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A REVIEW ON OVERVIEW OF BHRINGRAJ [ECLIPTA ALBA] PLANT

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ABSTRACT

The main sources of food, shelter, and several forms of healing are plants. since ancient times, they have been used to cure a wide range of human illnesses worldwide. one such significant plant is e. alba, often known as bhringraj, a wellknown herb used to treat liver and hair growth issues. additionally, it works well as a medication for conditions affecting the skin, cough, asthma, eyes, and any region of the head. it addresses premature graying of the hair, stops hair loss, and promotes hair growth. there is more advantageous for a number of chronic skin conditions, such as atopic dermatitis (eczema), chroni c wounds, skin ulcers, and pruritis (severe itching). it enhances liver function, lessens constipation, improves digestion, boosts metabolism, and stim ulates the liver's production of bile.

KEYWORDS: Bhringraj, Hair Growth, Herbal Hair Gummies.

INTRODUCTION

As per who estimates, 80% of people around the world use medicinal plants for the cure and prevention of various diseases including cancer owing to their easy availability and cost effectiveness. eclipta alba has long been used in ayurveda to treat liver diseases, eye ailments, and hair related disorders. the herb bhringraj is native of India and southwest America. its scientific name is eclipta prostrata which is a plant belonging to the Asteraceae family. it’s another name is eclipta alba. it has four varieties. these are based on its color of flower. these are yellow, white, blue and red. the white and yellow variety used as a medicinal plant. the white variety is more commonly available, as it grows wildly in moist places, as a weed. another name of yellow variety is wedelia chinensis and it’s a rare variety. it spreads rapidly.

the most beneficial effects if anyone eats it as a fresh form (chauhan, 2019; pareek and kumar, 2015). furthermore, these herbs can be used as ruminants (sheep, goat, cattle etc.) forages and it has some beneficial effects on their growth and production.[1]

Taxonomic hierarchy of
Eclipta Alba Kingdom: *Plantae*
Subkingdom: *Viridaeplantae*
Infrakingdom: *Streptophyta*
Division: *Tracheophyta*
Subdivision: *Spermatophytina*
Infradivision: *Angiospermae*
Class: *Magnoliopsida*
Superorder: *Asteranae*
Order: *Asterales F.*
Amily: *Asteraceae*
Genus: *Eclipta L.*
species: *eclipta alba (l.) hassk*.[1]

Eclipta alba has been traditionally used to check hair loss and stimulate hair growth *eclipta alba* hassk. (bhringaraja, fam: compositae) is a small-branched annual herb with white flower heads inhabiting tropical and subtropical regions of the world.[2]

Fig: Bhringraj Plant.[3]

MORPHOLOGY

- It is an erect or prostrate, branched (occasionally rooting at nodes) annual herb up to 30-40 cm high.
- Stem is cylindrical or flat, rough because appressed white hairs, nodes distinct and greenish occasionally brownish.
- Leaves are opposite, sessile to sub-sessile 2.0 to 6.2 cm long, 1.5-1.9 cm wide, oblong, lanceolate, sub-entire, acute to sub-acute and strigose with appressed hairs on both surfaces.[4]

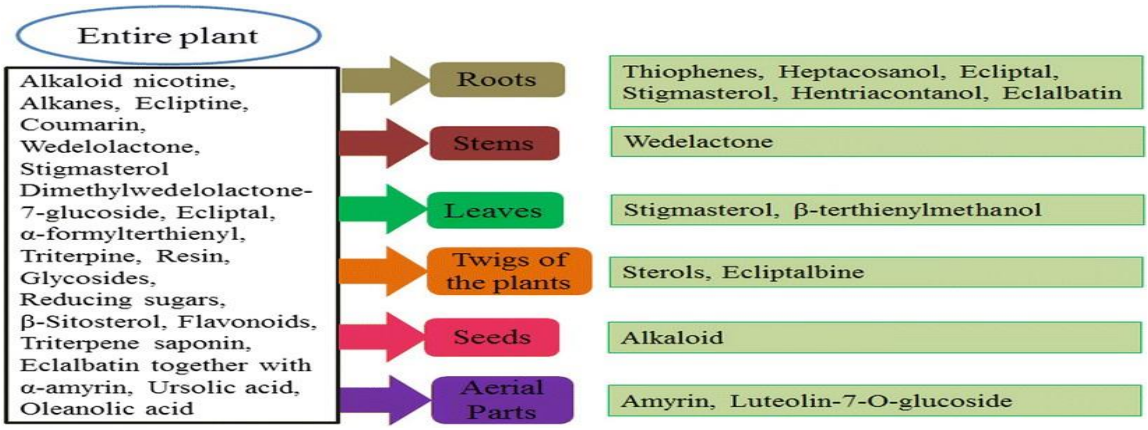

Table 1: Phytochemical Constituents Found In Eclipta Alba.[5]

Root: The part of plant which attaches it to the ground or to a support, typically underground, conveying water and nourishment to the rest of the plant via numerous branches and fibers.[4]

Fig: Bhringraj Root.[6]

Stem: A stem is one of the two main structural axes of a vascular plant, the other being the root. it supports leaves, flowers and fruits, transports water and dissolved substances between

the roots and the shoots in the xylem and phloem, stores nutrients and produces new living tissue.[4]

Fig: - Bhringraj Stem.[7]

Leaves: A flattened structure of a higher plant, typically green and blade like, that is attached to a stem directly or via stalk and also a main organ of photosynthesis and transpiration.[4]

Fig: - Bhringraj Leaves.[8]

Seed: - Bhringraj seeds are tiny, dark seeds of the eclipta prostrata plant, also known as false daisy or kesharaj, used in ayurveda to promote hair health, vitality, and liver support. the seeds are used to grow plants, which are then used for medicinal purposes, including hair growth and reducing hair graying. the plant thrives in tropical and subtropical regions, requiring moist, fertile, well-draining soil and full sun to partial shade.[4]

Fig: - Bhringraj Seed.[9]

Pharmacological Activities

Hair Growth: Conducted a study on nude mice to evaluate the hair growth promoting activity of e. alba. petroleum ether extract (pee) along with other solvent fractions of e. alba was topically applied on the backs of nude mice. prominent follicular hypertrophy was observed after the treatment with pee. in the basal epidermal and matrix cells, follicular keratinocytes number was increased. these changes support e. alba use in the growth of hair.[10,11] another study conducted by begum , supported the use of e. alba for hair growth. the study was conducted on nude mice models which were genetically suffering from hair loss due to abnormal keratinization. it was revealed from the study that topical application of methanolic extract of e. alba had significant impact on the hair growth of mice models. it was observed that hair follicle number had increased after the treatment which shows that e. alba is a brilliant hair growth promoter.[12]

Anti-Cancer: An in vitro study was conducted by Chaudhary, to evaluate the anti-cancer potential of e. alba. the model systems used for the study were human liver cancer cell line (hepg2), c6 glioma and a498 cell lines. it was found that hydroalcoholic extract of this plant caused inhibition of cell proliferation.[13]

Antibacterial: An in vitro study conducted by gurrapu and mamidala, on escherichia coli, pseudomonas aeruginosa, shigella boydii, staphylococcus aureus, and streptococcus faecalis demonstrated that e. alba can be used as a good antimicrobial agent. it was found that alkaloids extracted from e. alba has inhibitory against these bacterial strains.[14] evaluated the anti-bacterial and anti-oxidant potential of e. alba on bacterail species e. coli, klebsiella

pneumoniae, shigella dysenteriae, salmonella typhi, p. aeruginosa, bacillus subtilis, and s. aureus. ethanol and ethyl acetate extracts were found to be significant antibacterial agents. ferric thiocynate method was employed for the evaluation of anti-oxidant potential. hexane, ethyl acetate, ethanol, and water extract showed anti-oxidant activity at various concentrations (50, 100, 250, and 500 in µg/ml) while aqueous extract showed significantly less activity than the other extracts.[15]

Anti-Viral: A study conducted by manvar, against hepatitis c virus (hcv) showed that e. alba extract had significant inhibitory actions against ran dependent ran polymerase activity of hcv replicas in vitro whereas it caused inhibition of hcv replication in cell-culture system which showed its anti-viral potential.[16]

Hepatoprotectives: A study on rats and mice models in which lung injury was induced artificially by carbon tetrachloride. it was found that alcoholic extract of e. alba (bhringraja) exhibits hepatoprotective activity at a dosage of 62.5–500.0 mg/kg p.o. extract restored all the changes induced by carbon tetrachloride.[17] the experimental study conducted by naik et al., on albino rat models treated with high fatty diet to investigate the hepatoprotective activity of e. alba (bhringraja) demonstrated that phytochemical constituents such as wedelolactone, demethylwedelolactone, and saponins are associated with hepatoprotectivity. it was found that these phytochemicals significantly reduced the fat deposition, mononuclear infiltration, and necrotic foci. regeneration of hepatocytes in the liver was also stimulated by these phytochemical constituents.[18] this activity was also investigated by ahirwar and Saxena, on albino rat models. models were artificially induced with hepatotoxicity by carbon tetrachloride. it was found that isolated fraction of e. alba had significant hepatoprotective potential at dosage of 200 mg/kg body weight. the protein levels were restored after the treatment with e. alba extract.[19] this activity was also supported by a comparative study conducted by kumar, on albino rat models. in this study paracetamol was used to induce hepatotoxicity in the models. alcoholic and aqueous extracts were comparatively investigated. it was found that alcoholic extract of e. alba has more potent hepatoprotective activity.[20] Indulekha and Jeyaraj performed an investigative study on animal models to find out the hepatoprotective nature of e. alba. models were induced with hepatotoxicity by paracetamol. study revealed that e. alba has potent hepatoprotective activity.[21]

Benefits Of Bhringraj: - Bhringraj For Weak And Thin Hair

Boosts hair growth by improving blood circulation in the scalp. it supplies proper nutrients to hair roots, making them stronger. with regular use, hair grows longer, thicker, and stronger. many people use bhringraj oil as a natural solution to promote hair growth and reduce hair thinning. it also provides natural shine and treats dull hair.

Bhringraj For Hair Fall

Hair fall happens due to weak roots, stress, or poor nutrition. bhringraj strengthens hair roots by giving them proper nourishment. it protects the scalp from damage caused by pollution and dryness. daily use of bhringraj oil or powder helps control hair fall naturally, without harmful chemicals.

Bhringraj For Dandruff Treatment

Dandruff is caused by a dry or dirty scalp. bhringraj has natural antibacterial and antifungal properties that clean the scalp deeply. it removes flakes, reduces dryness, and stops itching. its cooling effect soothes the scalp and keeps it fresh.

Bhringraj In Hair Discoloration

Many people face early greying of hair due to stress or heat in the body. bhringraj helps in keeping hair naturally black by balancing internal body heat. it has special darkening properties that delay the greying process. regular use of bhringraj oil keeps hair youthful, black, and shiny.

Bhringraj For Scalp Infection

Bhringraj nourishes the scalp and keeps it moisturized. it reduces itchiness, dryness, and infections that can affect hair growth. scalp massaging increases circulation in the scalp, removes dirt and sweat. it keeps the scalp fresh, clean, and in the best condition for strong hair.

Bhringraj For Hair Dryness

Bhringraj works as a natural conditioner for rough and dry hair. it makes hair soft, smooth, and shiny. regular use removes tangles, reduces frizz, and improves overall hair texture.

Bhringraj For Liver Disease

Bhringraj is known as a liver tonic in ayurveda. it supports liver function by helping clean toxins and supporting liver cells. it is used for conditions like hepatitis, jaundice, and fatty

liver. bhringraj supports better digestion, and clean blood, makes the liver strong, and improves its function.

Bhringraj For Indigestion

Bhringraj supports a healthy stomach by improving nutrient absorption and digestion. it helps break down food properly, increases hunger, and reduces problems like gas, acidity, or bloating. it also helps clean toxins from the digestive tract, keeping your stomach light and clean.

Bhringraj For Obesity

By improving digestion and boosting metabolism, bhringraj helps in managing body weight. it prevents fat build-up and removes waste through better liver and kidney function. it also reduces water retention, which can cause bloating and weight gain.

Bhringraj For Stress And Anxiety

Bhringraj has a calming effect on the brain and body. it helps reduce stress, mental tension, nervousness and calms the mind. massaging bhringraj oil on the scalp can help you feel peaceful, lower anxiety levels, and support mental health.

Bhringraj For Insomnia

It is used by people who have disturbed sleep. scalp massaging increases sleep quality and provides deep sleep. it is a safe and natural remedy for insomnia or restless sleep.

Bhringraj For Skin Allergies

It detoxes the blood and reduces heating. it clears acne, rashes, and pimples from the skin. its anti-inflammatory and cooling effects reduce redness, itching, and swelling. it reduces skin allergies and improves skin glow.

Bhringraj In Wound Recovery

Due to its antibacterial and antifungal nature, it quickly helps to heal wounds, cuts, and skin infections. it protects the skin from harmful germs, supports faster recovery, and protects the skin's health.

Bhringraj For Low Immunity

It shows a natural defense against invading infection by increasing body immunity. it is generally used for common colds, allergies, and seasonal infections.

Bhringraj For Respiratory Infection

Bhringraj helps remove extra mucus from the lungs, chest, and nose. it gives relief from breathing problems like asthma, cough, cold, and bronchitis. it clears the airways and supports easy breathing. it is often used in ayurvedic medicine as a natural remedy for respiratory issues, especially in winter or allergy season.

Bhringraj For Joint Swelling

Due to its good anti-inflammatory properties, it reduces swelling and pain in joints. it is useful for arthritis, back pain, or stiff joints. it improves joint movement, makes them flexible, and reduces joint stiffness.

Bhringraj In Anemia

Bhringraj helps in iron absorption, increases red blood cell count, energizes the body, and relieves fatigue. it naturally treats weakness and anemia, hence it is best consumed by women and growing children.

Bhringraj For Mental Fatigue

It is a general brain tonic. it improves memory, focus, and brain function. it provides mental strength, sharpens the mind, and improves daily life quality.[22]

Nutritional Value

Table 2: The Percentage Of Trace Elements Present In The Leaf, Stem, And Root Parts Of Eclipta Alba Hassk And Eclipta Prostrata Linn.[23]

Characteristic elements	Elemental percentage (%) *Eclipta alba* Hassk			Elemental percentage (%) *Eclipta prostrata* Linn		
	Leaf	Stem	Root	Leaf	Stem	Root
Na	6.43	6.77	12.71	8.22	5.46	5.92
Mg	6.80	7.27	7.15	3.26	1.51	2.57
Si	31.42	5.06	7.59	14.64	10.48	12.84
Cl	8.50	22.37	12.78	14.11	21.88	15.90
K	9.32	15.96	11.57	12.96	35.74	22.31
Ca	10.25	7.18	7.05	10.12	–	15.61
Cr	–	–	1.03	–	–	–
Mn	0.87	–	2.34	–	1.17	0.88
Fe	1.83	2.09	3.20	0.78	0.41	4.91
Ni	1.32	–	1.31	–	–	–
Cu	13.79	18.59	21.58	17.65	14.34	10.89
Zn	9.46	6.63	11.70	11.00	–	–
Co	–	–	–	0.34	0.46	–
Cd	–	2.12	–	2.61	8.53	2.54

Potential Side Effects

While eclipta alba is generally considered safe, it may cause side effects in some individuals, particularly when used in excessive amounts or for extended periods. possible side effects include.

- **Stomach Upset:** Some people may experience mild stomach discomfort.
- **Allergic Reactions:** Individuals with known plant allergies should use eclipta alba with caution.
- **Skin Irritation:** When applied topically, it can cause skin irritation in sensitive individuals.

As with any herbal remedy, it's essential to consult with a healthcare professional or ayurvedic practitioner before using eclipta alba, especially if you have underlying health conditions or are pregnant or breastfeeding.[24]

Extraction Methods

Conventional Methods For Extracting Bioactive Compounds From E. Alba:- Conventional extraction methods are widely used for the extraction of bioactive compounds from plants owing to their effectiveness, ease of implementation, cost-effectiveness, scalability, compatibility with different compounds, conservative approach, and long-standing knowledge, base.[25,2627] however, these conventional extraction techniques have limitations, such as lower extraction efficiency, longer extraction times, and potential environmental concerns[26,27] in this section, the conventional extraction methods that have been applied to the extraction of bioactive compounds from *e. alba* are discussed.[27]

1. Solid–Liquid Extraction: Maceration, Agitation, And Percolation

The basic concepts and techniques used in maceration, agitation, and percolation for the extraction of crude pharmaceuticals include the leaching of soluble elements from solid materials with or without the aid of a mechanical factor or heat.[28,29] diverse parts of the plant have been extracted using these extraction methods under various operating conditions. petroleum ether–water, methanol, ethanol, water, and their mixtures have been used for the solid–liquid extraction of bioactive compounds from *e. alba*.[30,31] the methanolic solid–liquid extraction studies of bioactive compounds from the leaves of *e. alba* reported that the yields of wedelolactone were 5.1 mg/g at a solid-to-liquid ratio of 1:40 at 50 °c, agitated at 600 rpm for 15 h.[32], and 0.41 mg/g at a solid-to-liquid ratio of 1:80 at 70 °c, agitated at 400 rpm for 90 min.[33] these two studies pointed out that the yield of bioactive compounds can be varied

according to different operating conditions using the same solvent and part of the plant. furthermore, nakbanpote and co-workers reported the influences of drying methods and the effects of maceration and percolation using ethanol on phenolic compounds and antioxidant activity from *e. alba* leaves. it was found that phenolic contents and antioxidant activity were irrelevant to extraction techniques, and the freeze-drying method allowed the highest recovery of total phenolic content (tpc) and total flavonoid content (tfc), while thermal drying promoted degradation.[30] notably, previous studies reported that wedelolactone was a major component found in methanol and ethanol extracts of the plant.[30,34,35] however, a recent study of the aqueous extraction of *e. alba* aerial parts of the plant reported that chlorogenic acid was the main active compound with no detection of wedelolactone in the extract.[36] thus, previous findings suggest future research to elucidate the specific factors influencing the extraction process for better understanding of bioactive compounds profile of *e. alba* plant.[25]

2. Solid–Liquid Continuous Extraction: Soxhlet Extraction

Soxhlet extraction operates based on the principle of continuous solvent reflux, allowing for efficient target compound extraction.[37,38] this method has been used in the bioactive compound extraction process from *e. alba*. several studies investigated the Soxhlet extraction of bioactive compounds from *e. alba* using different solvents (methanol, ethanol, water, and their mixtures, as well as hexane)[31,39,40], revealing varying yields of wedelolactone. in a previous study, the methanolic Soxhlet extract yielded the highest wedelolactone among different solvents (hexane, methanol, ethanol, and water).[40] furthermore, previous studies reported that Soxhlet extraction could provide the highest yield of wedelolactone compared to ultrasound-assisted extraction, heat reflux extraction, and other extraction methods.[31,41] in addition, previous studies of methanolic soxhlet extraction of bioactive compounds from the leaves of *e. alba* reported that the yields of wedelolactone were 5.05 mg/g using a solid-to-liquid ratio of 1:150 at 90 °c for 6 h[32] and 0.7 mg/g using a solid-to-liquid ratio of 1:100 at 90 °c for 6 h.[33] these two studies used the same extraction parameters, including part of the plant, solvent, extraction temperature, and duration, but they differed in solid–liquid ratio. this variability suggests unidentified factors influencing the extraction process. thus, elucidating the potential influencing factors is needed for a detailed mechanistic understanding of soxhlet extraction on *e. alba* bioactive compounds that would contribute to optimizing extraction efficiency and reproducibility.[25]

3. Solid–Liquid Continuous Extraction: Reflux Extraction

Reflux extraction involves heating a solid sample with a heated solvent, and the extracted compounds are condensed and returned to the extraction vessel. reflux extraction differs from soxhlet extraction in that it does not include the soxhlet extractor.[42] this method has been applied to bioactive compound extraction from various parts of *e. alba*. the ethanol–water and methanol–water systems have been used for the reflux extraction of bioactive compounds from *e. alba*.[43,44] in a comparative study of the extraction of luteolin from the aerial parts of *e. alba* using 80% ethanol at 80 ± 2 °c, acid reflux extraction yielded a higher amount of luteolin in a shorter extraction time compared to heat reflux extraction.[44] the yield of wedelolactone from aerial parts of the plant using an ethanol–water mixture through heat reflux extraction was reported to be 62.93 ± 0.82%, and the extraction duration was 5 h.[43] in addition, fang and co-workers investigated the effect of heat flux extraction on wedelolactone yield from *e. alba* aerial parts using an ethanol–water system for 90 min, and the result showed that wedelolactone yield was 3.89 ± 0.11 mg/g.[41] in contrast, zhao and co-workers explored the effect of heat flux extraction of wedelolactone yield from aerial parts of *e. alba* plant using a methanol–water system for 60 min, and the result showed that wedelolactone yield was 2.8 mg/g.[45] however, previous studies did not extensively explore optimization strategies for reflux extraction of bioactive compounds from *e. alba*, such as the use of response surface methodology or factorial designs, which could enhance efficiency.[25]

4. Liquid–Liquid Extraction: Aqueous Two-Phase Extraction (Atpe)

Aqueous two-phase extraction (atpe) is a liquid–liquid extraction technique that involves using two immiscible aqueous phases, typically polymers or salts, instead of an organic solvent and water.[46] this method has been used in the extraction of bioactive compounds from the *e. alba* plant. gharat and rathod applied atpe for wedelolactone extraction from *e. alba* leaf. in this study, the impacts of molecular weight (mw) of polyethylene glycol (peg) (4000–8000 mw), peg concentration (12–18%), sodium citrate salt concentration (14–24%), and ph (5–8) on wedelolactone extraction were evaluated using central composite design (ccd) through response surface methodology (rsm). the yield of wedelolactone increased with an increase in the molecular weight of peg. however, it reached over 6000 mw, and the yield decreased. peg at a concentration of 18% was found to be able to create a sufficient hydrophobic reaction of the surface of the substance and pge, leading to better partitioning. in addition, higher salt concentration was found to have a negative impact on atpe for wedelolactone. at a neutral ph (ph7), it was reported to be the most suitable ph for the

peg/citrate salt system. the yield of wedelolactone through atpe using optimal conditions of solid–liquid ratio of 1:40, peg (6000 mw), peg concentration (18% *w*/*v*), sodium citrate salt concentration (17.96% *w*/*v*), and ph 7 for 2 h was reported to be 6.52 mg/g, which was higher and needed a shorter time compared to that of soxhlet extraction and batch extraction.[47] as there is a limited study of this method for *e. alba* plant, further investigation is needed to examine the scalability and reproducibility of the optimized conditions for the extraction of bioactive compounds from the *e. alba* plant.[25]

5. Hydrodistillation (Hd)

Hydrodistillation (Hd) is a method for extracting bioactive compounds, particularly essential oils, from plant materials.[48] a study conducted by lin . explored the volatile compounds from the aerial parts of the *e. alba* plant using hd for 3 h. this study reported that 55 volatile compounds, including heptadecane, *n*-hexadecenoic acid, and pentadecane, were extracted from the aerial parts of the *e. alba* plant.[49] this study reported significant variations in the primary constituents in the essential oils of *e. alba* that had previously been documented. the principal constituents of *e. alba* leaves and stem bark were β-caryophyllene and α-humulene, whereas the stem bark had notable concentrations of (e)-β-farnesene. however, this study either included little or no of these chemicals. when compared to the aerial sections of *e. alba*, the primary constituents showed no appreciable variations. the variations in volatile components could result from genetic and environmental factors that influence the quality of medicinal plants.[49]

CONCLUSION

The miracle herb e. alba, also known as bhringraj, is most frequently employed in traditional me dical systems to treat a wide range of human illnesses. Its extraordinary ability to strengthen hair and promote hair development makes it extensively utilized.it has a broad variety of phytochemical cal elements, including alkaloids, saponins, and cumestans, which have important biological qual ities like immunomodulatory, hepatoprotective, antibacterial, antiviral, and anti-stress. nearly every civilization and tribe on the planet uses it. some cultures also use it as a leafy vegeta ble. elephantiasis, anorexia, leprosy, eczema, psoriasis, jaundice, piles, cough, colon, and spleno megaly are among the illnesses that it is used to treat in ayurveda. this little medicinal herb has s everal therapeutic uses.

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4. Dehradun Miss Kanchan Singh Assistant Professor, Dev Bhoomi Institute Of Pharmacy And Research, Dehradun *Corresponding Author Email: Sopr.Kanchan@Dbuu.Ac.In Dr. Amandeep Singh Associate Dean, Dev Bhoomi Institute Of Pharmacy And Research, Dehradum Phytochemical And Pharmacology Activity Of Bhringraj: A Review Umang Jha Research Scholar, Dev Bhoomi Institute Of Pharmacy And Research Issn 2550-6978 Eissn 2550-696x © 2022.
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