal contraceptive would allow couples control their fertility without consulting a health worker, which in turn would likely markedly increase the number of couples practicing family planning.

Oral administration of embelin (75 mg/kg per day, daily for 15 and 30 days) to male rats caused significant elevation in the uptake of D- glucose, L-alanine, L-leucine and calcium in small intestinal segments. Embelin also produced significant increases in intentinal brush border membrane- associated enzymes (sucrose, lactase, maltase, alkaline phosphatase and leucine amino-peptidase) in both intestinal homogenates and partially purified brush border membrane preparations.

4.14. Antihyperglycemic activity

Diabeticmellitus has been treated orally with herbal remedies based on folk medicine *Embelia ribes burm* (Myrsinaceae), known commonly as vidanga, was used in Ayurveda for its antheminitic activity. Ayurveda describes vidanga as pungent. Causes increase in digestive fire and cures flatulence and colic. A single study reported the antihyperglycemic activity of decoction of *E. ribes* in glucose-induced the lipid-lowering and antioxidant potential of ethanolic extract of *E. ribes* Burm was investigated in streptozotocin (40 mg/kg, IV, single injection) - induced diabetes in rats.

Twenty days of orally feeding the extract (200mg/kg)to diabetic rats resulted in significant ($p<0.01$) decrease in blood glucose, serum total cholesterol and triglycerides, and increase in HDL-cholesterol levels when compared to pathogenic diabetic rats.

Further, the extract also lowered the liver and pancreas thiobarbituric acid-reactivesubstances (TBARSs) values ($P<0.01$) when compared to TBARS diabetic rats. The results of test drug were comparable to gliclazide (25 mg/kg, orally), a standard antihyperglycemic agent. This is the first pilot study to provide biochemicalevidence of potential of E, ribesin diabetic Dyslipidemia.[69]

4.15. Antinematodal activity

The antinematodal activity of a mixed prescription of *Veronia anthemintica* seed (Kali zeeri) and *Embelia ribes* fruit (Babrang) was evaluated in goats. The EPG (Egg per gram) counts were made in the faeces before and on the 3rd, 10th and 15th days of the treatment with the powder in 0.5,1 and 2 g/kg body weight doses and with the water and methanol extracts equivalent to 2g/kg of the original powder. The evaluation of data on 15th day of the administration showed that 2 extractand 0.01 g/kg of moranteltartrate are equally effective and safe

intreating natural gastrointestinal nematode of the local goats.[70]

4.16. Antiproliferative activity

Biological activities of the 1, 4-benzoquinone derivatives 5-O-ehtylembelin (1) and 5- O-methylembelin (2) were investigated. Both of them showed antiproliferative activity against a panel of human tumor cell lines upon comparison to normal marsupial kidney cekks (Ptk2). They arrested HL-60 cells in the G (0)/G (1) phaseof the cell cycle in dose- and time-dependent manner. In HeLa cells, exposure to 100 microM of 1 or 2 for 6h induced a complete disassemblyofthemicrotubulenetworkandan increased number of cells blocked in mitotic stages. Treatment with 10 microM of 1 and 2 for 24h induced apoptosis in HL-60 cells. This evidence suggest that both 1 and 2 are promising novel antimitotic and anticancer molecules targeting microtubular proteins.[71]

4.17. Antispermatogenic activity

Embelia, the active principle of the seeds of *Embelia ribes* Burm, has been isolated and the purity established. Daily subcutaneous administrationofthecompound at adose of 20 mg/kg body weight to male albino rats for 15or 30 days revealed an inhibition of: a) epidiymal motile sperm count, b) fertility parameters such as pregnancy attainment and litter size, and c) the activities of the enzymes of glycolysis and energy metabolism. These changes were reversible, as seen after 15 and 30 days of recovery. Addition of embelin to epidiymal sperm suspensions caused a dose- and duration-dependent inhibition of spermatozoal motility and the activities of the enzymes of carbohydrate metabolism.

Light and scanning electron microscopy showed that both *in vivo* and *in vitro* treatment with the drug causes profound morphological changes in spermatozoal head, a) decapitation of the spermatozoal head, b) discontinuity of the outer membranous sheath in the mid-piece and the tail region, and c) alteration in the shape of the cytoplasmic droplet in the tail. Embelin from *Embelia ribes* significantly reduced the sperm count and motility and also the weight of the testes, in albino rats.[72]

4.18. Antiumor and anti-inflammatory activities

Embelin, a plant-based benzoquinone derivative, has been found to exhibitsignificant antitumor activity in methylcholanthrene-induced fibrosarcoma in albino rats besides enhancing their survival time. The drug also has an appreciable action on pain and inflammation. The changes in DNA, RNA and RNA and protein levels in various organs in the tumor-treated animals were also studied.[73]

4.19. Inhibitory activity

Seventy-six plant extracts including methanolic and successive water extracts from 37 India medicinal plants were investigated for acetylcholinesterase (AChE) inhibitory activity (*in vitro*). Results indicated that methanolic extracts to be more active than water extracts. The potent AChE inhibiting methanolic plant extracts included *Withania somnifera* (root), *Semecarpus anacardium* (stem bark), *Embelia ribes* (root), *Tinospora cordifoila* (stem), *Ficus religious* (stem bark) and *Nardostachys jatamansi* (rhizome).The IC_{50} values of *Embelia ribes* (Root) obtained for the extract was 23.04mug/ml.[74]

5. Formulation List (List of marketed products)

Embelia ribes used in various formulations like Ardrakakhandavaleha, Eranda paka, Krimighna kashaya churna, Vidangadi churna, Taramandura guda, Guduchi lauha, Abhayarishta, Kumari asava, Manibhadra yoga, Pippalyasava, Kaishore guggulu, Vyoshadi guggulu, Saptavishantika guggulu, Eladi ghrita, Kasisadi ghrita, Chandraprabhavati, Wdangadilauha, Vidangataila (**Table 7**).

Table 7: List of marketed formulations.

Vidanga taila	Vyoshadi guggulu
Saptavishantika guggulu	Kasisadi ghrita
Chandraprabha vati	Wdangadi lauha
Pippalyasava	Kaishore guggulu
Kumariasava	Manibhadra yoga
Taramanduraguda	Guduchi lauha
Krimighnakashaya churna	Vidangadi churna
Ardrakakhandavaleha	Eranda paka
Abhyarista	Agnitundi vati
Amarsundari vati	Ardrakkhandaavaleha
Ayaskriti	Bhallatak rasayana
Brhacchagaladya ghrita	Brhanmanjisthadi kwath
Brihatguduchi taila	Brihatphalghrita
Chandanadi lauha	Chandraprabha vati
Dashmularishta	Devadarvarishta
Draksharishta	Eladi ghrita
Guduchi lauha	Haridrakhanda
Kalyanakaguda	Kasisadi ghrita

Krimikuthar rasa	Krimighankashay churna
Kumaryasava	Kutaj avaleha
Lohasava	Madhukasava
Mahayogaraj guggulu	Manibhadra yoga
Narayana churna	Navayas churna
Nimbadichurna	Nityanand rasa
Panchanimbchurna	Panhatikta guggulu ghrita
Pippaladyasava	Pippalyadi lauha
Ajamodadi churna	Gudapippali
Avipatikar churna	Jatiphaladya churna
Brahmarasayan	Kasisadi taila
Brihanmarichadya taila	Krmimudgar rasa
Brihatvidyadharabhra rasa	Laghucinkadiklehya
Dantodbhedgadantak rasa	Madhusnuhi rasayana
Dhanvantara ghrita	Nagarjunanjan
Pathyadi lepa	Navayas lauha
Pradarantak lauha	Palashbijadi churna

6. DISCUSSION

Embelia ribes Burm f. a medicinal woody shrub belongs to the *Myrsinaceae* family. *Embelia ribes* contain embelin as an active constituent so it show its activity like anti-inflammatory, antibacterial, antifertility, antiprotozoal, antifungal, analgesic, antioxidant, anthelminthic, antidiabetic, anticonvulsant, anticancer, anti hyperlipidemic, wound healing and mollusicidal, also used in mouth ulcer,sore throat, pneumonia, obesity. its formulation in the market are Ardrakakhandavaleha, Krimighna kashaya churna, Vidangadi churna, Taramandura guda, Guduchi lauha, Abhayarishta, Eranda paka, Kumari asava, Pippalyasava, Manibhadra yoga, Kaishore guggulu, Vyoshadi guggulu, Eladi ghrita, Kasisadi ghrita, Chandraprabha vati, Wdangadi lauha, Vidanga taila, Saptavishantika guggulu etc.

7. CONCLUSION

The official botanical origin of *Vidanga* refers to fruit of *Embelia ribes* (Myrsinaceae) in the Indian Pharmacopoeia (1966) but mostly the fruit of Embelia is Tsjeriam are sold in the drug maket of the country. The plant *Vidanga* has been used since centuries in Indian system of medicine. It has been used to treat krimi (worm) disorders, Kusthaghn(Skin Disorders). *Vidanga* has long been used in Indian medicine to relieve worms, diabetes, wound healing and as an analgesic and anti-inflammatory plant. It is concluded that *E. ribes* has anti-inflammatory, analgesic, antioxidant, anti-diabetic, antibacterial, anticancer and rejuvenating effect.

CONSENT

It's not applicable.

ETHICAL APPROVAL

It's not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. The Ayurvedic Pharmacopoeia of India, Part 1, Volume 1, First Edition, Government of India, Ministry of Health and Family Welfare, Department of Indian System of Medicine & Homeopathy, New Delhi, 1986; 123-124.
2. Ved DK, Singh A. Identity of vidanga- a plant drug in trade. Newsletter- Medicinal Plants of conservation concern, 2006.
3. Carak Samhita.
4. RJ S, Akbari BV, Vidyasagar G, Sharma P. Development and Validation of HPTLC Method for Simultaneous Quantitation of Embelin and Assay of Marketed Formulation, 2010.
5. Caraka Samhita of Agnivesha, Elaborated by Caraka and Drahabala with the Ayurveda Dipika commentry by Cakrapanidatta, Sutrasthana 1/87, Edited by Vaidya Jadavji Trikamji Acharya, Chawkambha Vidyabhawan, Varanasi, Reprint, 2000.
6. Caraka Samhita of Agnivesha, Elaborated by Caraka and Drahabala with the Ayurveda Dipika commentry by Cakrapanidatta, Sutrasthana 2/3, Edited by Vaidya Jadavji Trikamji Acharya, Chawkambha Vidyabhawan, Varanasi, Reprint, 2000.
7. Caraka Samhita of Agnivesha, Elaborated by Caraka and Drahabala with the Ayurveda Dipika commentry by Cakrapanidatta, Sutrasthana 4/11,13,15,17, Edited by Vaidya Jadavji Trikamji Acharya, Chawkambha Vidyabhawan, Varanasi, Reprint, 2000.
8. Caraka Samhita of Agnivesha, Elaborated by Caraka and Drahabala with the Ayurveda Dipika commentry by Cakrapanidatta, Sutrasthana 21/23, Edited by Vaidya Jadavji Trikamji Acharya, Chawkambha Vidyabhawan, Varanasi, Reprint, 2000.
9. Caraka Samhita of Agnivesha, Elaborated by Caraka and Drahabala with the Ayurveda Dipika commentry by Cakrapanidatta, Sutrasthana 23/19,

Edited by Vaidya Jadavji Trikamji Acharya, Chawkambha Vidyabhawan, Varanasi, Reprint, 2000.
10. Caraka Samhita of Agnivesha, Elaborated by Caraka and Drahabala with the Ayurveda Dipika commentry by Cakrapanidatta, Sutrasthana 6/27-28, Edited by Vaidya Jadavji Trikamji Acharya, Chawkambha Vidyabhawan, Varanasi, Reprint, 2000.
11. Caraka Samhita of Agnivesha, Elaborated by Caraka and Drahabala with the Ayurveda Dipika commentry by Cakrapanidatta, Chiktsasthana 6/41, Edited by Vaidya Jadavji Trikamji Acharya, Chawkambha Vidyabhawan, Varanasi, Reprint, 2000.
12. Caraka Samhita of Agnivesha, Elaborated by Caraka and Drahabala with the Ayurveda Dipika commentry by Cakrapanidatta, Chiktsasthana 4/18, Edited by Vaidya Jadavji Trikamji Acharya, Chawkambha Vidyabhawan, Varanasi, Reprint, 2000.
13. Susruta Samhita, Sutrasthana 14/35, Edited with Ayurveda Tattva-Sandipika by Kaviraja Ambika Dutta Shastri; Chaukambha Sanskrit Sansthan, Varanasi, 5th edition, 1982.
14. Susruta Samhita, Sutrasthana 14/35, Edited with Ayurveda Tattva-Sandipika by Kaviraja Ambika Dutta Shastri; Chaukambha Sanskrit Sansthan, Varanasi, 5th edition, 1982.
15. Susruta Samhita, Sutrasthana 45/115, Edited with Ayurveda Tattva-Sandipika by Kaviraja Ambika Dutta Shastri; Chaukambha Sanskrit Sansthan, Varanasi, 5th edition, 1982.
16. Susruta Samhita, Sutrasthana 12/5, Edited with Ayurveda Tattva-Sandipika by Kaviraja Ambika Dutta Shastri; Chaukambha Sanskrit Sansthan, Varanasi, 5th edition, 1982.
17. Susruta Samhita, Sutrasthana 37/39, Edited with Ayurveda Tattva-Sandipika by Kaviraja Ambika Dutta Shastri; Chaukambha Sanskrit Sansthan, Varanasi, 5th edition, 1982.
18. Susruta Samhita, Kalpasthana 6/8, Edited with Ayurveda Tattva-Sandipika by Kaviraja Ambika Dutta Shastri; Chaukambha Sanskrit Sansthan, Varanasi, 5th edition, 1982.
19. Astanga Hridaya, of Vagbhata with the commentaries 'Sarvangasundara of Arunadatta and Ayurveda Rasayana' of Hemadri, Sutrasthana 10/30, Edited by Pt. Hari Sadaiva Shastri Paradakara, Chaukambha Sanskrit Prakashan, Varanasi, Reprint, 1997.
20. Astanga Hridaya, of Vagbhata with the commentaries 'Sarvangasundara of Arunadatta and Ayurveda Rasayana' of Hemadri, Kalpasthana 6/6, Edited by Pt. Hari Sadaiva Shastri Paradakara, Chaukambha Sanskrit Prakashan, Varanasi, Reprint, 1997.
21. Astanga Hridaya, of Vagbhata with the commentaries 'Sarvangasundara of Arunadatta and Ayurveda Rasayana' of Hemadri, Sutrasthana 10/47, Edited by Pt. Hari Sadaiva Shastri Paradakara, Chaukambha Sanskrit Prakashan, Varanasi, Reprint, 1997.
22. Astanga Hridaya,of Vagbhata with the commentaries 'Sarvangasundara of Arunadatta and Ayurveda Rasayana' of Hemadri, Sutrasthana 12/7, Edited by Pt. Hari Sadaiva Shastri Paradakara, Chaukambha Sanskrit Prakashan, Varanasi, Reprint, 1997.
23. Astanga Hridaya, of Vagbhata with the commentaries 'Sarvangasundara of Arunadatta and Ayurveda Rasayana' of Hemadri, Sutrasthana 12/22, Edited by Pt. Hari Sadaiva Shastri Paradakara, Chaukambha Sanskrit Prakashan, Varanasi, Reprint, 1997.
24. Saushruta NighaÆÔu, edited by Kashiraja Sharma and Narendra Nath Tiwari; Pub. by Mahendra Sanskrit Vishvavidhalaya, Nepal, 1st Edition, 2001.
25. Sidhrasa Nigjantu of Ravigupta.
26. Astanga Nighantu, of Vahata, Edited by P.V.Sharma, 1st Edition, Kuppuswamy Shastri Research Institute, Madras, 1973.
27. Paryayaratnamala of Indukarsunu, developed by NIIMH (National Institute of Indian Medical Heritage), Hyderabad for CCRAS New Delhi, 2012.
28. Madnadi Nighantu of Chandranandan, developed by NIIMH (National Institute of Indian Medical Heritage), Hyderabad for CCRAS New Delhi, 2012.
29. Shabdacandrika, by CakrapaÆidatta, edited by P.V. Sharma, Indian Institute of History of Medicine, Hyderabad, Central Council for Research in Ayurveda and Siddha, New Delhi, 1989. First edition.
30. Dravyaguna Sangraha of Chakradut, developed by NIIMH (National Institute of Indian Medical Heritage), Hyderabad for CCRAS New Delhi, 2012.
31. Sadarasa Nighantu by Dr. Goli Penchala Prasad, Chaukhambha Sanskrit Series, Varanasi, 2009.
32. Shodhala Nighantu of Shodhala ; Edited by Priya Vrit Sharma, Oriental Institute, Baroda, 1st Edition, 1978.
33. Sidhmantra Nighantu of Bopadeva, developed by NIIMH (National Institute of Indian Medical Heritage), Hyderabad for CCRAS New Delhi, 2012.
34. Hridayadipaka Nighantu of Bopadeva,with Siddhamantraprakasha, Edited by Sharma, P.V., Chaukambha Amarabharati, Varanasi, 1st Edition, 1977.
35. Madhava Drvyaguna of P.V. Sharma, Chaukhambha Bharti Academy, Varanasi, 2017.
36. Madanapala Nighantu by Pt. Ramaprasad Patiyala with Hindi commentary, Pub. by Khemraj Srikrishnadas Prakashana, 1998. Bombay.
37. Kaiyadeva Nighantu, Edited by P.V.Sharma and Guruprasad Sharma, Chaukambha Orientatia, Varanasi, 1st Edition, 1979.
38. Bhavaprakasha NighaÆÔu of Bhavamishra, Commentary by Krishnachandra Chunekar, Edited by Gangasahaya Pandey, Chaukambha Bharati Academy, Varanasi, Reprint, 1999.

39. Raja Nighantu of Shri Narhari Pandit's By Dr Satish Chandra Sankhyadhar, Forword by K.C. Chunekar, Chaukambha Orientatia, Varanasi, 2012.
40. Shivkosh Nighantu of Shiva Dutt Misra, Chaukambha Orientatia, Varanasi.
41. Rajavallabh Nighantu of Rajavallabh.
42. Nighantu Adarsha of Dr.Bapalal G. Vaidhya, Chaukambha Prakashan, Varanasi, 2016.
43. Priya Nighantu of P.V Sharma; Chaukambha Surabharati Prakashana, Varanasi, 2004.
44. Syed Asadulla, Ramandang and Rajasekharan: Pharmacognosy of *Embelia ribes* Burm F: International Journal of Research in Pharmacy and Chemistry, 2011; 4: 1236-1251.
45. Srinath Ambati, Jyothi.V and Asha Jyothi. V: Pharmacological, pharmacognostic and phytochemical review of *Embelia ribes*. IJPT, 2010; 2: 525- 539.
46. NusratParveen, Shagufta Aleem and Tabassum Latafat: A clinical study on role of qurs deedan and its efficacy in *Ascaris lumbricoides*. Hamdard Medicus, 2004; 47: 69-72.
47. Syed Asadulla, Ramandang and Rajasekharan: Pharmacognosy of *Embelia ribes* Burm F: International Journal of Research in Pharmacy and Chemistry, 2011; 4: 1236-1251.
48. Bhandari U, Kanojia R and Pillai K K: Effect ofethanolic extract of Embelia ribes on dyslipidemia in diabetic rats. Int J Exp Diabetes Res., 2002; 3: 159-62.
49. Ansari M N, Uma Bhandari, Islam F and Tripathi C D, Evaluation of antioxidant and neuroprotective effect of ethanolic extract of Embelia ribes Burm in focal cerebral ischemia/reperfusion-induced oxidative stress in rats. Fundamental- and-Clinical-Pharmacology, 2008; 305-314.
50. Atal C K, Siddiqui M A, Zutshi U, Amla V, Johri R k and Rao P G:Non-narcotic orally effective, centrally acting analgesic from an Ayurvedic dru., J.Ethnopharmacol., 1984; 11: 309-317.
51. Jalalpure SS, Alagawadi KR, Mahajanashetti CS, ShahB N and Salahuddin: *In vitro* anthelmintic property ofvarious seed oils against *Pheritima posthum*., Ind. J. of Pharmaceutical Sciences, 2007; 69: 158-160.
52. Tambekar DH, Khante BS, Chandak BR, Tltare A Sand S.S. Boralkar *et al*: Screening of antibacterial potentials of some medicinal plants from Melghat forest in India. Afr.J.Trad. Complementary and Alternative Medicines, 2009; 6: 228-232.
53. Umang H, Kapil M and Rakesh K, International Journalof Pharm Tech Research, 2009; 1: 1594-1597.
54. Chitra M, Shyamala Deviand Sukumar E: Antibacterial activity of embelin. Fitoterapia, 2003; 74: 401-403.
55. Uma Bandari and M Nazam Ansari: Antihyperglycaemic activity of aqueous extract of *Embelia ribes* Burmin streptozotocin-induced diabetic rats. Indian J Exp Biol., 2008; 46: 607-620.
56. Uma Bhandari, Neeti Jain & Pillai K.K: Furtherstudieson antioxidant potential and protection of pancreatic beta- cells by Embelia ribes in experimental diabetes. Experimental Diabetes Research, 2007; 1-6.
57. Bhandari U, Jain N, Ansari M N and Pillai K K:Beneficial effect of Embelia ribes ethanolic extract on blood pressure and glycosylated hemoglobin in streptozotocin-induced diabetes in rats. Fitoterapia, 2008; 79: 351-355.
58. Mahendran S, Thippeswamy B S, veerapur V P and Badami S:Anticonvulsant activity of embelin isolated from *Embelia ribes*. Phytomedicine, 2011; 15: 186-194.
59. Sreepriya M and Geetha bali: Chemopreventive effects of embelin and curcumin against N nitrosodiethylamine /phenobarbital-induced hepato-carcinogenesisin Wistarrat. Fitoterpia., 2005; 76: 549-555.
60. Retuer S, Prasad S, Phromnoi K, Kannappan R and Yadav V R:Embelin suppresses osteoclastogenesis induced by receptor activator of NF-κB ligand andtumor cells in vitro through inhibition of the NF-κB cell signaling pathway. Mol Cancer Res., 2010; 8: 1425–1436.
61. Ahn K S, Sethi G and Aggarwal B B:Embelin, an inhibitor of X chromosome-linked inhibitor-of-apoptosis protein, blocks nuclear factor-kappaB (NF-kappaB) signaling pathway leading to suppression of NF-kappaB- regulated antiapoptotic and metastatic gene products. Mol. Pharmacol., 2007; 71: 209-219.
62. Chitra M and Sukumar E:Devics, [3H]-thymidine uptake and lipid peroxidation by tumor cells on embelintreatment: an *in vitro* study. Oncology, 1995; 52: 66-68.
63. Bhandari U, Kanojia R and Pillai K K : Effect ofethanolic extract of Embelia ribes on dyslipidemia in diabetic rats. Int J Exp Diabetes Res., 2002; 3: 159-62.
64. Sanjesh G Rathi, Vaidhun H Bhaskar, Bhuvan P Raval, Maulik P suthar andParas GPatel: Der Pharmacia Letter., 2009; 1: 115-120.
65. Bhandari U, Ansari M N, Islam F, and Tripathi C D: The effect of aqueous extract of Embelia ribes Burm on serum homocysteine, lipids and oxidative enzymes in methionine induced hyperhomocysteinemia. Ind. J. Phamacol., 2008; 40: 152-157.
66. Rao I G and Singh D K:Combinations of *Azadirachta indica* and *Cedrus deodara* oil with piperonyl butoxide, MGK-264 and *Embelia ribes* against *Lymnaea acuminate*. Chemosphere, 2001; 44: 1691-1695.
67. Amrita S, Singh D K and Singh A:Molluscicidal activity of *Lawsonia inermis* and its binary and tertiary combinations with other plant derived molluscicides. Indian Journal of Experimental Biology, 2001; 39: 263-268.

68. Swamy HMK, Krishna V, Shankarmurthy K, Abdul rahiman B, MankaniK L and MahadevenK M:Wound healing activity of embelin isolated from the ethanolextract of leaves of *Embelia ribes* Burm. J. Ethnopharmacol, 2007; 109: 529-534.
69. Bhandari U, Jain N, Ansari M N and Pillai K K:Beneficial effect of Embelia ribes ethanolic extract on blood pressure and glycosylated hemoglobin in streptozotocin-induced diabetes in rats. Fitoterapia, 2008; 79: 351-355.