e-ISSN 2320 –7876 www.ijfans.org
Vol.11, Iss.8, 2022
 UGC CARE Listed (Group -I) Journal

Phytochemical and Pharmacological Potentials of *Eugenia Jambolana* : A Review

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e-ISSN 2320 –7876 www.ijfans.org
Vol.11, Iss.8, 2022
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ABSTRACT:

Eugenia jambolana is common plant which is mainly found in Indian sub continents. Jamun is Indian name of this plant. It has various pharmacological properties like antiviral, antidiabetic, antioxidants etc. In the present review we have highlighted the various pharmacological properties of Eugenia Jambolana with different chemical structures. Different extracts of *Eugenia jambolana* have been highlighted.

Key words: jamun; Eugenia; ras jaman; extracts

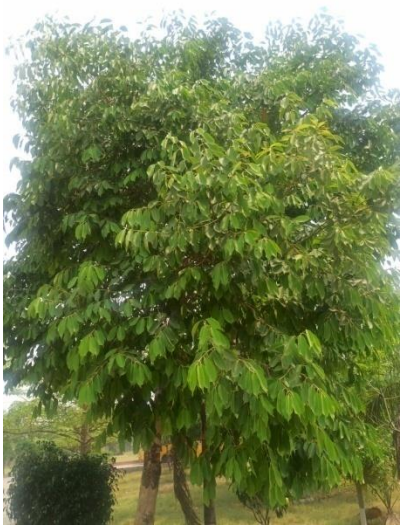
EugeniaJambolana Lam.(Family: Myrtaceae)

1.INTRODUCTION

Eugenia Jambolana Lam. relates to the family *Myrtaceae*, is large tree which is found in the Indian subcontinent. However, this tree was also found in Asia, East Africa and South America. Black plum or jamun is another name of *Eugenia Jambolana*. It is an Indian native plant. The tree bears fruits annually and fruits are in ovoid shape or may be in ellipsoid shape. On the basis of the botanical studies, there are two macrophytes of jamun according to their morphological and organoleptic characters. These macrophytes are *katha* (acidic in taste and small) and *Ras jaman* (oblong shape, dark purple with fleshy pulp and seed size is small). Height of trees is approx. 50 feet. The pale brown color is shown by young bark while darkish browny color is shown by the mature bark. The shape of leaves is elliptical and broadly oblong and shows fibrous nature. The flowering season in the Indian subcontinent is June-July and these come once a year. Small flowers with petals white in color [1,2].

Fruits appear from the scars of leaves are generally in pairs of threes. These are used in the preparation of various juices or health drinks[2,3]. Jamun was widely used for its antidiabetic properties in the era when insulin was not discovered. Various studies have also revealed different pharmacological activities like anti-fungal, anti-bacterial, anti-viral, anti-genotoxic, anti-allergic, anti-cancer, anti- inflammatory, anti-ulcerogenic and hepatoprotective properties etc.

(Synonyms: *Eugenia cuminii Druce*.



2. BIOACTIVES

Various studies have revealed that various minerals i.e., sodium, potassium, calcium,

phosphorus and zinc were contained by the jamun pulp. The pulp of Jamun is rich in water-soluble vitamins, i.e., ascorbic acid, niacin, thiamine; amino acids tyrosine, asparagines, alanine. It also contains carbohydrates like glucose, mannose, sucrose. Every part of Eugenia jambolana has useful metaboli.

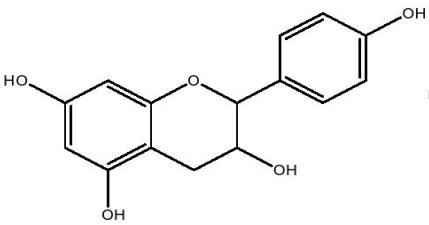
Myricitrin, noctacosanol,n-triacontanol, n-nonacosane, mycaminose, crategolic acid, n-hepatcosane, β-sitosterol, n-hentriacontane, betulinic acid, n-dotricontanol, myricetin quercetin, are the chemical constituents of leaves.[2]

The oil obtained from leaves also contains α-cadinol, pinocarveol, α-myrtenal, eucarvone, myrtenol, pinocarvone, and geranyl acetone, α-terpeneol, cineole[4] .

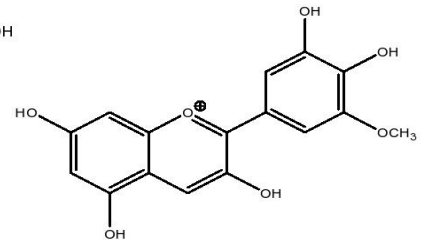
The stem bark consists of the following constituents: kaempferol, β- sitosterol, , friedelin, βsitosterol-D-glucoside gallotannin, gallic acid, betulinic acid, ellagic acid (Rastogi *et.al* 1990). The flowers are composed of chemical constituents such as isoquercetin, oleanolic acid, ellagic acid, quercetin, myricetin and kaempferol[3].

According to various obsetrvations, it has been revealed that jamun pulp is composed of delphinidin, anthocyanins, petunidin, and bright purple is given by these compounds[5].

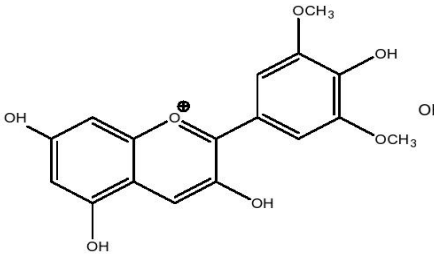
The most studied plant parts are seeds and important constituents of these are ellagic acid, 3,6-hexahydroxy diphenoylglucose jambosine gallic acid, , 4,6 hexahydroxydiphenoylglucose, β-sitoterol corilagin and quercetin[6].



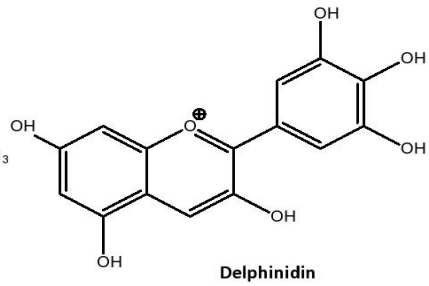
Anthocyanin



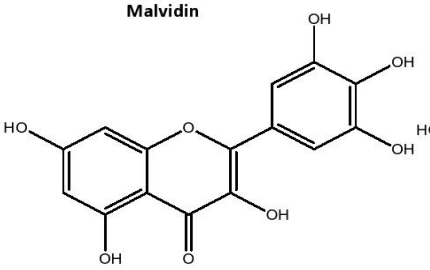
Petunidin



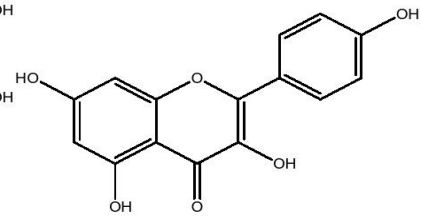
Malvidin



Delphinidin



Myricetin



Kaempherol

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Vol.11, Iss.8, 2022
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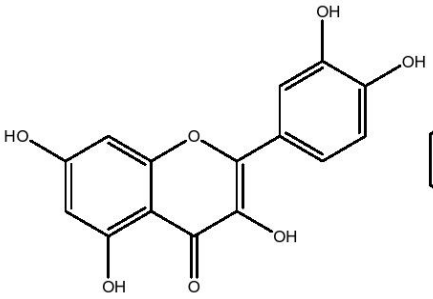
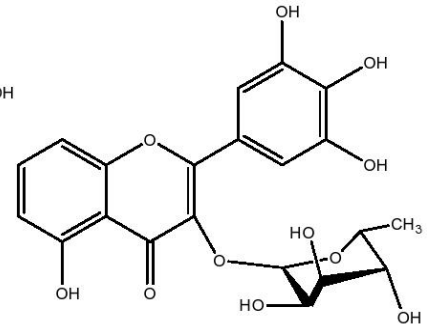
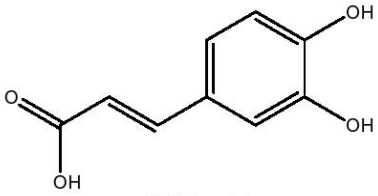


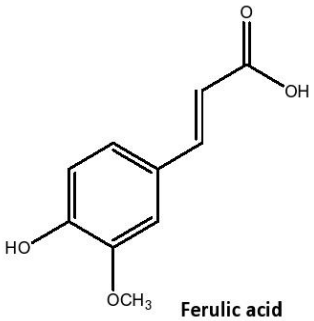
Quercertin



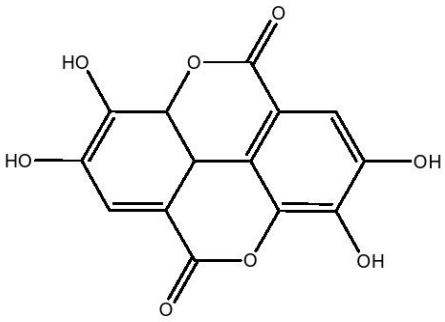
Myricitrin



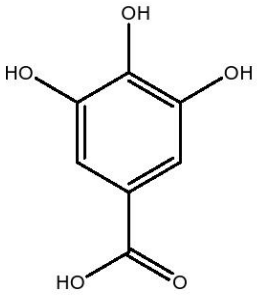
Caffeic acid



Ferulic acid



Ellagic acid



Gallic acid

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Vol.11, Iss.8, 2022
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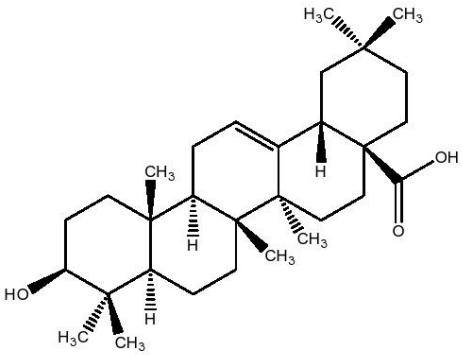
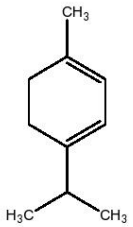
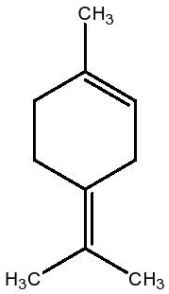


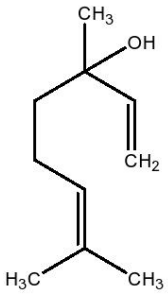
Oleanolic acid



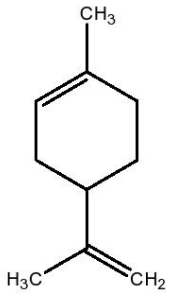
Terpinene



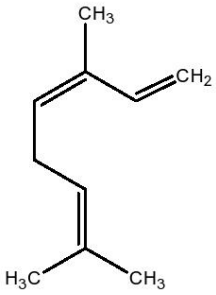
Terpinolene



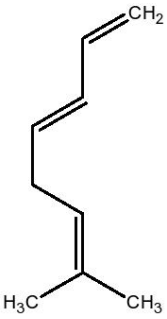
linalool



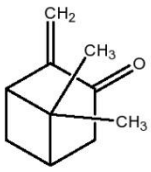
Limonene



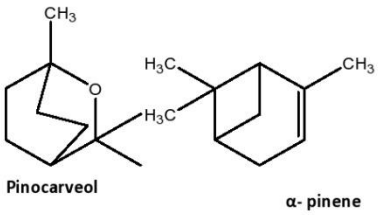
Cis Ocimene



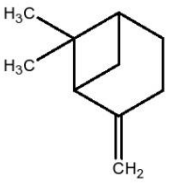
Trans



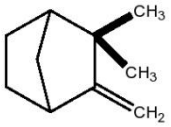
Pinocarvone



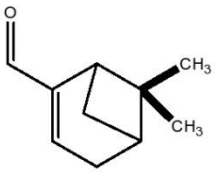
Pinocarveol **α- pinene**



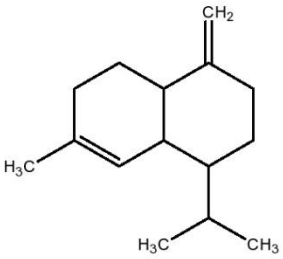
β- pinene



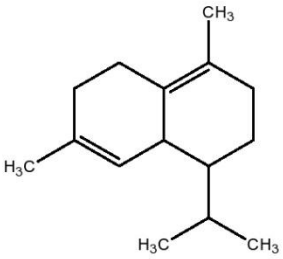
Camphene



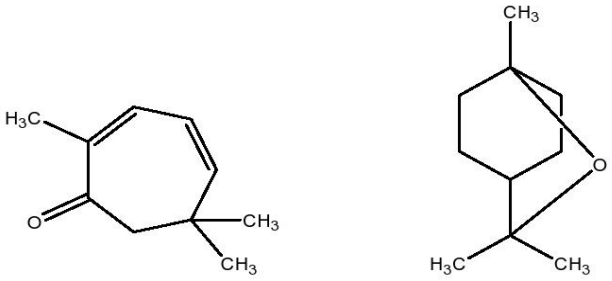
Myrtenal



γ- cardinene



δ- cardinene



Eucarvone 1,8 cineole

Fig1: structures of different chemical constituents

PHARMACOLOGICAL ACTIVITIES

Antibacterial activity:

Antibacterial effects possessed by the hydroalocoholic extract of jamun leaf against the bacterias named as E. faecalis, E. coli, Kocuria rhizophila etc[7].

Petroleum ether extract, ethyl acetate extract was studied for Antibacterial effects on Bacillus subtilis, Salmonella typhimurium and Enterobacter aerogenes. On gram-positive organisms, methanolic extract showed better effectiveness than other extracts. Methanolic

extract of seed was studied it showed effectiveness against Klebsiella pneumoniae,V. cholera, A. hydrophila, Enterotoxigenic Escherichia coli, Bacillus subtilis and Pseudomonas aeruginosa, but shows no evidence of effectiveness against was E.coli[8,9]

Antifungal action

Antifungal actions are shown by hydroalcoholic extract of leaf for *Candida albicans* and *Candida krusei*. The aqueous and methanol extracts inhibited certain bacteria such as T. Rubrum, T. mentagrophytes, and M. gypseum [10].

On Ascochyta rabie the growth inhibitory effects were shown by aqueous extract of leaves, ethanol extract of fruits and root bark and n-hexane extracts from stem-bark.[11,10]

Antiviral activity

It is reported that extract (aqueous) of the Jamun leaves have shown effectiveness in the inhibition of the replication of the buffalo pox virus and goat pox virus[12].

Free radical scavenging activity

This activity shown by ethanol-formic fruit extract, methanol leaf extract and hydroethanol extract of seed. These are reported as free radical scavengers [1,13].

Anti-inflammatory activity:

This activity was shown by ethanol extract in rats Anti-inflammatory activities in acute and chronic models were shown by ethanol extract in rats i.e carrageenan and kaolin–carrageenan for acute inflammation and chronic inflammation [14].

Gastroprotective action

Gastric ulceration induced by HCl or ethanol, this was inhibited by tannins which were isolated from jamun. In preventing ulcerations, fruits show effectiveness in both streptozocin-induced and normal diabetic rats[15]

Hepatoprotective effects

Against CCl_4-induced hepatotoxicity aqueous and methanolic extracts of leaf and seed showed effectiveness in rats[16,17]. In in vitro studieswith rats it was revealed that anthocyanins rich dose (230 mg per 100 g dry weight) of jamun extract was effective against damage of liver which was induced by CCl4. The treatment of hepatocytes with the extract showed diminishing activity with dose of 50 to 500ppm against the LDH release which was induced by CCl4, showed decreased the lipid peroxidation[18].

Antidiabetic activities

Antidiabetic activities of jamun revealed by the investigations and seed, pulp and bark have shown an effective antidiabetic action, while the leaf shows no activity[19]. Aqueous and alcohol extracts of Jamun seed in various doses given to rats with fructose diet shown concentration dependent beneficial effects. For 15 days rats were fed with fructose, then triglycerides, insulin and serum glucose levels were increased and this was confirmed by comparing with normal control models. When rats were treated with jamun aqueous extract (400 mg/ day) for 15 days, preventive effects prevented high glucose level and hyperinsulinemia[20,21,22].

Hypolipidemic effect

Diabetic rats showed hypolipidemic effects when these were fed with ethanolic seed extract (with dose 100 mg/kg body weight). The modification of plasma lipoproteins and

composition of fatty acid which were shown by rats(diabetic), this alteration is reversed after administration of the extract[23,24].

Cardioprotective effects

In case of myocardial infarction, which is isoproterenol induced in mice, cardioprotective effects were shown by methanolic extract of seed[25].

Anti-diarrheal effects

Ethanolic extract showed beneficial effects against diarrhea which was induced by castor oil and enteropooling, also showed reduction in motility of GIT. These observations emphasized on the effectiveness of Jamun as anti-diarrheal agent[26].

Antifertility activity

Antifertility activities were shown in albino male rats, when there was the administration of oleanolic acid, which is obtained from jamun flowers. When this compound was asdministered for 60 consecutive days in animals, this result into the diminished fertilizing capacity of the animals and there was no alteration in the weight of the body and in the weight of the reproductive organ. Spermatogenesis is locked by the Oleanolic acid and there There was no effect on Leydig stromal cells, spermatogenic and Sertoli cells, suggesting a specific effect on the spermatogenic process. Based on these observations, oleanolic acid is reported to act as an essentially non-toxic contraceptive[27].

Anti allergic activity

Oral administration of aqueous leaf extracts (25–100 mg/kg) to mice (Swiss albino) inhibited rat paw edema induced by allergen compound 48/80. Inhibition has been shown by the extract against 5-HT and histamine-induced edema, but no effect on platelet aggregation-induced paw edema [28] .

Antipyretic Effect:

Jamun exhibits antipyretic activity against yeast-induced fever in mice[29].

Neuropsychopharmacological Effects:

central nervous system depressant effects were induced by the chloroform extract of jamun seed. Modulated CNS activity is exhibited by methanol extracts of seeds [30,31].

Antitumor Effects

Cytotoxic effects have been demonstrated by jamun extracts from human cervical cancer cells32-34. Recently, jamun fruit extract has been used in estrogen-dependent/aromatase-positive (MCF-7aro) and estrogen-independent (MDA-MB-231) breast cancer cells, as well as in normal/non-tumorigenic (MCF-10A) breast cell lines[32 ,35].

Chemopreventive Effects

In mice, hydroethanolic extracts of seeds showed inhibition of DMBA-induced croton oil-promoted skin carcinogenesis. the extract was given to animals at doses of 125 and 250 mg/kg/body weight/animal/day either before or after induction period, reduced the cumulative number of papillomas, tumor incidence, and compared with the control group (carcinogen only) [1,34,35].

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S. No.	Plant Part	Extract	Dose	Uses	References
1.	Seeds	Aqueous	400mg/kg	Antidiabetic	21
2.	Seeds	Ethanolic	40mg/kg	Antihelminthic	08,09
3.	Leaves	Methanolic	400mg/kg	Hepatoprotective action	18
4.	Leaf buds	Emulsion	0.2mL/20gm	Laxative action	15
5.	Fruits	Ethanolic extract	200mg/kg	Peptic ulcer	15
6.	Seeds	Petroleum ether, chloroform, ethanol	100mgkg	Antinociceptive activity	
7.	Leaves	Hydroalcoholic extract	50mg/mL	Anti lipid scavanaging activity	24
8.	Seeds	Ethanolic	250mg/kg	Antidiabetic, antihyperlipidemic, anti oxidant properties	22
9.	Leaves and bark	Methanolic, hydromethanolic , hot aqueous Cold aqueous	Bark hot extract 0.0781 Leaves 0.0781	Anti viral properties	12
10.	Leaves extract and bark extract	Ethanolic extract (ointment)	5%w/w 10%w/w	Wound healing properties	23
11.	Leaf	Dichloromethane and methanol (1:1)	30mg/kg	Radioprotection	01
12.	Fruit skin	Crude	35.2 µg/mL	Anticancer	32
13.	seed	Methanolic	500mg	Cardioprotective	25
14.	Seeds	Ethanol , acetone	100mg/kg/day	Prevention of obesity	23
15.	seeds	Ethanolic	2% extract	In alopecia	35
16.	Seeds	Aqueous	5g/kg	In hyperlipidemia	23
17.	Seed powder	Aqueous	1g/kg	Antidiabetic	20
18	Leaf	Methanolic	112.79 µg/mL	Free radical scvanaging activity	01
19.	Pulp	Dried pulp powder	100 µg/mL	Anti proliferative activity	34

Table1: list of various extracts of Eugenia jambolana

Conclusion : Eugenia Jambolana plant reveals different pharmacological activities as contain chemical constituents show various therapeutic action. Jamun is a magnificient fruit for different ailments. It is safe, efficient and wonderful house remedy plant for diabetic patients. Seed and fruit part revealed different pharmacological and phytochemical potential, more parts of plant needs to explore.

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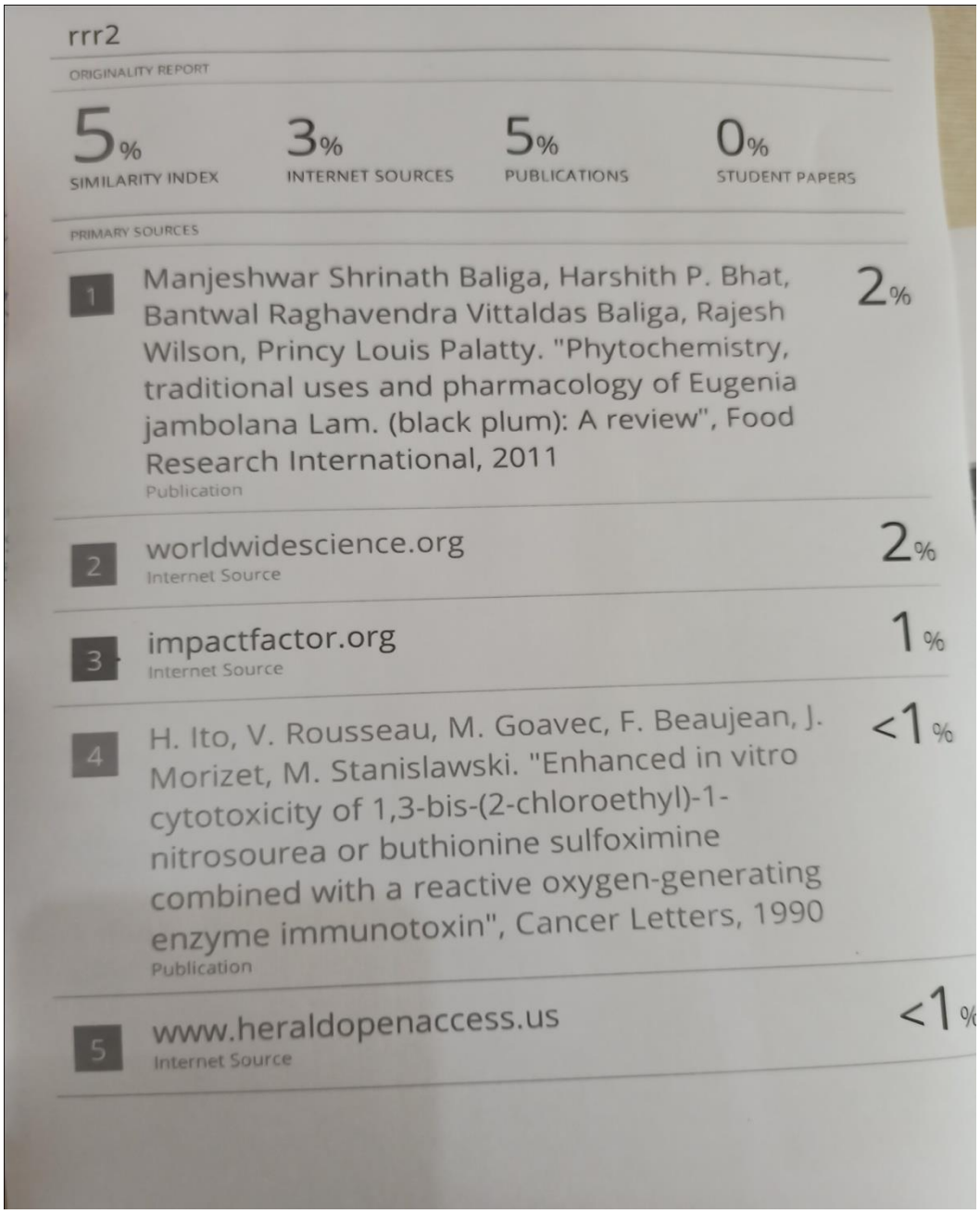

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