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REVIEW ON HEPATOPROTECTIVE EFFECT OF BERBERIS ARISTATA DC.

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ABSTRACT

Berberis Aristata DC. belonging to the family Berberidaceae, is a shrub used in the alternative medical systems that is native to Northern Himalaya region, Nepal, India and Pakistan. It is commonly known as "*Daruharidra* and *Chitra*". *Berberis aristata* DC. is used in *Ayurvedic* Medicinal system from the beginning of this System. It is widely used as a hepatoproctive, tonic, in urinary disorders, skin diseases, diaphoretic, diuretics and treatment of diarrhoea, Jaundice, Syphilis. Natural source of Berberine is *Daruharidra* which reduces the inflammation of hepatocytes in liver. The study was aimed to analyze its' hepatoprotective effect on the basis of Modern scientific evidence and Classical *Ayurveda* references. *Ayurvedic* literature describes *Daruharidra* plant is mainly used in *Kamala, Prameha, Kustha, Netra Roga, Vrana.*

Keywords: *Berberis Aristata* DC., *Daruharidra,* Hepatoprotective, Jaundice, Anaemia, Liver diseases, Hepato-toxicity, Hepatitis.

INTRODUCTION

The *'Yakrit'* is an important organ of the body correlated with the Liver. The *'Yakrit Vikar'* is a group of Diseases related to the Liver. *Charak Samhita* gives explanation regarding to the disease *Yakritodara* or

Yakrit Vriddhi and *Yakritodara* is mentioned along *Pleehodara* which is a type of *Udara rog*[1]. *Acharya Susruta* explains regarding *Yakritpleeha Utpatti*, *Pleehodara* and *Yekritdaalyodar*[2]. *Chakrapani* has commented on description of *Yakritodara* in *Charak Samhita* along with *Pleehodara* and mentioned that there are five types of *Pleehadoshas- Vataj, Pittaj, Kaphaj, Sannipataj* and *Rakta*[4]. *Pleeha Vriddhi* occurs in *Vamparshwa* and similar characteristic is found in *Yakrit* which occupies space in *Dakshinparshwa*[1]. *Pleeha-Yakrit Chikitsha* is mentioned in *Chakradatta*[4]. The disease *Yakrit Roga* for the first time was introduced by *Bhav Mishra* in the *Bhavprakash*. Here, the *shoroop* of *Yakrit* is mentioned and said to be *Visheshayavyava* and it is said to be *Sthana* of *Ranjak pitta*. In *Bhav Prakash Hetu, Samprapti, Lakshana* of *Yakrit Vikar* resembles to *Pleehavikar*[5]. The Liver disorders are Jaundice, Gastrointestinal bleeding, Ascites, Hepatic encephalopathy, Acute liver failure, Chronic liver failure[8]. *Acharya Charak* described for *Pandu Roga* treated by *Katukadya Ghrita*, *Pandunasak Ghrita*, *Kamalanasak Swaras*, *Manduk Vatak*, *Punarnawa Mandur*[1], In *Astanga Hridaya* for *Udar Roga* treatment *Hingwadi Kshar* is described, For *Pandu Roga* treatment *Mandur Vatak*, for *Kamala* treatment *Prayukta Swaras*[3] is described. These mentioned medicinal preparation almost includes *Daruharidra* (*Berberis aristata* DC.) for the treatment of *Yakrit Vikar*. *Daruharidra* is scientifically accepted as *Berberis aristata* DC. and a famous drug for treating liver related diseases as *Pandu, Kamala, Udar Roga*[6]. *Bhavprakash Nighantu, Dhanwantari Nighantu, Priya Nighantu* also described this plant for different medicinal values. *Berberis aristata* DC. found in Himalayan region in 3000-7000 ft. height. The plant has spines on margins of leaves. Fruit appears in rainy season[7].

- Division- Angiospermae
- Class- Diacotyledones
- Family- Berberidaceae
- Genus- *Berberis*
- Species- *aristata*
- Classical name-*Daruharidra*
- **Sanskrit Name-***Pitadru, Kaleyak, Haridrav, Pachampacha, Kantakateri, Kamani, Hemakanti, Daruharidra, Pitadaru, Pitachandana*, *Karkatakini, Katamkati, Kanchani, Kamavati, Kastharanjani, Kusumbhaka, Krimihara, Darvi, Darunisha, Darupurba, Drabidabi, Nisha, Parjani, Parjanya.*
- **Vernacular Names-** Bengali- *Daruharidra;* Gujrati- *Daruharidra, Daruhlaadur;* Hindi- *Daruhaldi, Darhald;* Marathi- *Daruhalad;* Oriya- *Daruhalidi,* Punjabi- *Sumalu,* Tamil- *Gangeti,* Nepali- *Chutro.*
- **English name-** Indian berberry, Tree turmeric, Nepal berberry, Opthalmic barberry.
- **Habit-** It is large deciduous shrub, usually 1.7-3.5 m in height. The plant has glossy dark green and ovate leaves, stalked flowers and wood, yellowish brown roots with thin covering bark.[9,10,11,12]
- **Habitat-**Himalayan region, 3-7 thousand ft. height in Nepal, India, Pakistan.
- **Parts used-** Roots, Stems, Leaves and Fruits.

In *Unani* system of medicine, Bark of *Berberis aristata* DC. is known as *Darhald.* It is frequently prescribed in the treatment of hepatomegaly, hepatitis, splenomegaly[13].

In *Paipalyaad Samhita* (*Atharvavediya*-20/37/7)-*Darupatra* is explained. In *Keshav Paddati* Decoction of *Haridra* and *Daruharidra* is used in *Khalitya.* In *Bamana Purana Daruharidra* was found in the name of *Peetadaru* and *Haridru.* In *Kalpasutra, Daruharidra* is mentioned as a plant and given many synonyms[6].

In *Samhita kala, Charak Samhita Daruharidra* is mentioned in different contexts synonyms and totally 79 times[1] and in *Sushruta Samhita Daruharidra* is described in 38 different contexts[2]. In *Astanga Hridaya Daruharidra* were explained in 69 different contexts[3].

In *Ayurveda, Daruharidra* is distinguished as a Hepatoprotective drug. It is used in *Brana, Prameha, Kandu, Bisharpa*. It is described in *gana* as *arshoghna, kandughna, lekhaniyamahakasaya* in *Charak Samhita; haridradi, mustadi* and *lakshadi* in *Sushruta Samhita* and *Sirovirachana* in *Astanga Hridaya*.

Hepatoprotective drugs are those drugs which protect liver from any infections. *Daruharidra* has been described by various *Acharyas* for *kamala* and various

other diseases. *Daruharidra* has *Ruksha Guna, Tikta, Katu Rasa, Katu Vipaka* and *Ushna Virya* and mainly *Lekhana Karma* which have main role in the *Bahupittakamala* i.e. Hepatitis. *Daruharidra* have berberine chemical constituents which have main role in hepatoprotective activity. other constituents are aromoline, oxyacanthine, oxaberberine and palmatine[14].

Aim and Objectives

1. To compile and evaluate the hepatoprotective activities of *Berberis aristata* DC. in the Modern scientific data and with *Ayurvediya* properties.
2. To analyze *Berberis aristata* DC. in the liver related disorders as a hepatoprotective drug.

Material and Methods

A Bibliographic investigation were done by analyzing Articles, Peer-reviewed paper, Google Scholar, PubMed., Reference books, worldwide accepted scientific databases. The Hepatoprotactive Drugs, Antihepatic Herbal Medicine, Hepatic Diseases, *Berberis aristata* DC as hepatoprotective drug, *Yakritroga, Daruharidra* words were used to search in the Online Databases. Extracted data was analysed to find the applicability of *Berberis aristata* DC. in Hepatic diseases as Hepatoprotective actions.

Results and Analysis

Results and Analysis have been conducted in the following ways:

1. Scientific data of BA in relation to Hepatoprotective medicine in modern scientific methods.
2. *Ayurveda* properties of BA have been analyzed in the reference of *Yakritvikaras.*

1. Hepatoprotective Activity:

1.1 Scientific Data of BA in the reference of Hepatoprotective action:

According to WHO problems related to liver leads to death of estimates about 1.4 millions peoples in the world. Liver diseases are one of the leading causes of illness and death in the society[15,16]. Liver injury caused by different infections, certain drugs, environmental and social factors such as alcoholism, infections, autoimmune disorders[17] resulting in severe pathological conditions such as hepatitis, Liver cirrhosis, Hepatosis (Non inflammatory diseases) etc[18]. The major agents involved are Hepatitis B, A, C, D, E and G. Hepatitis B in chronic condition leads to Liver cancer[19]. Transaminase, Alkaline phosphatase, Bilirubin, Triglycerides and Cholesterol are elevated in the liver diseases[20]. On the basis of the Biomarkers three major classes of the Hepatotoxicity are as- Hepatocellular injury, Cholestatic injury, Mixed injury[21]. Dried aerial part of BA was investigated in aqueous and methanolic extract and berberine, against CCL4 induced liver damage. The hepatoprotective activity of BA extract in Paracetamol and CCL4 shows protection against liver toxicity and have hepatoprotective action by inhibition of microsomal drug metabolizing enzyme[22,23]. Butanolic extract of BA shows action as hepatoprotective by selective intropic activities[24]. BA leaves and fruits showed hepatoprotection possibly through inhibitory action on hepatic drug metabolizing enzyme[31,32].

Pre-treatment of animals with berberine which is extract of *Berberis aristata* DC., 4 mg/kg; orally twice daily for 2 days prevented the acetaminophen or CCL4 induced rise in serum level of alkaline Phosphatase, ALP and aminotransminases, AST and ALT, suggestive of Hepatoprotection. Post-treatment with three successive oral doses of berberine 4 mg/kg every 6hrs reduced the hepatic damage induced by acetaminophen, while CCL4-induced hepatotoxicity was not modified, suggesting a selective curative effect against acetaminophen[33,34,35]

1.2 Effect of BA in Liver cirrhosis:

Dimethylnitrosamine (DMN) induced liver cirrhosis in rat is established and reproducible and it have a very much similarities with human liver cirrhosis[25]. In vivo study on rat shows that Ethanolic extract of BA (EEBA) and Alcoholic extract of BA (AEBA) treatment orally (daily dose 3000 mg/kg of body wt. for 4 weeks) improved the survival rate of these rats on day 28 compared to vehicle-treated cirrhotic rats[26]. In-vitro study in cell line L02 of bioactive compound (Berberine) of BA in apoptosis induced by H_2O_2 chemical shows the mechanisms of protection of hepatocytes from apoptosis by Decrease Caspase-3, decrease PARP, Decrease FasL, Decrease Bim and Increase SIRT1[27].

1.3 Anti-carcinogenic activity:

Berberine and alkaloid isolated from BA have a property of inhibition significantly carcinogenesis induced by 20-methylcholanthrene (200 microg/0.1mL/mouse) of N-trisodiethylamine (NDEA-0.02% NDEA in distilled water, 2.5 mL/animal by gavage, first day a week for 20 weeks) in a dose dependent manner in a small animals. Berberine of dose (0.5, 2.5 or 5.0 mg/kg) reduces significant level of tumor in animal after an injection of 20-methylcholanthrene and increased their life span compared with the control. Berberine of dose 10, 25 or 50 mg/kg was administered simultaneously with NDEA, the markers of liver injury were reduced significantly compared with animal treated with NDEA only, which resulted in all values being elevated. Methanolic extract of stems of BA is also showing promising results against breast and colon cancer cell lines[28,29,30].

1.4 BA as Hepatoprotective drug in Infective Hepatitis:

Infective Hepatitis is the highly contagious disease that attacks hepatocytes of liver[36]. Hepatitis 'A' (Known as Infectious Hepatitis) is acute infections of the caused by Hepatitis 'A' Virus (HAV) and RNA Virus. The Route of infection of 'HAV' is fecal-oral route[36]. Symptoms appear 2 to 6 weeks after the initial infection and usually symptoms is less than two months. BA have Berberine, Aromoline, Palmatine, oxyacanthine[37]. The berberine have properties of cholegogue, hepatostimulant and astringent and are useful in treating anorexia, dysentery and hepatitis[38]. BA definitely reduces the duration of symptoms of Hepatitis[39].

1.5 Use of Chemical component Berberine of BA in Non-Alcoholic Fatty Liver Disease (NAFLD):

Berberine is reported to inhibit cholesterol and triglyceride synthesis in human hepatoma cell line (HepG2) cells and primary hepatocytes[40, 41] and treating rat hepatoma H4IIE cells with BBR shows increased glucose consumption in dose dependent manner[42]. In vivo model of animals also confirms BBR's beneficial role in preventing or treating NAFLD. Intraperitoneal injection of BBR compound chemical for 3 weeks has been studied to alleviate hyperlipidemia and fatty liver on obese (ob/ob) and diabetes (db/db) mice[43]. BBR chemical used In Zucker diabetic fatty liver rats attenuate fatty degeneration[44] in Hyperlipidemic hamsters with BBR strongly reduces fat storage in liver[40]. As for mice with high fat diet (HFD) induced fatty liver, sixteen weeks BBR supplement could alleviate hepatic steatosis and decrease liver lipid content by 14%[45]. BBR prevents development of obesity and insulin resistance in HFD-fed rats[46]. BBR has been shown to reduce liver necrosis both in nonalcoholic steatosis and in steatosis due to hepatitis C infection[47, 48].

1.6 **BA extract in Hepatic Amoebiasis:**

The activity of crude extract formulations of *Berberis aristata, Boerhavia diffusa, Tinospora cordifolia, Terminalia chebula* and *Zingiber officinale* was evaluated in experimental amoebic liver abscess in golden hamsters. The formulation had a maximum cure rate of 73% at a dose of 800mg/kg/day in hepatic amoebiasis, reducing the average degree of infection (ADI) to 1.3 as compared to 4.2 for sham-treated controls[59].

2. Other activities -

2.1 Anti-microbial activity:

Ethanolic root extract of BA shows antifungal activity[53]. The extract of BA (aqueous, alcoholic and powdered root in distilled water) shows wide range of antibacterial activity against Gram-positive bacteria. The extract was also tested for antibacterial activity against Gram-negative bacteria; the antibacterial activity was limited against *E.coli, S. typhimurium, S. dysenteriae type 1* and *V. cholera,* the best activity being against *V. cholera.* The Gram-negative bacteria reported here as susceptible to the extract of BA are important human pathogens responsible for causing diarrhea and dysentery[54, 55]. Berberine, administered orally, resulted in satisfactory parasitological cure, comparable to that obtained with other established antigiardial drugs[56].

2.2 Antidepressant activity:

Berberine exerted anti-depressant like effect in various behavioral paradigms of despair possibility by modulating brain biogenic amines. Further, nitric oxide pathway or sigma receptors are involved in mediating its antidepressant like activity in mouse forced

swim test[57]. Berberine activity on the central nervous system work as the involvement of L-arginine-nitric oxide (NO)-cyclic guanosine monophosphate (cGMP) signaling pathway in the antidepressant action of berberine chloride was investigated[58].

2.3 Antidiabetic activity:

Dried and Powdered root extracted with water and methanol and crude extract was administered to normal and alloxan induced diabetic albino rat. The result shows that BA roots contain potent and orally effective antidiabetic component which either triggers the formation of insulin or shows insulin like effect[49]. Antidiabetic activity was screened in albino wistar rat by inducing diabetes by alloxan[50] and streptozocin[51]. Diabetic rats were treated with ethanolic extract of BA. The results conclude that ethanolic extract possess antidiabetic activity[50]. Berberine may be associated with promoting regeneration and functional recovery of β-cells[31, 52].

Indirect Pharmacological activities influencing Hepatoprotective activity of BA:

In Gall bladder disorders, Uterine disorders, Fever, Periodic neuralgia and menorrhagia, Ulcer healing, Enlargement of spleen and in Blood purification BA shows significant effect[60].

Chemical Composition:

BA contains Berberine (2.23%), Oxyberberine, Berbamine, Armoline, Karachine, Palmatine, Oxycanthine and Taxilamine. It also contains Protoberberine and Bisisoquinoline type of Alkaloids. Root contains Alkaloids like Berbamine, Berberine, Oxycanthine, Epiberberine, Palmatine, Dehydrocaroline, Jatrorhizine and Coumbamine[5,7,8,38]

Analysis of *Ayurvediya* properties of BA:

Ayurveda is that type of Medical system which deals the body in Holistic approach. In *Ayurveda* diseases are classified according to different aspects. According to *Dosha* there are two types as *Samanyaja* and *Nanatmaja*; Three types as *Shakhagat, Marmastisandhigat* and *Kosthagat;* Due to vitiation *of Rakta Dhatu Kamala, Plihavriddhi, Raktapitta, Pandu* are manifested. *Pandu* and *Kamala* have 5 and 2 types respectively. According to types *Pandu* have different clinical signs and symptoms. Generally appearing signs and symptoms are Indigestion, Fatigue, Tiredness, Swelling on body parts, Fever etc. *Kamala* have symptoms of Yellowish coloration of eye, skin, oral cavity, Nail, urine and faeces, Nausea and vomiting, Loss of appetite, Burning sensation of body, Extreme weakness. *Daruharidra* is mainly explained in *Ayurveda* in *Netraroga, Kamala, Pandu Roga* and various *Yakrit Vikaras*[1].

Classifications of *Daruharidra* in *Ayurveda:* *Daruharidra* is important medicinal plant in *Ayurveda* and have classifications on various *varga* as in table 1.

Table 1: Classifications of *Daruharidra* in *Ayurveda:*

Name of the text	Classification under *Varga* (grouping)	References
Charak Samhita	*Arshoghna, Kandughna, Lekhananiya*	*Sutra*-4/3,12,14;5,60; *Viman*-7/17;8/143,150 *Chikitsha*-6/27,28; 7/45, 60, 83, 90, 93, 96, 102, 113, 119, 135.139; 8/136; 14/160, 186,196, 221, 231, 234;15/135,137; 16/53, 62, 72, 96; 26/52, 187, 190, 196, 197, 199, 200, 236, 241.
Sushruta Samhita	*Haridradi, Mustadi, Lakshadi*	*Sutra*-46/432; 38/27, 54; *Chikitsha*-2/69;5/42; 9/35; 18/18; 19/40; 11/8
Astanga Hridaya	*Arshoghna, Sirovirachana*	*Sutra*-15/4;20-38;22/19; *Saarir*-1/62; *Chikitsha*-8/103, 131; 9/58, 90; 10/35; 11/8; 12/6,7; 16-16, 43; 26/26; 37/73
Dhanvantari Nighantu	*Guduchhadivarga*	56-59
Madhav Dravyaguna	*Bibidhausadhivarga*	105

Kaiyadev Nighantu	*Aushadivarga*	1116-1117
Raj Nighantu	*Pipalyadivarga*	175
Bhavprakash Nighantu	*Haridradivarga*	201-205
Priya Nighantu	*Satapuspadivarga*	200-202
Nighantu Adarsha	*Daruharidradivarga*	6th *Varga*
Dravyagunavigyanan	*Arshoghnadivarga*	537

Formulations of *Daruharidra:*

In *Ayurveda yakrit Vikaras* are generally classified as in *Abhighat* (Injury to Liver), *Bidradhi* (Liver abscess), *Yakrtidalyudar*, *Granthi* (Liver cyst), *Yakritarvuda* (Hepatic tumors)[2]. *Daruharidra* in *Ayurveda* have main roles in the treatment of these *Vikaras.* Formulations related to these *Vikaras* are *Kiratatiktadichurna, Kanakarista et*c. are given in Table 2. These medicines are given for *Pandu, Kamala* and other types of *Yakritvikaras* having various signs and symptoms.

Table 2: Common Formulations of *Daruharidra* used for *Yakritvikara:*

Name of text	Formulations	References
Charak Samhita	*Kanakarista*	Cha.chi.14/160
	Kiratatiktadyachurna	Cha.chi.15/137
	Manduravataka	cha.chi.16/73
	Punarnavamanduravataka	Cha.chi. 16/93
	Dravadileha	cha.chi.16/97
	Vyoshadyaghrita	cha.chi.16/119
Astanga Hridaya	*Patoladichurna*	Ast.Hri.chi.10/35
Chakradatta	*Darvadileha; Vyoshadyaghrita*	8/28; 8/56
	Trausanadyamandura	8/34
	Punarnavamandura	8/42
Sarangadhar Samhita	*Triphaladiswaras*	Sa.ma.1/9
	Punarnavadikwath	sa.ma.2/76
	Manduravatak	sa.ma.7.34
Bhavprakash Nighantu	*Punarnavamandura*	Bha.ma.chi.8/30
	Triushanadimandura	Bha.ma.chi.8/50
	Astadashangalauha	Bha.ma.chi.8/55

Pharmacodynamic Properties of *Daruharidra* in *Ayurveda*:

These seven constituents of *Dravyaguna* are *Dravya* (Drug), *Rasa* (Taste), *Guna* (Property), *Virya* (Potency), *Vipak* (Drug metabolism), *Prabhava* (Non-specific activity) and *Karma* (Pharmacological action). *Daruharidra* is *roghagna, Oudbhidam* (Plant origin), *Vanaspatya* (Plant possess both flower and fruits).

On the basis of *Padartha* of *Dravyaguna, Daruharidra* have following Properties as described by different *Acharyas* given in Table 3. *Rasa* is that property which is perceived through the taste-buds. *Guna* is the property which will have inherent relation with the *dravya* but remain inactive. *Vipaka* is the property of a drug which is responsible for the change in original taste on exposure to GIT enzymes and responsible for the final form of the drug inside the body. *Virya* is the property by which the drug produces the therapeutic effect. *Karma* is the inseparable reason for the association (*Samyoga*) and dissociation (*Vibhaga)* of a drug in exhibiting its pharmacological action[61].

Table 3: *Rasapanchak* of BA:

Name of text	*Guna*	*Rasa*	*Virya*	*Vipak*	*Doshakarma*	References
Dh. Ni.	*Ruksha*	*Tikta*	*Ushna*	-	-	*Guduchayadivarga:*56-58
Ni. Ad.	*Ruksha*	*Tikta*	*Ushna*	*Katu*	*Kaphapittahara*	*Daruharidradivarga*
Mad. D.G.	*Ruksha, Laghu*	*Tikta, Katu*	-	-	*Kaphanashani*	*Bividhausadivarga:* 105
D.G. Vigyana	*Laghu, Ruksha*	*Tikta, Kashaya*	*Ushna*	*Katu*	*Kaphapittanasak*	*Arshognadivarga*
Pri. Ni.	-	*Tikta*	*Ushna*	-	*Kaphapittahara*	*Satapuspadi:* 172-174
Bhav. Ni.	*Ruksha*	*Katu, Tikta*	*Ushna*	*katu*	*Kaphapittanashana*	*Hritakyadivarga*: 201-205
ka. Ni.	*Ruksha*	*Tikta, Katu*	*Ushna*	*Katu*	*Kaphapittanashana*	*Aushadivarga:*1116-1117

(Dh.Ni-Dhanvantarinighantu, Ni. Ad.-Nighantu Adarsha, Mad. D. G-Madhav Dravya Guna, D. G. vigyanan-Dravyagunavigyanan, Pri. Ni-Priya Nighantu, Bhav. Ni-Bhavprakash Nighantu, Ka. Ni-Kayadev Nighantu)

Laghuguna is the quality which results the lightness. It acts as *Kaphahara* and *Vatavardhaka*. *Rukshaguna* is the property which is responsible for dryness or responsible of absorption of moisture. It subsides the *kapha* and aggravates *vata. Rukshaguna* results in *sthambhana, soshana, Rukshana, Avrishya* actions[5,3,2].

The Pharmacodynamics properties of *Daruharidra* are summarized as follow[6]:

Rasa (Taste)- *Katu, Tikta* (Bitter)
***Guna* (properties)-** *Laghu* (Light), *Ruksha* (Dryness)
***Virya* (Potency)-** *Ushna*
***Vipak*(Metabolic transformation)-** *Katu*
***Dosha karma* (Actions)-** *Kaphapittahara*

On the basis of these properties of *Daruharidra,* its action are tabulated in Table 4. These are *Vrananasaka, Pramehahara, Kanduhara, Pandunasana, Kamalahara* etc.

Table 4: *Karma* (actions) of *Daruharidra* according to *Ayurveda* texts

Karma	*Ma.Ni.*	*D.G. Vigyanana*	*Ka. Ni.*	*Ma.Bi.Ni.*	*Dh. Ni.*	*Ni. Ad.*	*Pri. Ni.*	*Bhav.Ni.*	*Mad. D.G*	*So.Ni.*
Vrana	+	-	+	-	+	+	+	+	+	+
Prameha	+	-	+	-	+	+	+	+	-	-
Kandu	-	+	-	-	-	+	-	-	+	-
Tvakrog	-	+	-	-	-	-	-	+	-	-
Karnarog	+	+	+	+	-	+	+	+	-	-
Netrarog	+	+	+	+	+	+	+	+	-	-
Mukharog	+	+	+	-	-	+	+	+	-	-
Varnya	-	-	+	-	-	-	+	+	-	-
Pandu	+	+	+	-	-	-	+	+	-	-
Yakritrog	-	+	-	-	+	-	+	-	-	-
Sotha	+	+	+	-	-	-	+	+	+	+

(Ma.Ni.-Madhanpal Nighantu, D.G.Vigyanan-Dravyagunavigyanan, Ka.Ni.-Kaiyadev Nighantu, Ma.Bi.Ni-Madan Binod Nighantu, Dh.Ni-Dhanvantari Nighantu, Ni.Ad- Nighantu Adarsha, Pri.Ni-Priya Nighantu, Bhav. Ni-Bhavpraksah Nighantu, Mad.D.G-Madhav Dravyaguna, So.Ni-SodhalNighatu)

DISCUSSION

Daruharidra have *Rasa: Katu, Tikta; Guna: Laghu, Ruksha; Virya: Ushna* and *Vipak: Katu* and is rich in content of Berberine. It alleviates *Kapha* and *Pittadoshas*[38].

Due to Berberine as chemical constituent and *Tikta rasa* of *Daruharidra*, it reduces the excretion of excessive formation of bile pigments. Due to this factor it reduces the level of serum enzymes in the blood and decreases the inflammation in liver cells. *Tikta rasa* of *Daruharidra* have functions as *Raktasodhana, Tvaka, Mamsaprasadaka* and *Yakrituttejak.* These properties of *Daruharidra* acts as a drug in *Kamala, Pandu, Yakritvikarhara*[1]. Meanwhile, *Ushna Virya* helps to reach all the body parts due to its *Agneya* nature and mobility nature and with *Ushna Virya; Laghu, Rukhsha Guna* helps to pacify *Kaphadosha.* All these properties of *Daruharidra* shows antioxidative, anti-inflammatory, anticancer, Hepatoprotective, Immunomodulatory and also useful in treating anorexia, dysentery, Gallbladder problems, Hepatitis[38].

CONCLUSION

Berberis aristata DC has been tested by the researchers for its various effects of the body. In *Ayurveda,* it is been used in many diseases as a combined ingredient and single drug of medicine. *Daruharidra* is used as a medicine since *Veda, Upanishad* and *Samhita* period. Due to its important properties, *Daruharidra* shows hepatoprotective action against various Liver related problems. Experimental and Clinical studies show that it shows Hepatoprotective, Antioxidative and in *Ayurveda Netraroghara, Mukharognasaka, Yakritvikarnasaka* and *Plihavikarhara* properties.

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ABBREVIATIONS

ALP- Alkaline phosphatase
ALT- Alanine Aminotransferase
AST- Aspartate Aminotransferase
BA- *Berberis aristata* DC
BIM- Bcl-2-like 11
CCL4- Carcon tetrachloride.
FasL- Fas Ligand
PARP- Poly [ADP-ribose] polymerase

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