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## Medicinal value of three common plants of Rajasthan, India: Review

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### Abstract

Herbal medicines are cost effective and without side effects thus gaining the escalating faith. The villagers and tribal are still exploring the plants for ethanomedicinal purposes. Various phytochemicals isolated from plants showed pharmacological potential used directly as drugs or provide base for synthesis of new drugs. This review summarizes phytochemical, ethanomedicinal and pharmacological value of *Capparis decidua*, *Prosopis cineraria* and *Tecomella undulata*. These plants are commonly found in the Rajasthan, India. Traditionally used as medicine in Ayurveda, Unani system of medicine and also as folkloric medicine. Different parts of the plants used for treating various ailments. These plants contain different types of alkaloids, terpenoids, phenols, phytosterols, flavonoids, tannin etc. The major objective of this review is to analyse the medicinal utility of these three common plants of Rajasthan.

**Keywords:** Ethanomedicinal, phytochemical, pharmacological, *Capparis decidua*, *Prosopis cineraria*, *Tecomella undulata*

### 1. Introduction

India is blessed with various climatic zones these zones are rich in its flora and fauna. Around 45,000 plants and 81,000 animal species are reported so far in India. Hence India is included in the 12 mega diversity countries. For millennia, plants are used for therapeutic purposes. Diversity of plants was explored to cure different diseases since ancient time in India [1]. Indians are practising different medical system as Ayurveda, Siddha and Unani, mostly based on plants. Among these Ayurveda is the oldest medicinal system and using approximately 2000 plants species. An age old written document on medicinal plants Charak Samhita proved uses of plants for wellbeing of human. It describes the uses of herbs in preparation of 340 drugs and their indigenous uses. In the modern system of pharmacology, approximately 25% of drugs are obtained directly from plants, and many others are synthetic analogues of plant isolates [2]. Now people are more attracted towards herbal medicine in both developing and developed countries. Because of less side effects as compare to allopathic medicines. The World Health Organization (WHO) has listed 21,000 plants, which are used for medicinal purposes around the world. Out of which Twenty five hundreds plant species are reported from India and 150 species are used commercially on large scale for drugs production [3].

India is the sixth largest country of the world, divided into 29 states. Rajasthan is the largest state of India, situated in the north-western part of India between 23°3' and 30°12' N latitude and 69°30' and 78°17' E longitude; comprises an area of about 34227 Sq. Km. Most of the area of Rajasthan come under the Thar Desert but rich in biodiversity. Various plants found in Rajasthan having medicinal properties. In this review we are going to analyse medicinal properties of *Capparis decidua*, *Prosopis cineraria* and *Tecomella undulata* commonly found in the Rajasthan. We will discuss phytochemical, ethanomedicinal properties and pharmacological properties of above mentioned plants.

*C. decidua* possess alkaloids, glycosides, terpenoids, sterols, flavanoids, phenols and fatty acids having high contents of isothiocyanate glucoside, glucocapparin, stachydrine, n-triacontane,  $\beta$ -carotene,  $\beta$ -sitosterol, n-triacontanol, n-pentacosane and phthalic acid [8]. Traditionally the plant is used in heart diseases, colic pains, scurvy and phthisis flatulence, anorexia, respiratory disorders, as anthelmintic, diuretic, Joint diseases, in cough and as an antidote in case of poisoning etc.. Anti-inflammatory, anti-asthmatic, anthelmintic, purgative, hepatoprotective, antidiabetic, hypolipidaemic, anti-atherosclerotic and anti-microbial activities are the pharmacological activities reported for the plant [4].

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Similarly *P. cineraria* contains various bioactive compounds such as flavonoids, alkaloids, diketones, phenolic contents, free amino acids, patulitrin, spicigerin, prosogerin A,B,C,D, lipids,  $\beta$ -sitosterol, sugars and vitamins [20]. Different parts of plant are used traditionally for treatment of a number of ailments like leprosy, dysentery, asthma, leucoderma, dyspepsia and earache etc. Pharmacological properties of different extract of the plant are antihyperglycemic, antioxidant, analgesic, antipyretic, antihypercholesterolemic, antitumor, nootropic have been proven [22].

Important chemical constituents of *T. undulata* are radermachol, undulatin, lapachol, tecomelloside, stigmasterol,  $\beta$ -amyryn,  $\beta$ -sitosterol,  $\beta$ -sitosteryl acetate, campasterol etc. [25]. In the indigenous system of medicine the plant is used for the treatment of leucorrhoea, leucoderma, piles, anorexia, flatulence, tumours, migraine, enlargement of spleen and worm infestations [29]. Bark is also used as muscle relaxant, cardiotoxic and choleric [27]. Hepatoprotective, analgesic activity, anti-inflammatory, anti-proliferative, anti-diabetic, anti-oxidant, anti-microbial and anti-obesity activities have been proven in laboratory. The plant extract include in commercial formulations for hepatoprotection like herboliv, hepato-100, himoliv, liv-52, livo-plus etc. [27].

Besides their medicinal utility these plants are playing important roles in life of common people. They are using the berries of *C. decidua* and the pods of *P. cineraria* for culinary purpose. Leaves of *P. cineraria* (loonge) are used as fodder for local animals. The wood of *T. undulata* is used as timber. The numbers of these plants are decreasing due to urbanisation and lack of awareness about the medicinal potential of these plants. It's an attempt to summarize the medicinal uses of these plants. So that researcher explore bioactive constituent of these plants for medicinal purpose and prove their traditional uses.

## 2. Capparis decidua

*C. decidua* is the native plant of Thar Desert. The plant is xerophytic and draught resistant; belongs to family Capparidaceae. The genus Capparis comprises 250 species including trees, shrubs and woody climbers but in India only 26 species of the genus are reported [5, 12]. Commonly known as kair (Punjab), ker (Haryana), teent (Rajasthan), kareel (Hindi), karira (Sanskrit) etc. Found mostly in tropical and subtropical region of world. The plant is highly branched, spiny and leafless up to 6 meter height [4, 8]. Medicinal utility of plant is well recognized by many ethnic groups. The plant is rich in nutrient, used for nutraceutical purposes by local people. Young berries are used to make pickle and vegetable [11]. The plant is an important component of desert ecosystem, play important role in rural economy of north-west arid region of India. Over 7,000 tonnes of fruit are produced in the Rajasthan districts of Jodhpur and Bikaner alone [12].

### 2.1 Phytochemicals

Various phytoconstituent have been isolated from *C. decidua* as  $\beta$ -sitosterol, spermidine alkaloid, isocodonocarpine, Capparinine, Capparinine from root [4, 5]; spermidine alkaloids, Isocodonocarpine, Capparidinine and Capparisinine, N-acetylated spermidine alkaloids, Capparisine, Codonocarpine, Cadabacine, Rutin 1-Stachydrine,  $\beta$ -sitosterol, 6-oxygenated heterocyclic constituents, like Capparisesterpenolide, Cadabacine, Stachydrine, Rutin, codonocarpine and Deciduatpenolides A, B, C, D and E from root bark [4, 5]. Plant stem contains two

alkaloids n-triacontanol, 2-carboxy-1, 1-dimethylpyrrolidine (stachydrine) [5]. Capric acid and a glucoside isolated from flower buds when boiled with sulphuric acid yield isodulcicite and quercetin like compound respectively. Nonacosane, n-pentacosane, n-triacontane, triacontanol and  $\beta$ -sitosterol isolated from flower [4, 5]. Different Glucosides as (6S) – hydroxyl-3-oxo- $\alpha$ -ionl glucosides corchoionoside C (6S, 9S)-roseside) prenyl glucoside, cappariloside A and B, 1H-indole-3-acetonitrile glycosides; Biflavonoids, Isoginkgetin, Ginkgetin, Sakuranetin, P-hydroxyl benzoic acid, 5-(Hydroxymethyl) furfural, Bis (5-formyl furfuryl) ether; Sterols Daucosterol,  $\alpha$ -D fructo furanosides methyl, Uracil, stachydrine, cadabacine P-hydrobenzoic acid etc. were isolated from fruit. Mature fruit contain more or less similar compounds as immature fruit except methylstachydrine, hydrocinnamic acids, phthalic acid, capparilside, 4-hydroxy-5-methylfuran 3-carboxylic acid, isocodonocarpine etc. [11]. Isothiocyanate glucoside named Glucocapparin, Methyl isothiocyanate, n-pentacosane, n-triacontanol and  $\beta$ -sitosterol are identified in seed, flowers and fruit husk. Fruit husk also contain ascorbic acid & phthalic acid [4, 5].

### 2.2 Ethanomedicinal value

Medicinal utility of the *C. decidua* have been recognized by traditional healers and tribal since long time. They are using different parts of the plant for treating various ailments. The root is used as antibacterial, expectorant, stimulant, thermogenic, sudorific, carminative, aphrodisiac, anodyne, anthelmintic, and anti-arthritis. It is also used in the treatment of dyspepsia, constipation, lumbago, odontalgia, amenorrhoea, scorpion sting and dysmenorrhoea. It is taken in different form as decoction of root is used in fever and jaundice treatment, powder is taken with water in liver problems [8, 10]. Root bark is used as alterative, acrid, astringent, alexeteric and diaphoretic. Its extract is used to treat haemorrhoids. In the case of pleurisy, its powder is applied on ribs externally [4, 8]. Its powder or infusion is used in treatment of joint pains, gout, intestinal worms, as antidote in poisoning, cough, dropsy, palsy, asthma, for intermittent fever, malignant ulcer and boils etc. [4]. Decoction of stem and leaves are used to treat pyorrhoea. Fresh twig decoction and aqueous extract of stem are used to cure jaundice [10]. Similarly stem bark is also used in different way for treatment. Decoction of stem bark used to treat asthma and other respiratory disorders. Whereas Crushed bark of the plant is used for treatment of wounds. Tender shoot and fresh leaves are used in toothache, blister and swelling. Flower buds are eaten raw to treat stomachache whereas flowers are used to sooth pain and increase erection [8, 10]. Fruits are considered to cure diabetes, convulsions, constipation, cardiac problem, biliousness, halitosis etc. Mixture of fruit powder and sugar in equal quantity is used to cure rheumatism. Vegetable prepared from fruits in ghee is considered good for eyes [4, 9, 10]. It is also useful in enlarged spleen and facial paralysis. All parts of plants are used to cure migraine and arteriosclerosis also act as analgesic and anti-haemorrhoid agent [10]. Fresh juice of plant is used for killing worm in ear. Not only plant and plant parts but its coal obtained from its wood is also used in muscular injuries [8, 10].

### 2.3 Pharmacological value

The plant *C. decidua* contains various Phytoconstituents having pharmacological value. It was found that traditional uses of the plant are correct in the light of new researches. Phytochemical Isocodonocarpine isolated from root possess

anti-inflammatory and antiasthmatic properties. Capparisidine isolated from the plant showed dose dependant depressant effect on heart rate and coronary flow [5].  $\beta$ -Sitosterol isolated from the root bark showed anti-inflammatory and anti-cancerous activity [4]. Stachydrine found in root bark and stem showed anticancer activity against solid tumor cells [6].  $\beta$ -Sitosterol ester ( $\beta$ -Sitosterol triacetate) was isolated from plant stem showed cytotoxicity that is comparable to paclitaxel [7]. Ethanolic extract of aerial part of the plant showed anti-inflammatory and analgesic activity. Aqueous extract of root showed more anthelmintic and purgative properties as compare to ethanolic extract. While the alcoholic extract of the fruit pulp and root bark also possess anthelmintic and anti-microbial activity. Aqueous and methanolic extract of stem shows hepatoprotective activity. Fruits have antidiabetic, hypolipidaemic, anti-atherosclerotic and anti-hypertensive activities. Seeds showed antibacterial activity against *Vibrio sp.* [4, 5]. Alcoholic extracts obtained from bark, flower and fruit have been shown to have hypolipidaemic activity. Flavonoids from root/ stem and flowers showed broad spectrum antibacterial activity. Alcoholic extract of fruits, seeds and flowers husk and root bark showed antibacterial activity [5]. Alcoholic extract obtained from bark, flower and fruit showed hypolipidemic activity in model rat. Ethanol extract of plant showed hypotensive activity on the dose dependent basis. It caused decrease in blood pressure and heart rate in experimental animals. The young leaves and delicate shoot showed rubefacient and vesicant activity [5]. Aqueous extract of the plant exhibited novel anti-Hepatitis-B Virus activities in a time-and dose-dependent manner [13].

### 3. Prosopis cineraria

*Prosopis cineraria* is known as “king of desert” “wonder tree” or “kalptaru” because all the parts of tree are useful. The plant belongs to Family Fabaceae (Leguminosae) and sub family Mimosaceae. The genus *Prosopis* consisting of around 44 species that are distributed mainly in dry regions of South west Asia, Africa and Western North America to Patagonia [20]. The plant grows in dry and arid regions of India mainly Rajasthan, Haryana, Punjab, Gujarat, Western Uttar Pradesh and drier parts of Deccan. The tree is locally known as Shami, jati, Jandi or Khejri (India), Jand (Pakistan) and Ghaf (Arabic) [17]. Unripen pods are used to make vegetable and pickle. Dried pods are also used to make vegetable by local people. A resin derived from plant known as mesquite gum is used to make sweets. Leaves are called loong/ good nutritive fodder for camel, goat, donkey etc. [23]. Khejri plant play important role in desert ecosystem. The plant is nitrogen fixer, improve soil quality. Its deep roots help in sand dune stabilization [14, 22]. Besides other uses all parts of plant have some medicinal and nutraceutical uses.

#### 3.1 Phytochemicals

Phytochemical investigation of *P. cineraria* identified various phytochemicals as alkaloids, glycosides, flavones, tannin, sterol etc. Sitosterol, campesterol, cholesterol, and stigmasterol, hentriacontane, actacosanol, methyl docosanoate, Di-isopropyl-10, 11-dihydroxyicosane-1, 20-dioate, tricosan-1-ol, and 7, 24-tirucalladien-3-one steroids and a piperidine alkaloid spicigerine have been isolated from leaves [22]. Prosogerin A & B, sitosterol and spicigerine were isolated from flowers. Besides these patulitrin, a glucoside of patuletin was also isolated from flowers [18, 22]. 3-benzyl-2-hydroxy-urs-12-en-28-oic acid and maslinic acid-3-glucoside

(triterpenoids); linoleic acid (fatty acid); prosophylline (piperidine alkaloid); 5, 5'-oxybis-1, 2-benzenediol; 3, 4, 5-trihydroxycinnamic acid 2-hydroxyethyl ester; and 5, 3', 4'-trihydroxyflavanone 7-glycoside (polyphenols) have been isolated from pods [16, 22]. Sitosterols, spicigerine, Prosogerin A, B, C, D and E have been isolated from its seeds. Gallic acid, patuletin, Iutolin, patulitrin and rutin have been also isolated from seeds. Relatively large proportion of unsaturated fatty acids, with linoleic and oleic acids present in the lipids isolated from seeds [18, 22]. Methyl heptacosanoate, heneicosanoic acid, 4-hydroxy benzoic acid, methyl 4-hydroxycinnamate, methyl 2-methoxy-5-hydroxycinnamate and O-Coumaroylglycerol present in whole plant [22].

#### 3.2 Ethanomedicinal value

All parts of *P. cineraria* plant have some importance hence called kalptaru. Ancient literature reported folkloric uses of the plant. Different parts of the plant are used for various medicinal purposes as: Root is used as antidysenteric [18]. Smoke of leaves is used to cure eye infections [15]. Paste of leaves is used in blister, boils and mouth ulcer in case of animals [17]. Bark is used to get relieve from asthma, bronchitis, dysentery, leucoderma, leprosy, rheumatism, muscle tremors and piles by local people. It also has abortifacient and laxative properties [17]. Stem bark is used for the treatment of respiratory and gastrointestinal ailments. Flower are mixed with sugar and eaten to prevent miscarriage. Twig and flowers are used as anti-diabetic agent. [15]. The pods are called sangari used as nutraceutical food. Sangri is a good source of protein and minerals like calcium, sodium, potassium and used to prevent protein and mineral deficiencies. The pods are also considered as astringent [17].

#### 3.3 Pharmacological value

Ethanolic extract of *P. cineraria* root exhibited analgesic activity [20]. Crude ethanolic extract of bark of the plant showed anti-diabetic and antioxidant efficacy [14]. Different extracts of stem bark of plant exhibited different bioactivity. A crude methanolic extract from the stem bark showed bronchodilator and vasodilator activities possibly mediated through blockade of  $Ca^{+2}$  channels [15]. Methanol and aqueous extract of stem bark showed moderate antibacterial property in comparison to ciprofloxacin. Petroleum ether extract of stem bark showed antipyretic activity [20]. Fifty percent of Hydro-alcoholic extract of stem bark showed antihyperglycemic activity whereas 70% Hydroalcoholic extract of it exhibited antihypercholesterolemic activity. Methanolic extract of it showed nootropic activity and significant anticonvulsant effect in models animal [22]. Aqueous extract of leaves showed antipyretic and analgesic activity on model mice [20]. Whereas methanol extract of leaves showed hepatoprotective activity [21]. Leaves extract also exhibited antibacterial, antihyperglycemic, antihyperlipidemic and antioxidative activities [17]. Steroids like  $\beta$ -sitosterol, campesterol, sitosterol and stigmasterol isolated from leaves caused reduction in cholesterol level in blood. These steroids also exhibited antioxidant, hypoglycemic and thyroid inhibiting properties. Patulitrin isolated from flowers exhibited cytotoxic active against Lewis lungs carcinoma in vivo [22]. Methanol extract of its pod showed high antioxidant and antifungal activity [16]. Rutin exhibited anti-inflammatory activity. Luteolin showed anti-cancer activity. Hydroalcoholic extract of leaves and bark exhibited antitumor activity. Hydroxycinnamic acid and coumaric acid derivatives isolated from plant possess

antioxidant properties <sup>[22]</sup>. Ferulic acid isolated from fresh fruits of the plant showed hypolipidemic effect <sup>[24]</sup>.

#### 4. *Tecomella undulata*

*Tecomella undulata* belongs to family Bignoniaceae. Family Bignoniaceae contain 120 genera and nearly 800 species but in India only 21 genera and about 25 species are found. *Tecomella* is monotypic genus <sup>[25]</sup>. The plant is deciduous, ornamental shrub or small tree. The plant found in arid to semiarid regions of India including Rajasthan, Punjab, Haryana, Gujarat, Maharashtra, western ghat, from Sub-Himalyan tract of Uttar Pradesh to Assam west and Andmans <sup>[26]</sup>. The plant is commonly known as Rhoida, Rohira, Lohira, desert teak, marwar teak or white cedar etc. The plant is drought and fire resistant therefore thrives well in the arid region. It is an important component of desert ecosystem. Help in the binding of soil, act as wind breaks and prevent shifting of dunes <sup>[26]</sup>. Numbers of plant is decreasing, need conservation.

##### 4.1 Phytochemicals

Phytochemical studies of *T. undulata* isolated and identified several compounds. Some of these compound having pharmacologically value. Different parts of the plant contain different types of chemical constituent. Lapachol, tricontanol- 1,  $\beta$ - sitosterol, tectol, veratric acid Iridoid glycoside-6-O-veratryl-catalpo-side- $\alpha$ -lapachone have been isolated from roots whereas Tectol, Dehydro- $\alpha$ - lapachone were isolated from heartwood and root. Tecomin, iridoid glucosides tecomelloside, rutin, quercetin, luteolin- 7- glycoside and  $\beta$ - sitosterol, undulatoside B, Alphanamixinin and  $\beta$ -Sitosterol have been isolated from bark of plant. Tecomaquinone-I, Alpha-Lapachone, Tectoquinone, Deoxylapachol, Lapachole, Radermachol, 2-Isopropenylnaphtho (2, 3-b) furan-4, 9-quinone, Dehydro-alpha-Lapachone, Cluytly ferulate, Undulatin, were obtained from heartwood. Biochemical compounds veratric acid, dehydrotecol, lapachol,  $\beta$ -sitosterol, tecomelloside, ferulate and n-tricontanol have been isolated from heart-wood and bark. Leaves contain oleanolic acid, ursolicacid, diterpene, aphanamixol, betulinic acid, triacontanol, cirsimaritin, cirilioneol, pentariacontanol and 4, 5-dihydroxy-3, 6, 8-trimethoxy flavones. Quercetin, rutin, luteolin-7-glycoside and  $\beta$ -sitosterol were isolated from flowers. Alimonoid, rohitukin, linoleic acid, oleic acid, stearic acid, and palmitic acid were derived from seeds whereas Aphanamixin lactone, Aphanamixolide was isolated from fruitshell <sup>[25, 26, 27]</sup>.

##### 4.2 Ethanomedicinal value

*T. undulata* have valuable medicinal value. Different parts of the plant are used in indigenous medicinal system. The paste of its root is used to treat leucorrhoea sometime pulp is given along with rice water. Bark is mainly used as folkloric medicine for the treatment of various diseases. The bark juice is used in conjunctivitis. Paste of its bark is applied on traumatic wound to promote wound healing. The bark of young branches used for the treatment of syphilis, as stimulant for digestive system, astringent, anthelmintic, refrigerant and possesses pain relieving properties. Bark is specially used in ascites associated with hepatosplenomegaly. Bark extract is an excellent blood purifier and cholagogue, therefore used in hepatitis. It is also used to treat enlargement of spleen, gonorrhoea, urinary disorder, leucoderma, liver diseases and syphilis <sup>[26]</sup>. The bark powder is taken with hot milk for abortion <sup>[27]</sup>. Decoction of bark powder and extract in

clarified butter is used in treatment of jaundice; enlarge spleen, anaemia, intestinal worms, and urinary disorders. Distillate obtained after soaking the bark and wood of stem in water for two days used to treat eczema. It is also used for treatment of piles, anorexia, flatulence, skin disorder, diabetes, obesity tumors and worm infestations <sup>[26]</sup>. Paste of fresh leaves is applied on head for treating migraine <sup>[27, 29]</sup>. Flowers are used to treat hepatitis, also used to make tea to reduce thirst <sup>[26, 27]</sup>. Crushed seeds and pinus leaves extract taken together to cure haemorrhoids and abscess <sup>[26]</sup>. The seeds are used against abscess, ulcers, and diseases of blood, eye, ear, eczema and also in muscular pain <sup>[27]</sup>. In traditional system of Ayurveda, the plant is used in various formulations for the treatment of liver and spleen diseases, oedema and anaemia etc. <sup>[26]</sup>. The plant is also used in the treatment of enlargement of liver and spleen, urinary disorders, worms, leucoderma, leucorrhoea, fever, piles and anorexia. Whole plant is used to treat different type of allergies and old wounds by local people <sup>[27]</sup>.

##### 4.3 Pharmacological value

In recent years researchers have confirms the traditional experiences about therapeutic potential of plants or plant extract in different clinical studies. They use different extracts of *T. undulata*. Ethanolic extract of stem showed hepatoprotective activity whereas methanolic extracts of demonstrated analgesic activity. Lapachol present in the heart wood has antifungal and anti-termite properties. The chloroform and water soluble portion of alcoholic extracts of the bark has smooth muscle relaxant activity. Whereas alcoholic and chloroform extracts of bark have exhibited cardiostonic and chloretic activity. The ethanolic extract of bark showed immunomodulatory property <sup>[25, 26]</sup>. Methanolic and ethanolic extract of stem, methanolic extract of leaves demonstrated hepatoprotective activity. Phytochemical betulinic acid isolated from stem showed hepatoprotective activity. Chloroform extract of stem bark exhibited anti-cancer potential <sup>[26]</sup>. Butanolic extract of bark demonstrated significant anti-inflammatory activity <sup>[29]</sup>. Ethanolic extract of the plant showed both anti- hyperglycaemic and anti- oxidant effect. Ethyl acetate extract of plant inhibited adipocyte differentiation that characterised its anti-obesity property. Methanolic extract of whole plant exhibited anti-inflammatory activity <sup>[26]</sup>. Ethanolic extract of leaves exhibited anti-hyperglycemic and antioxidant potential <sup>[28]</sup>. Methanolic extract of plant showed significant analgesic potential <sup>[29]</sup>. Methanolic and aqueous extracts of plant also demonstrated antibacterial activity against some gram positive as well as gram negative bacteria <sup>[25, 26]</sup>. Ethanolic extract of plant showed stimulatory effect on humoral and cell mediated immune response, suppress delayed type hypersensitive reaction caused by sheep RBC in mice. Aqueous and alcoholic extract of leaves and stem exhibited antibacterial activity against human pathogen *Salmonella typhi* <sup>[26]</sup>. Alcoholic extract of plant is effective against gram negative bacteria whereas acetone extract is effective against gram positive bacteria <sup>[29]</sup>.

Pharmacological values of some phytoconstituents isolated from *T. undulata* have been characterised. Radermacol isolated from heartwood;  $\beta$ - sitosterol isolated from bark, heartwood, root, leaf and quercetin isolated from flowers demonstrated anti-inflammatory activity. Lapachol from heartwood and root;  $\beta$ - lapachone,  $\alpha$ - lapachone from heart wood,  $\beta$ - sitosterol isolated from bark, heartwood, root and leaf; quercetin isolated from flowers showed anti-cancer

property. Undulatin from leaves, lapachol from heartwood and root; quercetin from flower exhibited antimicrobial activity. Lapachol, quercetin and betulinic acid isolated from the plant showed antiviral activity. Betulinic acid and ursolic acid isolated from leaves exhibited strong anti-HIV activity. Betulinic acid, ursolic acid and oleanolic acid isolated from plant showed hepatoprotective activity. Dehydro-  $\alpha$ - lapachone isolated from heart wood showed anti-angiogenic property.  $\beta$ sitosterol exhibited antipyretic and immunomodulatory activity [27]. Octadimethyl succinate derivatives of oleanolic acid and betulinic acid also demonstrated excellent anti-HIV activity [25, 26]. Both the compounds Oleanolic and ursolic acid are also recognized to have anti-inflammatory, anti-hyperlipidemic and anti-cancerous properties. Crismaritin is a flavonoid isolated from leaves having adenosine antagonistic properties in rats [29].

## 5. Conclusion

Medicinal plants are used for health care from ancient time. Phyto-constituents isolated from plants are used directly as drug or base material for drug synthesis since long time. Huge numbers of plants are unexplored or underestimated for their medicinal utility. Modern synthetic medicine causing various side effects, leads to different health problems. There is immense need of research in scientific way to explore medicinal utility of different plants. Need to discover natural resources to combat upcoming lethal diseases and increasing problem of drug resistance. In this review we have discussed three common plants of Rajasthan *Capparis decidua*, *Prosopis cineraria* and *Tecomella undulata*. A wide range of phyto-chemicals have been reported in these plants. These plants are mentioned in Ayurvedic and traditional literature. Scientific investigation of these plants supports the folkloric uses of the plants. Pure phyto compounds isolated from these plants should be validated scientifically for their therapeutic potential. Toxicological evaluation of these compounds should be done before their clinical uses. After that these compounds can be used as therapeutic alternative to treat diseases. There is enormous scope for future research and further pharmacological investigation of not only these plants but also of other plants to serve the humanity.

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