A POTENTIAL ACTIVITIES OF GYMNOSPORIA MONTANA AND JAGGERY AGAINST JAUNDICE: AN UPDATED REVIEW

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ABSTRACT
Jaundice, also known as hyperbilirubinemia, is defined as a yellow discoloration of the body tissue resulting from the accumulation of excess bilirubin. This activity reviews the treatment of jaundice by use of combined Gymnosporia Montana and Jaggery. Gymnosporia montana (known as Vikro), occurring throughout the arid, dry areas of India, is traditionally claimed to be useful in various ailments. In the present communication the details of the plant like taxonomic position, distribution, traditional uses, pharmacognosy, chemistry and pharmacology has been also reviewed. It has great potential as hepatoprotective and anticancer drug. Jaggery is sugarcane based natural sweetener made by the concentration of sugarcane juice without any use of chemicals. It is available in the form of solid blocks and in semi-liquid form. It contains the natural sources of minerals and vitamins inherently Present in sugarcane juice and it is one of the most wholesome and healthy sugars in the world.

INTRODUCTION
Jaundice cause by excess amount of Bilirubin accumulated in tissue. Bilirubin has two components: unconjugated (indirect) and conjugated (direct), and hence elevation of any of these can result in jaundice. Icterus acts as an essential clinical indicator for liver disease, apart from various other insults.[1] Yellowing of skin sparing the sclerae is indicative of
carotenoderma which occurs in healthy individuals who consume excessive carotene-rich foods.\cite{2}

Gymnosporia Montana (FIG.1) is a much branched, spinescent shrub or small tree, occurring throughout the arid, dry areas of India. Its systematic taxonomic position is as follows:\cite{3}

Kingdom: Plant  
Division: Spermatophyta  
Sub-division: Angiospermae  
Class: Dicotyledoneae  
Sub Class: Polypetalae  
Group: Disciflorae  
Order: Celastrales  
Family: Celastraceae  
Genus: Gymnosporia (Wt. & Arn.) Benth & Hook. F.  
Species: montana  
Plant’s Name: Gymnosporia montana (Roth.) Benth.  
Syn.: Maytenus emarginata (Willd.) D.Hou.

Fig. 1: Gymnosporia Montana (Image Captured by Uday Tala at Shree H.N. Shukla Botanical Garden), Nr. Lalpari, Behind Marketing yard, Rajkot.
Regional names

Ajmere: Kakra.
Bengal: Vaichigachha
Bhil: Dhatti.
Bombay: Hurmacha, Malkangoni, Zekadi.
Canarese: Halumanike, Malegu, Malkanguni, Tandraja.
Central Provinces: Baikal, Gajachinni
Gujarati: Vikalo, Vikro.
Hindi: Baikal, Kngani, Tondarsaijhad.
Marathi: Bharatti, Bharuli, Vekal, Vekar, YeYekkadi
Porbandar: Vikaro.
Punjab: Dajkar, Kharai, Kingaro, Mareila, Talkar.
Sanskrit: Bahuphala, Brahmapadapa, Dantakashta, Gopaghantha, Granthila, Himaka, Kantakari, Kantaki, Kantapada, Kantapatra, Kinkari, Madhuparni, Mriduphala
Tamil: Kattanji
Telugu: Dantausi, Danti, Gajasinni, Gechangi, Peddachintu, Peddadanta, Sinni.
Uriya: Gourokasa

Plant distribution

Throughout the arid, dry areas of India. Punjab, Sind, W. Rajputana, Gujarat, Khandesh, W. Peninsula, Deccan, C. Provinces, Afghanistan, Arabia, Mediterranean, Tropical Africa, Malaya, Australia.

Jaggery is prepared by concentrating the sugarcane juice and it is Available in the form of solid blocks and in semi-liquid form. Besides This, the sap collected from some palm trees such as palmyra-palm (Borassus flabellifer L.), coconut-palm (Cocos nucifera L.), wild date-Palm (Phoenix sylvestris Roxb.) and sago-palm (Caryota urens L.) is Used for preparation of jiggery. For ease of handling, packaging and Storage, jaggery in granular form is becoming popular. The hygroscopic Nature of granulated jaggery product lead to stickiness and caking Problems.
Etiology of jaundice

- Acute inflammation of the liver
- Inflammation of the bile duct
- Obstruction of the bile duct
- Hemolytic anemia – Gilbert’s syndrome
- Cholestasis
- Physiological jaundice
- Maternal-fetal blood group incompatibility (Rh, ABO)
- Breast milk jaundice
- Breast feeding jaundice

Evaluation of jaundice

After obtaining a thorough history and performing physicals, the most important laboratory test to be done is liver function tests.\(^{[5,6]}\)

Liver function tests – to check serum levels of aspartate transaminase (AST), alanine transaminase (ALT), alkaline phosphatase (ALP), gamma glutamyltransferase, serum albumin, protein, and bilirubin

AST, ALT and ALP levels – if the liver transaminase levels increase but ALP levels are low, then the insult is hepatic in origin.
AST/ALT ratio is more than 2 to 1 in alcoholic liver disease.

AST and ALT values are in 1000s; then the hepatocellular disease is likely due to toxins like acetaminophen or ischemia or viral.

If ALP levels are five times elevated than normal and liver transaminases are normal or less than two times normal, then the most likely cause is biliary obstruction. The high serum ALP levels due to a biliary injury can be differentiated from bone disorders by ordering a GGT serum profile, increased levels confirm hepatic origin.

If AST, ALT and ALP levels are normal- then the jaundice is not due to liver or bile duct injury. The cause must probably be pre-hepatic: inherited disorders of liver conjugation or blood disorders or defect in hepatic excretion (Rotor, Dubin-Johnson).

Serum Bilirubin – whether there is a rise in unconjugated or conjugated bilirubin

In addition to the liver panel, all jaundiced patients should have additional tests such as albumin and prothrombin time – which are indicative of chronic and acute liver function, respectively. The inability of prothrombin time to correct with parenteral administration of vitamin K suggests severe hepatocellular dysfunction.

The results of the bilirubin, enzymes, and liver function tests will direct the diagnosis towards a hepatocellular or cholestatic cause and offer some idea of the duration and severity of the disease.

Further evaluation can be conducted based on the initial assessment.

Hepatocellular workup: viral serologies, autoimmune antibodies, serum ceruloplasmin, ferritin.

Cholestatic workup: Additional tests include abdominal ultrasound, CT, magnetic resonance cholangiopancreatography (MRCP), endoscopic retrograde cholangiopancreatography (ERCP), percutaneous transhepatic cholangiography (PTC), endoscopic ultrasound (EUS).
Chemistry of gymnosporia montana
Several sesquiterpene pyridine alkaloids like emarginatine A, B, E, F, G and a sesquiterpene ester, celahin B, have been reported from the family Celastraceae\textsuperscript{[07-09]} Number of compounds, with varied chemical nature, have been reported by several workers from different parts of Gymnosporia Montana.

Leaves
Several compounds viz. Tingenone, 3-0-acetyloleanolic acid, hexacosane, hexacosanol, n-triacontanol, betulin, β-amyrone, B amyrin, 8-amyrin, β-sitosterol, celacinnine and kaempferol have been isolated\textsuperscript{[10-13]} from the leaves of G. Montana. Presence of Galactose as free sugar and seven free amino acids including arginine, glutamic acid, alanine, proline, y-aminobutyric acid have also been reported by De et al.\textsuperscript{[14]} The same group has also reported\textsuperscript{[15]} the presence of seven fatty acids, of which palmitic acid is the major one (72.03%), in the leaf.

Stem
Joshi et al.\textsuperscript{[10-15]} have reported isolation of iguesterin, pristimerin, tingenone, β-amyrin, β -sitosterol and maytenonic acid from the stem. It is also reported\textsuperscript{[16]} to contain sesquiterpene pyridine alkaloid Emarginatine B and maytansine. Presence of β-amyrin has also been supported by Anjaneyulu and co-workers.\textsuperscript{[17]}

Root
Iguesterin, pristimerin, tingenone, β-amyrin, and B-sitosterol have been isolated by Joshi et. Al Satyanarayana and his team have isolated dukidol and β-amyrin whereas Akshaya Kumar et. Al. have reported presence of (-) epigallocatechin, Emarginatine A and Emarginatine G, two other sesquiterpene pyridine alkaloids have also been isolated from this plant.

Chemical constituents of jaggery
It is rich in important minerals (viz., Calcium-40-100 mg, Magnesium-70-90 mg, Potassium-1056 mg, Phosphorus-20-90 mg, Sodium-19-30 mg, Iron-10-13 mg, Manganese-0.2-0.5 mg, Zinc-0.2- 0.4 mg, Copper-0.1-0.9 mg, and Chloride-5.3 mg per 100 g of jaggery), vitamins (viz., Vitamin A-3.8 mg, Vitamin B1-0.01 mg, Vitamin B2-0.06 mg, Vitamin B5-0.01 mg, Vitamin B6-0.01 mg, Vitamin C-7.00 mg, Vitamin D2-6.50 mg, Vitamin E-111.30 mg, Vitamin PP-7.00 mg), and protein-280 mg per 100 g of jaggery, which can be made available to the masses to mitigate the problems of mal nutrition and under nutrition. The
micronutrients present in the jaggery possess antitoxic and anti-carcinogenic properties.\textsuperscript{[18]} It has moderate amount of calcium, phosphorous and zinc, so it helps to optimum health of a person along with all its benefits, purifies the blood and prevents rheumatic afflictions and bile disorders and thus helps to cure jaundice.

**Pharmacology of gymnosporia montana**

Very few reports on pharmacological activity of Gymnosporia montana are available. On the basis of its traditional and folk-lore claim of being useful in jaundice and inflammation, De and co-workers\textsuperscript{48} have evaluated its leaf extracts for possible anti-inflammatory and hepatoprotective activities. Antiinflammatory activity was evaluated by noting the effect of their prior treatment on carrageenin induced rat hind paw oedema. The extracts did not affect carrageenin induced hind paw oedema – indicating lack of anti-inflammatory activity. Preliminary screening for hepatoprotective activity was carried out by noting their effect on carbon tetrachloride induced prolongation of pentobarbitone sleeping time in mice. Methanol extract of the defatted leaf was found to significantly antagonize carbon tetrachloride induced prolongation of pentobarbitone sleeping time in mice. The extract also significantly antagonized the elevation of serum transaminase activity in rats. Since the extract indicated hepatoprotection in preliminary study, it was further evaluated by the same group for its effect on CCl\textsubscript{4} induced alterations in different serum and liver parameters and changes in liver cytoarchitecture for confirming the hepatoprotective activity of the plant. Transaminase activity, lipid constituents of serum and liver, orosomucoid level in serum, as well as liver glycogen and phospholipids content were the main parameters studied. The extract reversed majority of the CCl\textsubscript{4} -induced alterations in different serum and liver biochemical parameters and also significantly antagonized the CCl\textsubscript{4}–induced changes in the liver cytoarchitecture\textsuperscript{49}. Later Patel et al.\textsuperscript{50} have also reported that pre-treatment of the alcoholic extract (100mg/kg) of G. Montana leaves in Wistar rats produces hepatoprotective activity comparable to that of silymarin (100mg/kg) against paracetamol induced hepatotoxicity. The methanolic extract of the defatted dried leaf powder, when evaluated for its antioxidant potential by estimation of lipid peroxidation (by FTC method), total antioxidant activity (by thiobarbituric acid method), DPPH radical scavenging activity and nitric oxide scavenging activity, has also shown to be a promising source of antioxidants\textsuperscript{51}. Recently Dhuru et al.\textsuperscript{52} have reported the anti-inflammatory, analgesic and antibacterial activity\textsuperscript{53} of the plant. Presence of antispasmodic activity has been reported by Dhar et al.\textsuperscript{54}. The present review reveals that Gymnosporia montana possess various biological activities like hepatoprotective, anticancer,
antioxidant, antibacterial, analgesic, antispasmodic and it has great potential as a promising anticancerous and hepatoprotective drug.\[^3\]

**CONCLUSION**

Medicinal herbs can be a good alternative for many diseases and conditions. They are cost effective, and tend to have fewer side effects. Moreover, they can be bought in health food shops, pharmacies and on-line without the need for a prescription. However, herbal medicines can still have unwanted health effects, especially when used in combination with other drugs. If you are using more than one herbal medicine, or using them for a serious condition, it's best to consult with a naturopath or established herbalist. It's also important to tell your physician that you are using an alternative medicine to prevent drug interaction. As Per above discussion, I conclude that we use the Gymnosporia Montana and Jaggery in the treatment of Jaundice.

**REFERENCES**


