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Review article

A REVIEW ON THE PHYTOCHEMICAL, PHARMACOLOGICAL AND TRADITIONAL PROFILE ON THE *RUBUS* GENUS IN NORTH-EASTERN AND WESTERN PARTS OF INDIA

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Abstract

Background: *Rubus is a diverse genus belonging to Rosaceae family. The genus Rubus is one of the less explored genera consisting of blackberries, raspberries, dewberries, etc. It is mostly consumed by the ethnic communities of India as a source of medicine. This genus has shown many health benefits to the people such as in antimicrobial infection, antidiabetic, hepatoprotective and many more.* ***Objective:*** *The objective of the review is to explore the pharmacological, traditional and phytochemical aspects of the Rubus genus.* ***Methods:*** *An extensive literature research was carried out using keywords 'Rubus' in combination with 'northeast India' and/or 'pharmacological' and/or 'phytochemical' and/or 'traditional' on search engines viz, web of science, PubMed, Science Direct, India biodiversity portal and Google Scholar.* ***Discussion:*** *From the literature survey it was analysed that it is a very large genus of flowering plants widely available and having potential medicinal benefits. Used traditionally as a potential healer. Rubus has many important compounds present in them and thus researchers are testing out various pharmacological activities.* ***Conclusion:*** *Further extensive researches can be carried out in this genus as the genus Rubus shows potential benefit as a future therapy.*

Keywords: *Rubus*; Pharmacology; Antimicrobial activity; Anti-inflammatory activity; Traditional uses; Phytochemistry.

Introduction

Rubus is a diverse genus of flowering plants belonging to the family Rosaceae. This genus mainly consists of blackberries, raspberries, and dewberries. Most of these plants have a woody stem with prickles like roses [1,2]. Spines, bristles, and gland-tipped hairs are also common characteristics in this genus. The blackberries, and a variety of other *Rubus* species with piling or rambling growth habits, are known as brambles. Although the term bramble is not used for raspberry that grows like

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upright canes, or for trailing or prostrate species, such as most dewberries, or various low-growing boreal, arctic, or alpine species. Most species are hermaphrodites except *Rubus chamaemorus.*

The genus *Rubus* has been known to possessed antioxidant activities, and provide prevention of various oxidative stress-associated diseases such as cancer, inflammation, and diabetes. In the past few years, the identification and development of phenolic and other components or extracts from various plants of the *Rubus* genus have become a major concern. [3-5]The genus *Rubus* contains a variety of plant forms. This genus exists from sea level to 4500m and is native to six continents. More than 740 species have been described worldwide. *Rubus* species include plants that are climbing, slow-growing, and upright shrubs. The leaves come in many shapes, including those similar to bamboo, maple, apple, hawthorn, and grape. The fruit colour ranges from white, yellow, orange, red, purple to black. More than 18 countries have established gene banks to preserve members of this genus.

Fig 1: *Rubus ellipticus*

Fig 2: *Rubus moluccanus*

Phytochemistry

To date, this large genus which has more than 100 species have been investigated in order to identify chemical constituents of the plant. *Rubus* is characterized by their ability to synthesize and accumulate ellagitannin. Although it contains many other biologically active ingredients, such as flavonoids, anthocyanins, tannins, etc.

Compiling the list of components of *Rubus* species. A list of contents from different sources has been described below.

Phenolic compounds

Phenolic compounds represent structurally diverse classes of compounds having different kinds of conjugates. Plant phenols can occur mainly in conjugated forms with one or more sugar residues linked to hydroxyl groups. A direct linkage to the aromatic carbon of the sugar also exists. One of the largest plant metabolites is a phenolic compound and is very important for human diets. Due to the health benefits of plant-derived phenols, there has been an increased interest in the study of phenols. Soft fruits are a rich source of polyphenolic antioxidants and are widely distributed in the plant kingdom.

Berries of *Rubus* species such as raspberry, blackberry, etc provide delicious fruits that can be consumed raw or can also be taken in form of products such as jams, juices, and liquors. The extracts of these berries contain phenolic compounds that have shown to inhibit oxidation and inhibit the growth of pathogenic bacteria. Hydrolysable tannins such as Gallo and ellagitannins represent the major class of phenolic compounds in *Rubus* berries. The second most abundant class of pigmented berries are anthocyanins while compounds such as hydroxycinnamic acids, flavanols, flavan-3-ols, and proanthocyanins constitute the minor ones.[6-9]

Ellagitannins are the most widespread tannins reported in the *Rubus* genus. Analysis of extracts of raspberries (*Rubus ellipticus*) reported significant quantities of an ellagitannin, sanguiin H-6, with lower levels of a second ellagitannin, lambertianin C. The fruits of *Rubus niveus* have shown higher tannins content which is related to the antioxidative property with anticarcinogenic, antimutagenic potentials of high molecular weight phenolics, which is important in protecting cellular oxidative damage.

Flavonoids

Flavonoids are known to be a complex group of polyphenolic plant metabolites. These are mainly found in the foods that human beings consume. Reports on the flavonic composition of the *Rubus*genus mainly consist of *R. ellipticus*(Figure 1)and*R. niveus*. Flavonoids are ubiquitous dietary chemicals with significant influence *in vivo* effects within the immune system comprising the inflammatory response. In case of flavonoid content *Rubusellipticus*(Figure 1) was found to possessed higher flavonoid content in relation to *Rubusniveus* and *R. moluccanus*(Figure 2). Generally, blackberry leaves consist of higher flavonoid content than raspberry leaves. [10-12]

Anthocyanins

Anthocyanins are naturally occurring phenolic compounds. The colour appearance of many plants, flowers, and fruits is due to the presence of anthocyanins. These compounds are also of great importance due to their pharmacological activities. The extracts of berries of *Rubus* species have been found to contain high amounts of anthocyanins. The composition of anthocyanins of various fruits of the *Rubus* species is quite distinctive. [13-16] Wild raspberry (*R. moluccanus*) (Figure 2) contains a distinct spectrum of anthocyanins. The major components are cyanidin and cyanidin-3-sophoroside, with smaller quantities of other anthocyanins, including cyanidin-3-(2G-glucosylrutinoside), cyanidin-3-glucoside, cyanidin-3-rutinoside, and pelargonidin and its glycosides. The antioxidant capacity of *Rubus* fruits can be related to their phenolics, flavonoids, tannins and anthocyanin contents. Correlations and regression analysis between phenolics, flavonoids, tannins, anthocyanin's contents, and antioxidant activity obtained from *Rubus* spp. shows a positive correlation between all the estimated phytocompounds. [17,18]

Terpenoids

Terpenoids occur naturally and provide a variety of functions. The most widespread terpenoids reported in *Rubus*species are triterpenoids. Triterpenoids constitute a large, diverse group of active natural products derived from squalene. More than 4000 triterpenoids have been isolated so far and over 40 skeletal types have been identified. Reports on the triterpenoid composition of the *Rubus*genus are widely recorded in the literature.

The methanolic extract of *R. idaeus*has been found to yield novel ursane- and oleanane-type triterpenoids, such as olean-12-ene-3β,29-diol and urs-12-ene-3β,30-diol [19,20]. Reports on triterpene components of other species of *Rubus*have been found in the literature. Along with five known triterpene glycosides, a new triterpeneglucosyl ester named crataegioside, was also identified.

Pharmacological activity

Several types of research conclude the benefit of using *Rubus* spp. extracts, these include analgesic, anti-inflammatory, anti-carcinogenic, nephroprotective, antibacterial, and hypoglycaemic activities. Many pharmacological studies have pointed out the fractions of either a plant species of the *Rubus* genus or “a crude drug”. A number of studies, however, have focused on the bioactivity of specific isolated compounds (s). Some of these were isolated using bioassay-guided fractionation after previously detecting activity in the plant part.[19]

Anti-inflammatory and antioxidant activity

Traditional remedies are used for anti-inflammatory diseases. It is, therefore, crucial to evaluate the potential of herbal remedies for the discovery of novel bioactive compounds that might serve as leads for the development of potent drugs. Various research groups have initiated anti-inflammatory screening programs for plants used as anti-inflammatory agents in the treatment of several pathologies in traditional medicine all over the world, although other uses have also been suggested. Some of these studies focus on species belonging to the genus *Rubus*. [20-29]

A study conducted by Arun Kumar and Uma Shankar Sharma shows the presence of antioxidant property in *Rubusellipticus*(Figure 1). DPPH radical scavenging assay and reducing power methods were the two methods that were used to identify the in-vitro antioxidant activity of plant extracts. Fruit extracts of *Rubusellipticus*(Figure 1) have got profound antioxidant activity. The DPPH antioxidant assay involves the ability of DPPH which is a stable free radical, that decolorizes in the presence of antioxidants. An odd electron present in DPPH radical is responsible for the absorbance at 517 nm as well as for visible deep purple colour. DPPH is decolorized when it accepts an electron donated by an antioxidant compound which is further quantitatively measured by the changes in absorbance. All the fruit extracts of *R. ellipticus*(Figure1) exhibited significant dose-dependent inhibition of DPPH activity. The study concluded that an ethanolic extract of *Rubusellipticus*(Figure1)fruits was a significant source of natural antioxidants, which aids in preventing the progress of various oxidative stress. [30-32]

Many researchers reported that the anti-inflammatory and antioxidant activities of the *Rubus* species are mainly due to triterpenoids and tannins. Some of these compounds were isolated by bioassay-guided fractionation procedures after previously detecting activity in the part of the plants.

Anti-microbial activity

The antimicrobial activity of *Rubusmoluccanus*(Figure 2)and*Rubusellipticus*(Figure 1) were evaluated by using the agar-disc diffusion method with minor modifications. It was observed that *Rubus* species displayed numerous secondary metabolites and the effects of the extract against some common pathogenic bacteria were investigated. The result demonstrated that *R. moluccanus*(Figure 2) and *R. alpestris* were effective against Gram-positive and Gram-negative bacteria. Various strains of bacteria such as S. aureus, B. subtilis, and E. coli were tested against the *Rubus* spp. extract and it was found that some phenolic compounds including flavone, quercetin, and naringenin were the primary potential compounds that contributed to the antibacterial activities against these bacterial strains. Other than this compounds such as anthocyanidin, pelargonidin, delphinidin, cyanidin, and cyanidin-3-glucoside in berry extracts were also able to inhibit the growth of E. coli.

It has been found out that due to some genetic and environmental factors there is high variability in the phytochemicals content of *Rubus*. Methanol-water extracts of *R. moluccanus*(Figure 2), *R. fraxinifolius*, and*R.alpestris* fruits showed a significant number of phytochemicals, which contribute to antibacterial. Berries of the plant *Rubusmoluccanus*(Figure 2) were reported to contain several biologically active chemicals and also reported to possess anti-microbial activities. The ethanolic extract of the leaves of *Rubusmoluccanus*(Figure 2) was also found to possess similar compounds and exhibit significant antimicrobial and anthelmintic activities against the tested organisms. Therefore, the Pharmacological potential of the plant extract may be due to the same chemical compounds. [33]

Other activities

A variety of other pharmacological actions have been reported for the *Rubus* genus and compounds isolated from their species. Among the widespread traditional medicinal uses of some *Rubus* species (*Rubusellipticus*) (Figure 1) is that of hypoglycemic agents in the management of diabetes mellitus. Jouad et al. investigated the hypoglycemic effect of *R. fruticosus* in normal and streptozotocin-induced diabetic rats. In both types of rats, single and repeated oral administration of the plant produced a decrease in blood glucose levels. However, treatments did not affect insulin secretion in either normal or streptozotocin-induced diabetic rats, indicating that the mechanism(s) by which this plant decreases blood glucose levels is extra-pancreatic. These findings indicate that R. *fruticosus* acts as a potential agent for lowering blood glucose levels. The hypoglycemic effect of five medicinal plants was studied on alloxan-induced diabetic rats. The results showed that each plant studied, including *R. niveus*, significantly lowered blood glucose. *R. niveus* also showed antinociceptive action within the writhing test in mice, and antispasmodic activity on isolated guinea-pig ileum and rat duodenum. [34-37]

The *in-vitro*study for relaxant activity was tested using extracts of dried raspberry (*R. idaeus*) leaves. The leaves of *R.idaeus* were prepared with different solvents and were tested on transmurally stimulated Guinea-pig ileum. Several pieces of evidence suggest that there are components of raspberry leaf extract that are responsible for relaxant activity in in-vitro gastrointestinal preparations. The compounds liable for this activity are reported to be the ellagitanninslambertianin C and sanguiin H-6, a triterpenoid, triterpenoid glycosides, and an open chain alcohol glycoside [38]. Nephroprotective evaluation of *Rubusellipticus*(Figure 1) fruit was performed on gentamicin and cisplatin-induced nephrotoxicity in rats. The pet ether and aqueous extract of the fruits are found to be less significant than the ethanolic extracts. The

nephroprotective activity of all the extracts against cisplatin and gentamicin-induced models may possibly due to thepresence of phytoconstituents like carbohydrate, alkaloid, saponin, tannin, triterpenoids, flavonoids. [39-44]

Traditional uses of *Rubus*

*Rubus*has been known to be used traditionally all around the world. Some of the known traditional uses include treatment for wound healing, ulcers, gastrointestinal illness, diabetes and bacterial/fungal infection. Many *Rubus*species have also been used for analgesic, anti-inflammatory activities. [45-58]

Table 1: *Rubus* species used traditionally by different communities

S.No.	Common name	Scientific name	Place of use/tribes	Parts used/ preparations	Mode of action	References
1	*Jutuli-poka, Katsol, Anshu, Wild raspberry*	*Rubusmoluccanus*	Dhemaji district (Assam)	Fruits, young shoots are taken.	Helps in enhancing fertility in female	[45]
2	*Jetuli-poka*	*Rubusmoluccanus*	Koch-Rajbongshi and Rangia tribes of North kamrup (Assam)	Leaf extract	Taken orally to reduce headache	[46]

3	*Jejeli-poka*	*Rubusalceifolius*	Ethnic communities of Tinsukia district (Assam)	Root, tender shoot, fruit	Root to relive pain in dysmenorrhea. Tender shoot for cough and pneumonia. Unripe fruit is rubbed over tongue to cure fungal infection.	[47]
4	*Soh-shiah*	*Rubuselliptic us*	Khasi and Garo tribes of Meghalaya	Fruits and roots	Dysentery	[48]
5	*Sohnepbah*	*Rubusmicropetalus*	Khasi traditional healers in Meghalaya	Fruits and stem	Fruits taken to cure cough. Crushed stem bark to cure mouth ulcers	[49]
6	*Soh-shiah*	*Rubuselliptic us*	East Khasi hills district (Meghalaya)	Roots	Taken for rheumatism, ulcer and skin infection.	[50]
7	*Raspberry*	*Rubuselliptic us*	Tripura	Fruit	Consumed as a table fruit	[51-53]
8	*Heijampet, Yellow raspberry*	*Rubuselliptie ns*	Meitei commun	Fruits, leaves	Fruit against diarrhoea.	[54]

			ity of Manipur	and roots	Root for dysentery. Leaves for abortifacient	
9	*Heijampeta muba, Ceylon blackberry*	*Rubusmoluccanus*	Meitei community of Manipur	Fruit, leaves and root	Fruit against diarrhoea and root for dysentery and leaves for abortifacient	[55]
10	*Lam-hejampet*	*Rubuselliptic us*	Manipur	Leaf	Fresh tender leaves are chewed for tongue sores.	[55-56]
11	*Heimang*	*Rubuscalycinus*	Bishnupur district (Manipur	Leaves and roots	Leaf for urinary complex and painful menstruation. Root used in colic	[57]
12	*Hmu-bel-bing*	*Rubusindotibetanus*	Mizos of Mizoram	Fruit	To cure headache	[58]

Conclusion

*Rubus*is a diverse genus of flowering plants consisting of blackberries, raspberries and dewberries. Most of these plants have a woody stem with prickles like roses. This genus is known to possess antioxidant, anti-inflammatory, anti-microbial activities. Due to their huge potential benefits a number of countries have established gene banks to preserve this genus. This genus has been documented to contain a compilation of compounds such as flavonoids, anthocyanins, tannins, terpenoids and steroids.Some other researchers also documented the

pharmacological activity of this genus. From those studies it was established that the plant species showed anti-inflammatory, analgesic, antioxidant and antimicrobial activities. Other activities such as relaxant, nephroprotective were also evaluated. *Rubus* has been known to be used traditionally all around the world. In north-eastern states of India, various tribal communities like the Koch Rajbanshi, Rangia tribes, Khasi tribes, Garo tribes and also the Meitei communities (of Meghalaya) are known to use some plant species of the genus *Rubus* for medicinal purposes such as skin disease, tongue sores, pneumonia, headaches, etc. Many more phytochemical, pharmacological studies can be researched further. This genus (i.e., *Rubus*) has not been explored much and further studies are required as it provides strong potential as a future therapy.

References

1. *Rubus* genus. Available from: https://www.wikipedia.org/rubus (15 July 2021; 12:38 PM)
2. Biochemistry-genetics-and-molecular-biology of *Rubus.* Available from:https://www.sciencedirect.com/Rubus/ (15 July 2021; 12:44 PM)
3. Graham J., and Brennan R., Raspberry – Breeding, Challenges and Advances, 2018; 1–158.
4. *Rubus*. available from http://www.theplantlist.org/(15 July 2021; 12:50 PM)
5. Various species of *Rubus*. https://indiabiodiversity.org/ (15 July 2021; 12:55 PM)
6. Krondatyuk TP, Pezzuto JM. Natural product polyphenols of relevance to human health. Pharmaceutical Biology,2004; 42, 46-63.
7. Kähkönen MP, Hopia AI, Heinonen M. Berry phenolics and their antioxidant activity. Journal of Agricultural and Food Chemistry, 2001; 49, 4076-4082.
8. Moyer RA, Hummer KE, Fim CE, Frei B, Wrolstad RE. Anthocyanins, phenolics and antioxidant capacity in diverse small fruits: Vaccinium, *Rubus* and *Ribes*. Journal of Agricultural and Food Chemistry, 2002; 50, 519-525.
9. Maatta-Riihinen KR, Kamal-Eldin A, Torronen AT. Identification and quantification of phenolic compounds in berries of Fragaria and *Rubus* species (Family Rosaceae). Journal of Agricultural and Food Chemistry, 2004; 52, 6178-6187.
10. Mullen W, McGinn J, Lean MEJ, MacLean MR, Gardner P, Duthie GC, Yokota T, Crozier A. Ellagitannins, flavonoids and other phenolic in red raspberries and their contribution to antioxidant capacity and

vasorelaxation properties. Journal of Agricultural and Food Chemistry, 2002; 50, 5191-5196.

11. Mullen W, Yokota T, Lean MEJ, Crozier A. Analysis of ellagitannins and conjugates of ellagic acid and quercetin in raspberry fruits by LC-MS. Phytochemistry, 2003; 64, 617-624.
12. Vrhovsek V, Palchetti A, Reniero F, Guillou C, Masnero D, Mattivi F. Concentration and mean degree of polymerization of*Rubus*ellagitannins evaluated by optimized acid methanolysis. Journal of Agricultural and Food Chemistry, 2006; 54, 4469-4475.
13. Hussein SAM, Ayoub NA, Nawwar MAM. Caffeoyl sugar esters and an ellagitanin from *Rubussanctus*. Phytochemistry, 2003; 63, 905-911.
14. Cui CB, Zhao QC, Cai B, Yao XS, Osadsa H. Two new and four known polyphenolics obtained as new-cycle inhibitors from *Rubusaleaefolius*Poir. Journal of Asian Natural Products Research, 2002; 4, 243-252.
15. Gudej J. Kaempferol and quercetin glycosides from *Rubusidaeus* L. leaves. ActaPoloniae Pharmaceutical, 2003; 60, 313-315.
16. Venskutonis PR, Dvaranauskaite A, Labokas J. Radical scavenging activity and composition of raspberry (*Rubusidaeus*) leaves from different locations in Lithuania. Fitoterapia, 2007; 78, 162-165.
17. Gudej J, Tomczyk M.Determination of flavonoids, tannins and ellagic acid in leaves from *Rubus L. species*. Archives of Pharmaceutical Research, 2004; 27, 1114-1119.
18. Marinova D, Ribarova F. HPLC determination of carotenoids in Bulgarian berries. Journal of Food Composition and Analysis, 2007; 20, 370-374.
19. Niero R, Filho C, Souza MM, Montanart JL, Yunes RA, DelleMonache F. Antinociceptive activity of niga-ichigoside F1 from *Rubusimperialis*. Journal of Natural Products, 1999; 62, 1145-1146.
20. Ono M, Tateishi M, Mascoka C, Kobayashi H, Igoshi K, Komatsu H, Ito Y, Okawa M, Nohara T. A new triterpeneglucosyl ester from the fruit of the blackberry (*Rubusallegheniensis*). Chemical & Pharmaceutical Bulletin, 2003; 51, 200-202.
21. Kanegusuku M, Sbors D, Bastos ES, De Souza MM, Cechinel-Fliho V, Yanes RA, DelleMonache F, Niero R. Phytochemical and analgesic activity of extracts, fractions and a 19-hydroxyursane-type triterpenoid obtained from *Rubusrosaefolius* (Rosaceae). Biological & Pharmaceutical Bulletin, 2007; 30, 999-1002.
22. Rojas Vera J, Dacke CG, Patel AV, Blunden G.Triterpenoids, including one with smooth muscle relaxant activity from *Rubusidaeus* (raspberry) leaves. Natural Product Communications, 2006; 1, 613-617.

23. Rojas Vera J, Dacke CG, Blunden G, Patel AV. Smooth muscle relaxant triterpenoid glycosides from *Rubusidaeus* (raspberry) leaves. Natural Product Communications, 2006; 1, 705-710.
24. Johansson S, Göransson V, Luijendi KT, Backlund A, Claeson P, Bohlin L. A neutrophil multitarget functional bioassay to detect anti-inflammatory natural products. Journal of Natural Products, 2002; 63, 32-41.
25. Ivanova D, Gerova D, Chervenkov T, Yankova T. Polyphenols and antioxidant capacity of Bulgarian medicinal plants. Journal of Ethnopharmacology, 2005; 96, 145-150.
26. Jung SW, Shin MH, Jung JH, Kim ND, Im KS. A triterpeneglucosyl ester from the roots of *Rubuscrataegifolius*. Archives of Pharmacal Research, 2001; 24, 412-415.
27. Erdemoglu N, Küpelli E, Yesilada E. Anti-inflammatory and antinociceptive activity assessment of plants used as remedy in Turkish folk medicine. Journal of Ethnopharmacology, 2003; 89, 123-129.
28. Choi J, Lee KT, Ha J, Yun SY, Ko CD, Jung HJ, Park HJ. Antinociceptive and anti-inflammatory effects of niga-ichigoside F1 and 23-hydroxytormentic acid obtained from *Rubuscoreanus*. Biological & Pharmaceutical Bulletin, 2003; 26, 1436-1441.
29. Ruan J, Zhao X, Cassady JM, Stoner GD. Study on the constituents from freeze-dried power of blackberries (*Rubusursinus*). Zhong Yao Cai, 2001; 24, 645-647.
30. Chen C, Qixiu Z, Zhu Q, Jin Z. Pregnane glycoside, lignan glycosides, triterpeneglucosyl ester and flavonoid glycosides from *Rubusamabilis*. PlantaMedica, 2001; 67, 270-273.
31. S. Rebecca Hynniewta, H. Suchitra Devi, MeenaElangbam. Medicinal Plants recorded from pine forest of east khasi hills district, Meghalaya. Indian Forester, 2019; 145(5): 477-480.
32. C.P. Kala. Ethnomedicinal botany of the Apatani in the Eastern Himalayan region of India. Journal of Ethnobiology and Ethnomedicine, 2005.
33. A. Phukan, R. Borgohain, P. Chutia, E. Saikia, D. Kardong, B. Chutia. Phytochemical and Antimicrobial activity of some medicinal plants of North East India, 2014; Vol. 26, No. 12.
34. S. Normasiwi, A. Salamah, M. Imam Surya. Morphological characteristics of Indonesian *Rubus*flowers. Biodiversitas, 2021; Vol 22, Number 3, Pages: 1441-1447.
35. Asmita V. Patel, Janne Rojas Vera, Christopher G. Dacke. Relaxant Activity of Raspberry (*Rubusidaeus*) leaf extract in guinea-pig Ileum in-vitro. Phytotherapy Research, 2002; 16, 665-668.

36. Kristiina Antonius-Klemola. Molecular markers in *Rubus*(Rosaceae) research and breeding. Journal of Horticultural Science & Biotechnology, 1999; 74 (2) 149-160.
37. Mallappa Kumara Swamy. Natural Bio-active compounds. Volume 2: Chemistry, Pharmacology and health care practices, 2019.
38. MohdFadzelly Abu Bakar, NurAmalina Ismail, AzizulIsha, Angelina Lee Mei Ling. Phytochemical composition and biological activities of selected Wild Berries (*Rubusmoluccanus* L., *R. fraxinifolius*Poir., and *R. alpestric*Bume). Hindawi Publishing Corporation. 2016; Volume 2016, article ID 2482930.
39. YesiDesmiaty, BernaElya. Unripe fruit of *Rubusfraxinifolius* as a potential source of antioxidant and anti-elastase agent. International journal of applied pharmaceutics, 2021; ISSN: 0975-7058, vol 13, Special Issue 2.
40. YesiDesmiaty, FadlinaChanySaputri, RiniPrastiwi, BernaElya. Anti-elastase, Anti-Tyrosinase and Anti-Oxidant of *RubusFraxinifolius* Stem Methanolic Extract. Pharmacogn J. 2020; 12(2): 271-275.
41. Uma Shankar Shama, Arun Kumar. Nephro-protective evaluation of *Rubusellipticus* (smith) fruits extracts against cisplatin and gentamicin induced renal-toxicity in rats. Journal of Pharmacy Research 2011; 4(1), 285-287.
42. Liu Z, Schwimer J, Liu D, Greenway FL, Anthony CT, Woltering EA.Black raspberry extract and fractions contain angiogenesis inhibitors. Journal of Agriculture and Food Chemistry, 2005; 53, 3909-3915.
43. Niero R, Kanegusuku M, Souza MM, Yunes RA, Cechinel-Filho V. Antinociceptive action of extracts and fractions from *Rubusimperialis* (Rosaceae). Therapie, 2002; 57, 242-245.
44. Emendorfer F, Emendorfer F, Bellato F, Noldin VF, Niero R, Cechinel-Filho V, Cardozo AM. Evaluation of the relaxant action of some Brazilian medicinal plants in isolated Guinea-pig ileum and rat duodenum. Journal of Pharmacy and Pharmaceutical Sciences, 2005; 8, 63-68.
45. Tarun Chandra Taid, Ratul Chandra Rajkhowa, Jogen Chandra Kalita. A study on the medicinal plants used by the local traditional healers of Dhemaji district, Assam, India for curing reproductive health related disorders. Pelagia Research Library, 2014; 5(1): 296-301.
46. N J Das, S P Saikia, S. Sarkar, K. Devi. Medicinal plants of north-kamrup district of assam used in primary healthcare system. Indian Journal of Traditional knowledge. 2006; Vol. 5(4), pp. 489-493.
47. J. Buragohain. Ethnomedicinal Plants used by the ethnic communities of Tinsukia district of Assam, India. Recent Research in Science and Technology 2011; 3(9): 31-42.

48. R. R. Rao. Ethnobotany of Meghalaya: Medicinal Plants Used by Khasi and Garo Tribes. The New York Botanical Garden. 1981; Vol. 35, No. 1, pp. 4-9.
49. SR Hynniewta, Yogendra Kumar. Herbal remedies among the Khasi traditional healers and village folks in Meghalaya. Indian Journal of Traditional Knowledge. Vol. 7(4), October 2008; pp. 581-586.
50. A K Dolui, H K Sharma, Theresia Breen Marein, TcLalhriatpuii. Folk herbal remedies from Meghalaya. Indian Journal of Traditional Knowledge. 2004; Vol. 3(4), pp. 358-364.
51. SanjibShil, ManabendraDuttaChoudhury, Soumita Das. Indigenous knowledge of medicinal Plants used by the Reang tribe of Tripura state of India. Journal of Ethnopharmacology. 2014; 152(1), 135-141.
52. S. Goswami, Pala NA, Kumar M, Bussmann RW. Ethnoveterinary applications of Medicinal plants by Traditional Herbal Healers in Reang Tribe South District Tripura, India. Medicinal and Aromatic plants 2016; 5:2.
53. Kishore Kumar Das, C.K. Dotaniya, G.S.K. Swamy, Raja Ram Bunker. Under-utilized and under exploited fruits of Tripura. International Journal of Pure and Applied Bioscience. 2018; 6(1): 1641-1644.
54. D.S. Ningombam, S.P. Devi, P.K. Singh, A. Pinokiyo, BishesworiThongam. Documentation and Assessment on knowledge of ethno-medicinal practitioners: A case study on local meetei healers of Manipur. Journal of Pharmacy and Biological Sciences. 2014; Volume 9, Issue 1 ver. 1, PP 53-70.
55. CL. Ringmichon, BinduGopalkrishnan, A.P. Dixit. Ethno-pharmacognostical studies on Root Bark of *Rubusellipticus* Smith from Manipur. Journal of Pharmacognosy and Phytochemistry.2013; IC Journal No: 8192, Volume 2 Issue 2.
56. K. Y. Devi, MaibamHaripriya Devi, P.K. Singh. Survey of medicinal plants in Bishnupur district, Manipur, North Eastern India. International Journal of Applied Research, 2017; 3(4): 462-471.
57. SunitaGurumayum, J.K.Soram. Some Anti-diarrhoeic and Anti-dysenteric Ethno-medicinal plants of Mao Naga Tribe community of Mao, Senapati District, Manipur. International Journal of Pure and Applied Bioscience. 2014; 2(1): 147-155.
58. Yamuna Pandey, S. S. Bhatt. Overview of Himalayan Yellow raspberry (*Rubusellipticus* Smith): A nutraceutical plant. Journal of Applied and Natural science. 2016; 8(1): 494-499.

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