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Pharmacological Properties of Bixa Orellana – A Review

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Abstract: ***Bixaorellana popularly known as "urucum," has been used by indigenous communities in Brazil and other tropical countries for several biological applications, which indicates its potential use as an active ingredient in pharmaceutical products. It is a shrub used as an ornamental plant in India and is best known as the source of the natural pigment annatto, produced from the fruit. Parts of the plant has been used to make medicinal remedies. Bixaorellana is well known for its coloring agent and medicinal value. Annatto used in food dye,body paint, treatment for heart burn and stomach distress,sunscreen and insect repellant. The main actions of annattocolor are it kills bacteria, parasites, germs, increasesurination, stimulates digestion, lowers blood pressure,mildly laxative, and protects liver. The other actions ofannatto color includes it reduces inflammation, cough,cleanses blood, soothes membrane, reduces fever, bloodsugar, heals wounds. Therefore, this work comprises a systematic review about the use of Bixa Orellana. This study shows the well-characterized pharmacological actions that may be considered relevant for the future development of an innovative therapeutic agent.***

Keywords: Bixaorellana ,natural dye, annatto, antimalarial, hepatoprotective, antimicrobial, antioxidant, antifungal.

1. Introduction

Bixaorellana is a plant native to Brazil but grows in other regions of South and Central America. It is grown in tropical countries such as Peru, Mexico, Ecuador, Malaysia, Indonesia, India, Kenya, and East Africa[1].BixaorellanaL popularly familiar as annatto plant belonging to Bixaceae. The species name of this plant is named after theSpanish scientist conquistador, Franscisco de Orellana.The Bixaceae family is one of the smallest plant families, consisting only of one genus, Bixa. There are only five species grouped under a single genus, and the most common species is Bixaorellana, an evergreen shrub grown not only because of its beautiful red flowers and ornamental red spiny fruits, but also for its economic value. Bixaorellana, also known as "annatto"[3]. Itis a tree reaching 4 to 6 meters. Leaves are entire, ovate, 8 to 20 cm long, 5 to 12 cm wide, with a broad and heart-shaped base, and a pointed tip. Leaf shows the glossy cordate acuminate leaves are ever green with reddish veins with a thin long petiole. Leaves spirally arranged, simple, stipulate, ovate, shallow cordate to truncate at base, longly acuminate at apex, green or dark green above grey or brownish green beneath. Microscopically the leaf is dorsiventral, the midrib and the laminar region showed single layered epidermis on both the surfaces and covered with thick cuticle. The microscopy shows the presence of vascular bundle, collenchymas, spongy parenchyma and palisade cells[2]. The flowers are white or pinkish, 4 to 6 cm diameter, 4 to 6 cm in diameter on terminal panicles. Capsules are ovoid or rounded, reddish brown, about 4 cm long and covered with long, slender and soft spines containing many small seeds covered with a dye-yielding red pulp[5][6]. It bears clusters of brown or crimson capsular fruits, containing 10 to 50 seeds covered with thin, highly colored resinous coatings[4].

2. Uses

Parts of the plant has been used to make many medicinal remedies.

1) Natural Dye

The Annatto seed extract contains many color principles among all bixin, oil soluble and norbixin, water soluble principles are responsible for its dye characteristics. Bixin responsible for imparting reddishness and norbixin for yellow[10]. Annatto color imparts yellow to red with varied hue index as it possesses high tinctorial value, hence have significance in the food industry as a natural food grade colour, and stands second in rank among economically important natural food colourants [12][13], apart from its wide use insome regions of the world for non-food applications viz., to color textiles [14][7][8], fabrics andweapons [15][9][11].Isolated pure bixin and norbixin were subjected for color intensity stability. Annatto used in food dye,body paint, treatment for heart burn and stomach distress,sunscreen and insect repellent.

The main actions of annatto color are it kills bacteria, parasites, germs, increases urination, stimulates digestion, lowers blood pressure,mildly laxative, and protects liver. The other actions of annatto color includes it reduces inflammation, cough,Cleanses blood, soothes membrane, reduces fever, blood sugar, heals wounds[16].the formation of hydroperoxide of triglycerides in the presence of γ-tocopherol and annatto extracts revealed that both the extracts inhibited the formation of hydroperoxide. Addition of γ-tocopherol retarded the loss of carotenoid, and hence this combination was more effective in inhibiting the hydroperoxide formation. This particular principle is having significance in making food formulations with annatto colour, wherein it enhances pigment stability [17].

2) Cosmetics

Annatto is being used increasingly in body care products[18]. Annatto oil is an emollient, and its high carotenoid content provides antioxidant benefits on body care products, while adding a rich, sunny colour to creams, lotions, and shampoos. Protection from ultraviolet rays of sunlight, thereby protecting the skin from excessive sunburn. Dyes for lipstick are also obtained from

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BixaorellanaL[19]hence, the name lipstick tree. It is also used as a colouring agent for the preparation of sindoor[20][23].

3) Pharmaceutical Uses

Annatto is commonly used as a colouring agent for pharmaceutical ointments and plasters[21]. It has been used in direct compression tablet coating and oral liquid drugs [22]. The pulp, which includes the seed, is used for soft drinks and febrifuge[24-26].

4) Systemic Uses

Annatto extracts from leaves, roots and seeds have traditionally been used for medicinal purposes like asthma[27]. Extracts of leaves, bark, and roots are reported to be antidotes for poisoning and antivenin for snakebites[28][29]. The entire plant is used against fever and dysentery[53]. A decoction of the leaves is used to stop vomiting and nausea; treat heartburn, prostate and urinary difficulties, stomach problems and internal inflammation, arterial hypertension, high cholesterol, cystitis, obesity, renal insufficiency, and to eliminate uric acid and as a mild diuretic .[30][31].It is used as an aphrodisiac and astringent and to treat skin problems and hepatitis [32]as well as to avoid phlegm in newborn babies. The seeds are believed to be an expectorant, while the roots are thought to be a digestive aid and cough suppressant [33]. Its efficiency against STD such as gonorrhea was reported[34-36].

5) Hepatoprotection

Methanol extract of B. orellanaseeds illustrated hepatoprotective activity against liver damage induced by carbon tetrachloride (CCl4) [37]. B. orellana, showed significant decrease in the levels of serum markers, indicating the protection of hepatic cells.

ANTIMALARIAL ACTIVITY has been determined against Plasmodium gallinaceum, Plasmodium lophurae, falciparum and Plasmodium berghei .[38] B. orellanaextracts possess antiprotozoal, anthelmintic and plateletantiaggregant activity [39][40].

6) Diabetes Mellitus

Bixaorellanahas been used for the treatment of diabetes mellitus. B. orellanalowered blood glucose by stimulating peripheral utilization of glucose, [41]. B. orellana had antihistamine activities anti-inflammatory activity anticonvulsant activity antidiabetic activity [42-44].

7) Antimicrobial Activity

Bixaorellanashowed a broad spectrum of antimicrobial activity [45][46].B. orellanain traditional medicine used as a gargle for sore throats and oral hygiene.Seedsurucum is used as a condiment as well as laxative, cardiotonic, hypotensive, expectorant, and antibiotic [47-49]. It has anti-inflammatory activity for bruises and wounds and has been used for the treatment of bronchitis and for wound healing purposes. Oil is also obtained from this plant. The infusion of the leaves has been shown to be effective against bronchitis, sore throat, and eye inflammation [50][65].Bixaorellanaleaves exhibits antifungal activity[51][34][44][52].

8) Antioxidant

Annatto has been reported to contain tocotrienols (T3), a less prominent isomer of vitamin E which has been reported to possess in vitro and in vivo anti-cancer activity in mutagenic rodents and this was recently confirmed via oxidative effect, senescent-like growth inhibition and immune modulation effect as well as in tumoral mammary glands of transgenic mice expression of HER-2/neu. Anti-apoptotic effect of δ-T3 and γ-T3 components of annatto have been established in vitro in human and mice tumor cell lines.

Among the natural carotenoids, bixin is one of the more effective biological singlet molecular-oxygen quenchers and may contribute to the protection of cells and tissues against deleterious effects of free radicals [54]. Bixin is also an effective inhibitor of lipid peroxidation [55], inhibited TBARS production in peripheral macrophages, and this could be the mechanism by which carotenoids in vivo protect cells and tissues from damage induced by oxygen metabolites [56]. It is an antioxidant inhibitor of lipoxygenase activity[57]. Methylbixin has shown enhancement activity of gap junctional communication which is important in cancer prevention [58].

9) Antimutagenic Activity

It is potential against chromosomal damage induced by radiation [59-60] and clastogenic effects of antitumor agents [61]suggesting it as a promising agent against radiations. Bixaorellanaextract are good radioprotectors of bone marrow at non-toxic dose suggests that it may be promising agents for human radiation [62]

The protective effect of Bixaorellanaagainst DNA damage induced by UV radiation, hydrogen peroxide and superoxide anions promoted us to go assessing it'sradioprotective potential at chromosomal level [63-66], and it also displayed antimutagenic properties [67]. ; It thus has antigenotoxic properties and chemo-preventive effects.

10) Fuel

The wood of B.orellanais lightweight (specific gravity 0.4), weak, and not durable. It was used in former times to start fires by friction. Bixafruit pericarps that are by-product of annatto colour extraction industries can be used as a potential source of fuel[68].

3. Conclusion

BixaOrellena is thus used for the treatment of conditions such as microbial infections, sunstroke, tonsilitis, burns, leprosy, pleurisy, apnoea, rectal discomfort, headacheand for the treatment of small burns, poisoning, thinning hair, headaches, gonorrhea, skin diseases, nausea and vomiting, snake bites etc.Bixahas also been suggested to possess antifertility, anticancer, antidiabetic, antifungal, antimicrobial, hepatoprotective, cardio protective, antiemetic, antispasmodic, analgesic, adaptogenic and diaphoretic actions.

Although the commercial exploitation of this species is well established, there are very few studies on its pharmacological effects. Considering the need for developing a safe and effective product, more studies should

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be performed in order to confirm other biological activities supported by the popular uses of Bixaorellana.

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