

A Brief Review Article On Capparis Decidua And Its Medical Advantages

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Abstract

Capparis decidua, a member of the family Capparaceae, is widely distributed in the deserts of Asia, Africa, and Saudi Arabia. Along with its nutritious qualities, the plant has found widespread use in folk medicine. C. decidua had pharmacological properties such as antidiabetic, anthelmintic, antibacterial, antifungal, analgesic, anti-nociceptive, rheumatic, hypolipidemic, antiatherosclerosis, tumour, ant giardia, antioxidant, anti-inflammatory, hepatoprotective, and anticonvulsant. The caper plant contains a broad variety of phytochemicals, including alkaloids (capparisinine, caparisoned, stachydrine, and isocodonocarpine), phenolics, flavonoids, sterols, and fatty acids, all of which contribute to its remarkable bioactivities. In this article, we'll examine the pharmacological properties, traditional medicinal uses, and phytochemistry of this versatile plant. The use of plants as a foundation for functional foods and medications was also discussed.

Key Words: Capparis decidua, Medicinal applications, antifungal activity.

Introduction

According to a recent assessment undertaken by the WHO around the globe, there are about 20,000 therapeutic plants appearing all over the place, whether in the pharmaceutical market or in regular medicine. And, surprisingly, 1.4% do possess long-standing, widely accepted, and generally recognized without ambiguity component parts. The Global Health Organization (WHO) estimates that about 80 percent of the people in the most underdeveloped nations are dependent on alternative treatments for essential medical treatment. In the vast majority of conventional medical settings, fresh or dried therapeutic plants are available. Whether it's a sprig, a leaf, a tad, or a metrically enhanced kind of plant prepared by use of a solvent extraction process, any organic solvent (such as water or ethanol) will do. acetone), play a crucial part in, and represent the backbone of conventional medicine. Genus with over 270 species of shrubs that are both upright and climbing, spread out throughout the hottest areas of the planet Earth. Approximately 40 different species of Only a select few in India have any real economic importance. [1-2]

Numerous traditional Indian medical practices make use of India's abundant supply of medicinal plants. The effects of these plants, either singly or in combination, can be enormous. ability to give immediate therapeutic value. Application of the use of therapeutic plants in contemporary medicine is growing. In the Charaka Samhita, a famous Ayurvedic literature, 70 percent or more of the medicines used today may be traced back to the Sushruta Samhita and are based on herbalism. Kabar is the Persian word for "whatever," and it The Greek word for "caper" is "Capparis." Beyond the year 2000 are time-honoured condiments that have been around for decades.[3]

The fruit looks like a little pink cherry and is avoid or sub globose with numerous seeds. The fruit, which is green while fresh, becomes dark when dried. eaten by flocks of birds. [4] The plant is a large, spiky, climbing shrub with a densely branched bush. There are a staggering number of botanicals used in several conventional systems of medicine. The capability of these plants to grow in the form of shrubs and trees up to 6 meters in height Has a visible bole height of 2.4 meters (and only rarely 10 meters). Tender, blooming, waxy branches with rough, grey bark hairs that are 3–7 mm in length, straight or recurved, and in pairs thorns; linear, caduceus-shaped leaves on newly emerging branches 1–2 cm in length with a sharp, pickle-like tip, elongated, orange-yellow, and straight leaves with very short petioles. pungent stipules. [4] Caper plants, both wild and cultivated, are collected; plants in their natural habitat usually lack spines.[5]

Capparis decidua Edge is a bushy shrub or small tree with thick tufts of branches that grow to a height of 4-5 m and appear to be bare of leaves. The majority of the limbs are a glossy dark green, and they're armed with tiny paired spines. on the branches at every node, but older bark turns a silvery gray colour.[6] The 2-millimeter-long leaves have a similarly brief lifespan. on new growth, giving the impression that the plant is always bare of leaves. Flowers During the beginning of the dry season (March–May), spine axils produce tiny, pink, red-veined flowers. There is fruit in April and June; they resemble cherries in size and form and have numerous seeds. blackish when dried; ovoid or sub-globulus Caper berries, which are gathered from the wild and farmed alike,

have no backbone as a rule. It requires sandy soil with good drainage to thrive. sun. Plants can be grown from seeds planted in the fall or spring or from mature fruit. Summertime woodcutting is comfortable at 66–75 degrees Fahrenheit (19 C) [7]

Root bark and seed have antibacterial, hypercholesterolemic, and dose-dependently depressive properties, according to pharmacological research. activity, ability to reduce inflammation, and diabetes-preventing properties anti-activity as a helminthoid and a purgative action against hyperlipidaemia anti-inflammatory atherosclerosis action against hypertension liver defence mechanism Further research confirms the healthy nutritional content of karira [8].

The leaves, flowers, and fruits of the *Capparis decidua* plant are the most edible and nutritious sections of the plant. Vitamins, minerals, fibres, and proteins are just some of the numerous essential nutrients found in plants. These are highly nutritious and may be used in place of supplements. These characteristics are useful for warding off and remediating several ailments. The purpose of this investigation was to examine kara's historical use as a medicinal and nutritional staple in a range of Ayurvedic texts.[9]

1.1 Botanical Description

Capparis decidua (Forssk.) Edgew. (Kari) is a spiny, densely branched, green, twiggy plant or small tree with thick, spherical tops that grows in groups. When the stem is young, the bark is smooth and green, but as it gets older, it becomes yellow or whitish Gray [10]. The leaves fall off every year and are smooth, small, caducous, and juicy. [11] They only stay on the new shoots for about a month. From January to November new leaves appear. These leaves are sessile and have very short petioles. They are pointed and small (2–12 mm long and 1–3 mm wide). The fruits are round and grow on long stalks. They are green when they are young and turn red or pink when they are ready [12]. When a fruit is ready, it has a sweet, yellow juice with lots of seeds. Young shoots from the present year are the ones that flower. Narrow leaves and spines on the tips of shoots help plants lose less water through evaporation when it is very dry. It has well-developed tap roots that can get water from the ground up to 4 meters deep [13].

1.2 Taxonomy: -

Current Name: - *Capparis decidua*

Authority: - (forssk) Edgew

Family: - Capparaceae

1.3 Geographic distribution: -Originating in the following regions: Chad, Egypt, Ethiopia, India, Iran, Jordan, Mauritania, Niger, Nigeria, Pakistan, Senegal, Somalia, South Africa, Sudan, and the Indian states of Punjab, South Karnataka, Gujarat, Maharashtra, and Tinkerbell. [14-15]

1.4 Traditional Medicinal uses of this plant

Traditional healers and indigenous peoples frequently use the plant and its components to treat a variety of ailments.[17] Many ailments are treated using plants, including asthma, coughs, and toothaches, and they cover a wider spectrum of various uses in conventional folk medicine.[18] Studies have revealed that the plant possesses significant medicinal qualities like anti-inflammatory, anti-microbial, anti-plaque, anti-hypertensive, analgesic, and anti-helminthic qualities. The research revealed that *C. decidua* seeds are very good providers of each of the three major food groups: carbs, proteins, and fats. Historical texts also mention *C. decidua*'s therapeutic qualities. For gout, six palsy, dropsy, rheumatism, asthma, and intestinal worms, sporadic fever, powdered root bark, or infusion being put to use. The powder is applied externally to malignant ulcers. [19- 20] When treating muscle injuries, a paste produced from burned coal is used.[21] The blooms emit a volatile sulphur compound that is steam-formed (0.4%) and has antibacterial efficacy against a range of microorganisms. Various formulations of *C. decidua* exist, such as powder and infusion of rootbark (1 in 10), which may be taken in doses of 1/2 to 1 ounce; plant juice, 10 mg; and powder of leaves and root, 50–125 mg. Eleven The young leaves and top shoots are dried, powdered into a powder, and used to treat swellings, blisters, boils, eruptions, and as an antidote to poisons.[22] Teeth aches can be efficiently relieved by chewing them; pyorrhoea can be treated with a tea prepared from crushed stems and leaves. Thirteen Use plant in fusions externally for boils, breakouts, and joint ailments; orally for coughing; and as a countermeasure against poisoning. Apply fresh plant juice to the ear to get rid of worms. It's also regarded as a respectable Senega substitute [23-24]

1.5 Chemical constituents

Fruits: n-Triacontane, n-Pentosane, β -Carotene, Carbohydrates, Proteins, Glycosylates, n-Triacontanol, Tetrahydropyran-2-one,2-Carboxy-1-dimethylpyrrolidin.

Flower: nonacosane, n-Triacontane, n-Pentacosane, n-Triacontanol.

Flower buds: n-Triacontane, n-Pentacosane, Quercetin, Isodulcitol, Nonacosane.

Shoots: Thymol, Isopropyl isothiocyanate, Butyl isothiocyanate, 2-Hexenol.

Leaves: Phenyl propanoic, Terpenoids, Isothiocyanate, n-Alkaline. Homocitrate, Kaempferol, Quercetin, Isorhamnetin, rhamnetin, rhamnetin, quaternary ammonium compounds, alkaloids.

Roots Sitosterol, Spermidine alkaloid, Isocodonocarpine, Caprine, Capparinine, Capparinine, Codonocarpine.

Root barks: Cadabacine-26-O- β -d-glucoside, Isocodonocarpine, Caprine, Caparison, Codonocarpine, Capparis-26-O--d-glucoside Caprine, N-acetylated spermidine 14-N-acetyl isocodonocarpine, 15-N-acetylcapparisine, Rutina(K), I-Sachedina(J), β -Sitosterol, Terpenoids, Capparisesterpenolide.

Seeds & Seed oil: Glucoraphanin, n-Pentacosane, n-Triacontanol, β -Sitosterol, Capric acid, Monoterpenes, Sesquiterpenes, Tocopherols (Vitamin E).

1.6 NUTRIATIONAL VALUE

Plants possessing sufficient quantities of protein, fibre, and necessary minerals are highly esteemed for their nutritional value in both animal and human diets [27-29]. The Capparis genus comprises many species that include mineral content inside their floral buds and fruits. These plant parts are commonly utilized as vegetables and are also subjected to the pickling process. The buds and fruit have a high content of protein, carbs, lipids, and vitamins [30]. Capparis decidua, also known as Forskolium decidua, has been documented to possess a greater potassium content in comparison to many other nutritionally valuable tree species. In their study, Kumar et al. (2013) [31] documented the presence of various nutrients and compounds in Capparis decidua (Forssk.) Edgew. fruits. The concentrations of P, Mg, Fe, Zn, Cu, and Na were found to be 219.05 mg 100 g⁻¹, 49.16 mg 100 g⁻¹, 4.64 mg 100 g⁻¹, 0.31 mg 100 g⁻¹, 1.94 mg 100 g⁻¹, and 160.64 mg 100 g⁻¹, respectively. Additionally, the fruit samples contained proline (11.76 mg 100 g⁻¹), Ca (3.24%), crude protein (14.94%), total carbohydrates (73.48%), soluble carbohydrates (18.03%), starch (15.28%), crude fibre (10.94%), neutral detergent fibre (30.48%), hemicelluloses (11.45%), cellulose (8.91%), lignin (7.62%), crude fat (5.38%), and total ash (5.97%). Arginine has a role in the expeditious replenishment of adenosine triphosphate, cellular proliferation, vasodilation, neurotransmission, calcium release, and the enhancement of the immune response [32]. The berries of Capparis decidua (Forssk.) Edgew. are considered to be a valuable source of arginine. The seed oil of Capparis decidua (Forssk.) Edgew. is composed of oleic acid, linoleic acid, and palmitic acid, arranged in ascending order. Capparis decidua (Forssk.) Edgew. seed oil is considered a nutritious source of fatty acids, making it a viable addition to one's dietary regimen. The process involves pickling mature fruits, new shoots with little leaves, and immature fruits using either vinegar or granular salt. The inclusion of decreasing sugar, lipids, vitamin C, antioxidants, alkaloids, and carotene in this substance qualifies it as a dietary supplement [34]. The bud and mature fruit extract of Capparis decidua (Forssk.) Edgew. is utilized in the food processing sector as a flavouring ingredient.

Medical Advantages

2.1 Sedative and anticonvulsant effects: Traditional behavioural animal models were used to test the effect on the central nervous system (CNS) of an alcoholic extract made from the flowers and fruits on the top of the C. decidua plant. In the experiment where pentylenetetrazol caused the animals to have seizures, giving them C. decidua extract caused a dose-dependent (P 0.05) decrease in the number of seizures. Additionally, it significantly lengthened the latency period before convulsions occurred (P < 0.2001). Notably, none of the animals treated with the extract experienced mortality throughout the test. Compared to the control group, when C. decidua extract was given, maximum electroshock-induced seizures with tonic hind leg extension lasted much shorter (P 0.001) when the C. decidua extract was given. C. decidua has central nervous system depressive and anticonvulsant properties [34].

2.2 Anti-inflammatory and analgesic activity: C. decidua has potential as an anti-diabetic drug and may help people with diabetes reduce oxidative stress. Fruits exhibit anti-diabetic properties. The powder derived from C. decidua exhibits hypoglycaemic effects, reduces lipid peroxidation, and modulates the activity of free radical scavenging enzymes, including superoxide dismutase and catalase, in the erythrocytes, liver, kidney, and heart tissues of old alloxan-induced diabetic rats. C. decidua powder has been utilized in the treatment of alloxan-induced oxidative stress and diabetes in rats. The diabetic rats were orally given aqueous and ethanolic extracts at dosages of 250 and 500 mg/kg per day for a duration of 21 days in order to assess their anti-diabetic effects. The substantial hypo-glycaemic and anti-diabetic potential of the aqueous and ethanolic extract of the stem was reported by Purohit and Vyas [36-37].

2.3 Hypo-lipidemic activity: The present study demonstrates the hypolipidemic effects of three distinct alcoholic extracts derived from the bark, flower, and fruit of rats. The alcoholic extracts demonstrated the ability to return

the high levels of blood lipids to a normal state. Additionally, a notable reduction in the levels of total cholesterol, triglycerides, LDL cholesterol, and VLDL cholesterol was seen. The antimicrobial properties of alcoholic extracts derived from the husks of fruits, seeds, and flowers were proven in a study. The experiment conducted by Purohit and Vyas revealed that the consumption of a high-fat diet resulted in a substantial eight-fold elevation in blood total cholesterol levels in rabbits. The use of *C. decidua* fruit extracts, specifically at a dose of 500 mg/kg body weight in a 50% ethanolic solution, resulted in a considerable reduction in blood levels of total cholesterol (61%), LDL cholesterol (71%), triglycerides (32%), and phospholipids (25%). In a similar manner, the extract derived from *C. decidua* shoots showed a significant reduction in several blood lipid markers. Specifically, the extract was found to decrease serum total cholesterol levels by 48%, LDL cholesterol levels by 57%, triglyceride levels by 38%, and phospholipid levels by 36%. The application of fruit and shoot extract treatments resulted in a reduction of 44% and 28% in the cholesterol content of the aorta, respectively. The findings of the study provided confirmation of the putative hypolipidemic effects of the fruit and shoot of *C. decidua*. Noticeable decreases in plasma triglycerides, total lipids, and phospholipid content were observed. The administration of a 50% ethanolic fruit extract demonstrated a hypolipidemic impact in rabbits that were fed a cholesterol-enriched diet. This effect was shown by a substantial reduction in serum cholesterol levels, serum triglyceride levels, and low-density lipoprotein (LDL) levels. Additionally, the extract led to an increase in the high-density lipoprotein (HDL) ratio and enhanced cholesterol excretion.[38]

2.4 Antioxidant activity: Treatment with dried *C. decidua* fruit as an anti-diabetes drug led to a drop in alloxan, which caused erythrocytes, the kidney, and the heart to have a lot of lipid peroxidation. When *C. decidua* is used to treat alloxan-induced lipid peroxidation, superoxide dismutase and catalase enzymes are changed. This lowers oxidative stress. We looked at the anti-oxidant and cell-regeneration effects of stem extract in diabetic rats that had been given streptozotocin. Diabetic rats had much lower blood glucose levels when they were given a methanolic extract and an active fraction from a part of the stem. By getting rid of free radicals, the extract worked quickly to protect against lipid breakdown and lower the risk of diabetic problems.[39]

2.5 Antihypertensive Activity: An ethanolic extract of *C. decidua* caused systolic, diastolic, and mean blood pressure to drop in rats that had been put to sleep. This happened in a dose-dependent way. When the extract was given in doses of 1, 3, and 10 mg/kg, the mean artery blood pressure went down by 20%, 30%, and 47%, respectively. Then, it was seen that the hypotensive action was short-lived, with blood pressure going back to normal in 2 minutes. Overall, it makes sense to think that the alcoholic extract of *C. decidua* relaxes cardiac and smooth muscle tissue in a way that is not specific, and that this is probably what makes it lower blood pressure and slow the heart rate [40]

2.6 Anti-inflammatory and analgesic activity: In vitro anti-inflammatory activity found in their study backs up the use of the plants as crude anti-inflammatory medicines in traditional medicine.[41]

2.7 Hypo-cholesterol emic effect: The extract of the young fruits and shoots of *C. decidua* drops plasma triglycerides, total lipids, and phospholipids. Because of this, it is used as a drug for people with high cholesterol. It seemed to work by making more bile acids and cholesterol come out of the poop.[42]

Conclusion

Capparis decidua (Forssk.) Edgew. has been employed as a traditional medicinal remedy in several regions around the globe. Numerous researchers are actively engaged in the investigation and examination of this particular plant in order to find, isolate, and extract possible therapeutic components that have demonstrated diverse pharmacological properties. Several pharmacological properties have been discussed in the preceding text. However, there is a significant need for further investigation of this plant by scientists, chemists, pharmacists, microbiologists, and nutritionists. Although this plant exhibits a wide range of pharmacological actions, such as antirheumatic and aphrodisiac effects, these traditional claims have not yet been substantiated by any scientific investigation. Furthermore, until yet, there has been a lack of clinical research undertaken to validate the findings of preclinical investigations.

Reference

1. Shastri BM. —The wealth of India, A dictionary of Indian raw materials & industrial products, CSIR, New Delhi, 1995, P. 210- 212.
2. Isaac kehimkar, —Common Indian wild flowers, Bombay natural history society, oxford university press, Mumbai ,2000, P.no. 36.
3. Shrishailappa B, Desai V B and Suresh B, —Ethnopharmacology, its relevance and need in India, Eastern Pharma, Volume: 64 pp. 35-38, 2010

4. Bown D —Encyclopaedia of Herbsl, The Royal Horticulture Society, Dorling Kindersley Ltd, Volume: 1, pp.152, 2008.
5. Kumar S, Sharma R, Kumar V, Govind K, Vyas and Rathore A, —Combining molecular-marker and chemical analysis of *C. decidua* (Capparaceae) in the Thar Desert of Western Rajasthan (India)l, Rev. Biol. Trop. (Int. J. Trop. Biol. ISSN-0034-7744), Volume: 61, issue:1, pp. 311-320, 2013.
6. Kirtikar K R and Basu B, —Indian Medicinal Plantsl, International Book Distributers, Dehradun, Volume: 2, Issue: 1, pp. 195-199, 2008.
7. Bown D —Encyclopaedia of Herbsl, The Royal Horticulture Society, Dorling Kindersley Ltd, Volume: 1, pp.187, 2008.
8. Dipti, Jaiswal ML. Karīra (*Capparis decidua* Edgew.) – An Important Medicinal Plant of Arid Zone Int J Ayu Pharm Chem [cited 2017 sept 12] 2016; 5(2): 120-30.
9. Singh P, Mishra G, Srivastava S, Jha KK, Khosa RL. Traditional uses, phytochemistry and pharmacological properties of *Capparis decidua*: An overview. Der Pharmacia Lettre. [cited 2017 aug 8] 2011; 3(2): 71-82.
10. Ageel A, Parmar N, Mossa J, Al Yahya Mali RG, Hundiwale JC, Sonawane RS, Patil RN, Hatapakki BC. Evaluation of *Capparis decidua* for Anthelmintic and Anti-microbial activities. Indian Journal of Natural Product. [cited 2017 may 10] 2004; 20(4).
11. Gaiind KN, Juneja TR, Bhandarkar PN. Volatile principles from seeds of *Capparis decidua*. (Kinetics of in vitro antibacterial activity against *Vibrio cholerae*, *Vibrio ogava*, *Vibrio inaba* and *Vibrio eltor*). Ind J Pharm [cited 2017 sept 10] 1972; 34: 86-88.
12. Rashid S, Lodhi F, Ahmad M, Usmanghani K. Preliminary cardiovascular activity evaluation of Capparidisine, a spermidine alkaloid from *Capparis decidua*. Pak. J. Pharm. [cited 2017 Jan10 1989; 6: 61-6.
13. M, Al Said M, Tariq M. Anti-inflammatory activity of some Saudi Arabian medicinal plants. Agents and Actions. [cited 2017 Jun 20] 1986;17(3-4): 383-384.
14. Joseph B, Jini D. A medicinal potency of *Capparis decidua* (Forssk.) Edgew —a harsh terrain plant. Res. J. Phytochem. 2011; 5: 1–13.
15. Singh D, Singh RK. Kair (*Capparis decidua* (Forssk.) Edgew): a potential ethnobotanical weather predictor and livelihood security shrub of the arid zone of Rajasthan and Gujrat. Indian J Trad Knowl 2011; 10:146–65
16. Verma P D, Dangar R D., Shah K N, Gandhi D M and Suhagia S N, —Pharmacognostical Potential of *C. deciduas* Edgewl, Journal of Applied Pharmaceutical Science, volume :01, issue:10, pp. 06- 11, 2011.
17. Chunekar K C and Pandey G S. Bhavprakash nighantu. Chaukhambha Bharti Academy, 8th Ed., Gokul bhavan, Varanasi: 546, 1999.
18. Anonymous, The Wealth of India, Raw Materials. Vol. II, CSIR, Delhi 67, 1950.
19. Gupta A K, Reviews on Indian Medicinal Plantsl, Medicinal Plant Unit, ICMR, New Delhi 5:389, 2007.
20. Nadkarni K M, —Indian Materia Medical Bombay Popular Prakashan, volume: 3, pp. 265, 2000.
21. Khare C P, Indian medicinal plantsl, Springer India Pvt. Ltd 117, 2008.
22. Kirtikar K R, Indian Medicinal Plantsl, International Book
23. Anonymous, —The Wealth of India: A Dictionary of Indian Raw Materials & Industrial productsl, First Supplementary Series (Raw materials), National Institute of Science Communication and Information Resources, CSIR, New Delhi, volume: 1, pp. 211-212, 2007. 24. Nadkarni K M, Indian Materia Medica. Part-I, 3rd Ed. Vegetable Kingdom: 265, 1954. [15] Shastri G M and Bhavprakash, Part-I, 1st Ed., Sastu Sahitya Vardhak karyalaya, Mumbai 368, 1957.
24. Rai S and Rai S, —Oil and fats in arid plants with particular reference to *C. decidua decidua*'s, Latrines. Indian Scolds. Techno, volume: 12, pp. 99-105, 1987. 15. Zia-ul-Haq M, —Compositional Studies: Antioxidant and Antidiabetic Activities of *C. decidua* (Forsk.) Edgewl, Int. J. Mol. Sci, volume: 12, pp. 8846-8861, 2011
25. Ahmad K, Ashraf M, Khan ZI, Valeem EE. Evaluation of macromineral concentrations of forages in relation to ruminants' requirements: a case study in Soone Valley, Punjab, Pakistan. Pak. J. Bot. 2008; 40: 295–299.
26. Ashraf M, Khan A, Azmi A. Cell membrane stability and its relation with some physiological processes in wheat. ActaAgronHungar. 1992; 41: 183. [59]
27. Irigoyen J, Einerich D, Sánchez D. Water stress induced changes in concentrations of proline and total soluble sugars in nodulated alfalfa (*Medicago sativa*) plants. Physiol. Plant. 1992; 84:
28. Paterson RT, Karanja GM, Nyaata OZ, Kariuki IW, Roothaert RL. A review of tree fodder production and utilization within small holder agroforestry systems in Kenya. Agrofor. Sys. 1998; 41: 181–199.

29. 30. Özcan M. Mineral composition of different parts of *Capparis ovata* Desf. var. *canescens* (Coss.) Heywood growing wild in Turkey. *J. Med. Food*. 2005; 8: 405–407.
30. 31. Paterson RT, Karanja GM, Nyaata OZ, Kariuki IW, Roothaert RL. A review of tree fodder production and utilization within small holder agroforestry systems in Kenya. *Agrofor. Sys.* 1998; 41: 181–199.
31. Kumar S, Sharma R, Kumar V, Vyas GK, Rathore A. Combining molecular-marker and chemical analysis of *Capparis decidua* (Capparaceae) in the Thar Desert of Western Rajasthan (India). *Rev. Biol. Trop.* 2013; 61: 311–320.
32. Nieves Jr C, Langkamp-Henken B. Arginine and immunity: a unique perspective. *Biomed Pharmacotherapy*. 2002; 56: 471–482.
33. 34. Mahasneh AM. Screening of some indigenous Qatari medicinal plants for antimicrobial activity. *Phytotherapy. Res.* 2002; 16: 751–753
34. 35. Goyal M, Nagore B P, Sasmal D, —Sedative and anticonvulsant effects of an alcoholic extract of *Capparis decidua*'s, *Journal of Natural Medicines*, volume: 63, issue: 4, pp. 375-379, 2009.
35. 36. Agarwal V and Chavan B M, —A study on composition and hypolipidemic effect of dietary fibre from some plant foods, *Plant Foods Hum Nutra*, volume: 38, pp. 189-197, 1988.
37. Purohit A and Vyas K B, —Antiatherosclerosis effect of *Capparis decidua*'s fruit extract in cholesterol-fed rabbits, *Pharmaceutical Biology*, volume: 44, issue: 3, pp. 172-177, 2006.
38. —Hypolipidemic effect of *C. decidua* fruit extract (50% ethanolic) in cholesterol fed rabbits, *Indian Drugs*, volume: 28, issue: 9, pp. 413, 1991.
39. Sharma I, Guskin D, Sharma A and Dixit V P, Hypolipidemic effect of *C. decidua* fruit extract (50% ethanolic) in cholesterol fed rabbits, *Indian Drugs*, volume: 28, issue: 9, pp. 413, 1991.
40. issue:3, pp. 82-91, 2011. Dangi K S and Mishra S N, —Anti-oxidant and β -aerogeneration effect of *C. decidua* aphyllastem extract in streptozotocin-induced diabetic rat, *Bilo and Med*, volume.
41. 40. Ghangro I H, Ghangro A B and Channa M J, —Nutritional assessment of non-conventional vegetable *C. decidua* flower, *Rawal Medical journal*, pp. 40-2, 2015.
42. Yadav P, Sarkar S and Bhatnagar D, —Lipid peroxidation and antioxidant enzymes in erythrocytes and tissues in aged diabetic rats, *Indian J. Exp. Biol*, volume:35, pp. 389–392, 1997.
43. Goyal R and Grewal R, —The influence of tent (*Capparis decidua*) on human plasma triglycerides, total lipids and phospholipids, *Nutra. Health*, volume: 17, pp.71–76, 2003.