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KABAR (*CAPPARIS SPINOSA* L.): PHARMACOLOGICAL ACTION AND THERAPEUTIC USES IN THE PERSPECTIVE OF UNANI MEDICINE: A REVIEW

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ABSTRACT

Medicinal plants have been used since ancient times as therapeutic agents for the management and treatment of diseases because they possess health-promoting effects and contain bioactive components. These are used worldwide to treat many diseases, and new drugs continue to be developed through research from these plants. *Capparis spinosa* L. belonging to *Capparidaceae* family is an important source of different secondary metabolites of interest to humankind. It is commonly known as Caper bush. It has wide range of diversity. It is used for the treatment of various human ailments including gastrointestinal problems, hypertension, inflammation, amenorrhoea, anemia, liver dysfunction, rheumatism, bodyache, intestinal worms etc. Numerous bioactive phytochemical constituents have been isolated and identified from different parts (aerial parts, roots and seeds), which are responsible alone or in combination for its various pharmacological activities. This paper is a review of pharmacological properties, phytochemistry and therapeutic uses of *Capparis spinosa* L. as mentioned in the classical literature of Unani System of Medicine as well as to cover the recent studies on the drug in human and animal models.

KEYWORDS: Caper bush, *Capparis spinosa* L., bioactive, therapeutic use, medicinal plant.

INTRODUCTION

Capparis spinosa L. is a dicotyledonous perennial shrub which can grow up to 1 m high and has extensive root systems.[1] Leaf stipules may be formed into spines; this is the reason why it is called spinosa. It has beautiful white colour hermaphrodite flower, producing large, kidney shaped, and grey-brown colour seeds in September. It is the plant established to have highly diverse economic and medicinal value in different system of medicines like in Unani, Chinese, Ayurvedic, Iranian and Greco-Arabic System of Medicines.[2] It is a xerophytic plant growing in a broad range of climatic conditions, varying from dry deserts to cooler altitudes of mountains. It belongs to *Capparidaceae* family and is commonly known as Caper bush.[3] The fruits and roots of *C. spinosa* L. are used for medicinal purpose since ancient times for its beneficial effects on human diseases.[1,4] It has bitter, astringent and sharp test.[5] It is used in Unani Medicine by the name of Kabar. It has *Jālī* (detergent), *Mufattiḥ-i-Sudad* (deobstruent), *Qatil Kirm Shikam* (anthelmintic), *Mulaṭṭīf* (demulcent) *Muḥallil* (anti-inflammatory), *Mudirr-i-Bawl* (diuretic), *Mudirr-i-Ḥayḍ* (amenorrhoea), *Mulayyin* (resolvent), *Mu'arriq* (diaphoretic), *Musakkin* (analgesic), *Kāsir-i-Riyāḥ* (carminative), *Munaffith-i-Balgham* (expectorant), *Muqawwī -i-mi'da* (stomachic) and *Mushtahī* (appetizer) properties.[4,5]

Distribution

The plant is native to the Mediterranean region and is widely distributed from Morocco to Crimea, Armenia, Iran, North-west India, Rajasthan and Peninsular India.[6] Southern Europe, northern and eastern Africa, Madagascar, south–western and central Asia, Philippines, Indonesia, Papua New Guinea, Australia and Oceania.[7] Several countries such as Greece, Italy, Spain and Turkey have widely produced *C. spinosa*.[1]

Botanical description

Capparis spinosa L. is a prostrate, perennial deciduous, ascending or pendulous shrub with branches unramified to multiramified, up to 4 m long; young twigs glabrous, pubescent or white-tomentose, with simple hairs. It bears rounded fleshy alternate leaves and big white to pinkish-white flowers. The shrubby plant is many-branched, with alternate leaves, thick and shiny, with orbicular, ovate, obovate, lanceolate or elliptic blades, which are glabrous or pubescent, chartaceous to coriaceous or succulent,

rounded, cordate, subcordate, truncate, obtuse, attenuate or cuneate at base, rounded, acute, obtuse, acuminate, truncate or retuse at apex, more or less distinctly mucronate. The flowers are complete, sweetly fragrant with four sepals and four white to pinkish-white petals, many long violet-colored stamens, and a single stigma usually rising well above the stamens. Flowers solitary, axillary in the upper part of twigs, more or less zygomorphic, mostly noctiflorous; pedicels (0.8–) 2.5–8 cm long, glabrous to pubescent. Calix with 4 sepals, oblong or ovate, glabrous or pubescent outside, in bud all free, the posterior one slightly to strongly saccate, (0.8–) 1.2–2.5 cm long, other sepals (0.7–) 1.2–2.2 cm long. Petals 4, white or white–pinkish, upper pair connate, lower pair free, obovate, oblong or rounded–ovate, (0.8–), 1.5–3.5 (–4) cm long. Stamens numerous, up to c. 190, with filaments up to 5 cm long, and anthers c. 1.3–2.5 mm long. Gynophore (1.2–) 2–5 (–8) cm long, sometimes pubescent at base; ovary ovate, ellipsoid or cylindrical, 3–6 mm long, with 5–10 carpels and stigma sessile or capitate. Fruit ellipsoid, ovoid, obovoid, pyriform, oblong or globose, usually dehiscent, (0.8–) 1.4–5 (–5.5) × (0.5–) 1–2 (3.3) cm, with pericarp smooth or ribbed and red or yellow–greenish pulp; seeds numerous, reniform, 2–3.8 × 1.6–3.2 mm, reddish–brown [7,8]. The root sample collected from the local market of Srinagar is very light in weight, creamy white in colour with longitudinally grooved and rough bark (**Fig. 01**).

Fig. 01: Showing Bikh-i-Kabar (*Capparis spinosa* L. root) obtained from local market of Srinagar.

Vernacular names

Arabic	:	Kabar[4,12,13] Kibr[11] Kabbar[9]
Binomial name	:	*Capparis spinosa* L.
Chinese	:	Caper[1]
English	:	Caper Bush[6,9] Ceper Plant[11]
Greek	:	Kabar[6] Asunatees, Kabaras, Karas, Fetara[14,15]
Gujrati	:	Kabaree[11]
Hindi	:	Kabara, Hainsaa, Kanthara[11]
Italian	:	Cappero[1]
Marathi	:	Kabar[11]
Persian	:	Kabar,[4,12] Alaf-e-Mar[1] Kibar[11]
Punjabi	:	Barar, Kaur[11]
Spanish	:	Alcapparo[1]
Urdu	:	Kabar[9,11]

Scientific classification[9]

Reign	:	Vegetal
Kingdom	:	Plantae
Sub-Kingdom	:	Tracheobionta
Phylum	:	Magnoliophyta
Class	:	Magnoliopsida
Sub-Class	:	Dilleniidae
Order	:	Capparales
Family	:	Capparidaceae
Genus	:	*Capparis*
Species	:	*C. spinosa*

Cultivation and Collection

Capparis spinosa L. is usually cultivated in tropical and subtropical regions. The most common propagation of *C. spinosa* is vegetative cuttings. It can flourish under dry hot conditions in either well-drained or poor soils. It can be grown in a wide range of environmental conditions; it is generally grown on sandy loam soils with low alkalinity. It grows and flowers from May to October covering the summer drought. Since it has deep, extensive root systems and can be grown in harsh environments, it has been recommended for the prevention of land degradation and soil erosion control [1]. In different Himalayan locations, *C. spinosa* tolerates both silty clay and sandy, rocky or gravelly surface soils, with less than 1% organic matter.[8]

Description in Unani Literature

Kabar (*Capparis spinosa* L.) belongs to *Capparidaceae* family. It is a thorny shrub whose flowers are white in colour and the seeds are small and red in colour. The shape of the fruit resembles with olive. The leaves are round in shape and the root is white in colour. The root (*Bikh-i-Kabar*) and fruit (*Samar-i-Kabar*) of this plant is used in Unani System of Medicine. It's mainly found in Rajasthan.[4,10,11,12]

***Mizaj* (temperament)**
Its temperament is hot and dry in 2nd degree.[4,5,10,11,12,16] Some says hot and dry in 3rd degree.[14,15]

***Af'al* wa *Khawas* (actions and uses)**
Capparis spinosa L**.** is used for its *Jālī* (detergent), *Mufattiḥ-i-sudad* (deobstruent), *Qatil-i-Kirm-o-Shikam* (anthelmintic), *Mulaṭṭīf* (demulcent), *Muḥallil* (anti-inflammatory), *Mudirr-i-bawl* (diuretic), *Mudirr-i-hayḍ* (emmenogogue), *Mulayyin* (resolvent), *Mu'arriq* (diaphoretic), *Musakkin* (analgesic), *Kāsir-i-riyāḥ* (carminative), *Munaffith-i-balgham* (expectorant), *Muqawwī-i-mi'da* (stomachic), *Musakhkhin* (calorific) and *Mushtahī* (appetizer) properties. It opens obstruction of liver and spleen. It also considered as antidote[4,5,11,12,14,15] The fruit of the plant is used in the treatment of paralysis, bronchial asthma and toothache while the root is used in fevers, rheumatoid arthritis, cough and bronchial asthma.[4,11,12,14,15]

***Tarkeeb-i-Iste'mal* (method of administration)**
The method of administration of this drug for the treatment of various diseases are as follows

***Amrād-A'sabi-wa-Balghami* (nervine & phlegmatic diseases)**
- The plant is used in the treatment of paralysis, rheumatoid arthritis, khadar (Numbness), sciatica and gout.
- The decoction prepared from its root is useful in above said diseases.[10,4]

***Suda'* (*Headache*)**
- Application of its bark on the head relieves headache.[5]
- The plaster of its root and leaves dissolves the nodular swellings of scrofula.[5]
- It's juice kills insects inside the ear.[5]

***Waja' -i-Dandan* (*Toothache*)**
- Root of caper is boiled in vinegar and used as *Mazmaza* (mouthwash) to relieve toothache.[5,15]
- Dried flower buds are used in scurvy.[6]

***Amrād-i-sadr* (lung diseases)**
- The juice of the leaves is used to kill the worms present in the ear.[5,15]
- The juice of leaves and fruits is having bactericidal and fungicidal properties.[6]

***Amrād-i-Nizam Hadm* (digestive disorders)**
- The decoction of the plant is used to clear the obstruction of liver and spleen.[4]
- The paste made from the root and leaves is applied locally on spleen. The fruit along with vinegar is used to cure the inflammation of spleen.[4]

***Didan-i-Am'a* (intestinal worms)**
- Its decoction is used to kill the worms.[4]

***Amrād- Jild* (skin disorders)**
- Paste made from its branches is applied locally for the treatment of rashes, acne and boils.
- The paste prepared from the root or leaves of the plant along with vinegar is used to cure ringworm, pityriasis and scrofula.[4,10,14,15]

***Amrād-i-Bawl* (diseases of Urinary system)**
- The decoction is used in cases of anuria.[4]

***Amrād-i-Niswān* (gynecological disorders)**
- The decoction of the plant is used for the treatment of amenorrhea.[4]

***Mazarrat* (toxicity, side effect and adverse effect)**
It produces harmful effect on stomach, urinary bladder,[4] kidneys and brain.[12,15]

***Musleh* (Corrective)**
Sikanjabeen (*Vinegar* and *honey*), Anisoon (*Pimpinella anisum* L.), Khulanjan (*Alpinia galanga* L.) and Asal (honey) are used as correctives.[4,12]

***Badal* (Substitute or Alternative)**
The different parts of the plant are used as substitute e. g. root, leaves, fruit etc.[4,12]

***Miqdar Khuraq* (Dosage)**
5-9 g,[4] 5-7 g.[11]

Compound formulations: The compound formulations in which Caper is one of the important ingredients are mentioned in Table.

Table: Showing name of compound formulations with their dose, Method of Administration, action and uses.

Sr. No.	Name of Compound Formulations	Dose and Method of Administration	Action and uses
1.	Arq Ma' al-Lahm Mako Kasni Wala[17]	120 ml orally, adding sugar	It is anti-inflammatory, stomachic, hepatoprotective so used for gastritis, weakness of stomach and liver
2.	Ma'jun-i-Hafizul-Ajsad[18]	5-10 g, Oral	It has diuretic and anti-inflammatory properties. It's effect in anemia and anasarca.
3.	Ma'jun Suranjan[17,19,20]	7 g, with fresh or suitable water orally	It's used for anti-inflammatory, laxative properties. It's effective arthritis, sciatica, gout and constipation.
4.	Sharbat Bazoori Har[20]	50 ml, in the morning mixed with decoction of badiyan or suitable medicine orally.	It's have been used for the treatment of liver, kidney and urinary bladder disordered.
5.	Sharbat Khaksi[11]	5-7 g., in the form of decoction orally	Used for its deobstruent, detergent, anti-inflammatory, anthelmintic properties. It is mentioned effective in obstructive disorders of liver and spleen, also useful for helminthes, retention of urine and Amenorrhea.
6.	Rogan Aqrab[17]	Local application	It has sicatrizant properties and used to remove piles and used to break urinary bladder stone.
7.	Zimad Baras[20]	Local application	It is useful for leukoderma.

Phytochemistry

Capparis spinosa L. has a wide range of bioactive compounds such as alkaloids, flavonoids, steroids, terpenoids and tocopherols.[21] A heterocyclic pyrane ring and two benzene rings make up the 15-carbon skeleton of flavonoids. Based on their structural characteristics, flavonoids can be classified into a number of classes, including flavones, flavonols, flavanones, isoflavonoids, and others. Flavonoids may lower the risk of cardiovascular disease (CVD) and improve overall health when consumed.[22] Additionally, rutin lowers levels of low-density lipoprotein (LDL) cholesterol, which enhances indicators for CVD risk.[23] Due to its anti-hypertensive and anti-platelet aggregating effects, quercetin has been associated with a decreased risk of cardiovascular disease (CVD).[24] According to a study by Fu *et al*. (2007), Cappariloside A, stachydrin, hypoxanthine, and uracil were all found in the fruits of C. spinosa.[25] According to a different study by Calis. *et al*. (1999), spectroscopic techniques were used to identify two 1H-indole-3-acetonitrile compounds that include glucose: 1H-indole-3-acetonitrile 4-O-β-glucopyranoside and 1H-indole-3-acetonitrile 4-O-β-glucopyranoside.[26] In addition, the fruits of C. spinosa were found to contain capparine A, capparine B, flazin, guanosine, 1H-indole-3-carboxaldehyde, 4-hydroxy-1H-indole-3-carboxaldehyde apigenin, kaempferol, and thevetiaflavone.[27] Stachydrine, an alkaloid, is found in the roots. The roots also contain glucobrassicin, neoglucobrassicin, and 4-methoxyglucobrassicin. The plant produced glucoiberin, glucocapparin, sinigrin, glucocleomin, and glucocapangatin, among other glucosinolates. Rutin has also reportedly been found in plants. Stachydrine was produced by the leaves, cortex, and root bark. When given to dogs, rabbits, and rats, stachydrine accelerated blood coagulation and minimised blood loss.[6,11] According to Ascrizzi *et al*. (2016), sesquiterpene hydrocarbons made up 99% of the total emissions from C. spinosa seeds, with -caryophyllene (45%) being the most prevalent followed by α-guaiene (15%), bicyclogermacrene (12%), and germacrene B (8%).[28] Another study by Sharaf *et al*. (1997), stems and leaves of C. spinosa contain the antioxidants kaempferol-3-rutinoside, quercetin-3-rutinoside, quercetin-7-rutinoside, and quercetin 3-glucoside-7-rhamnoside.[29]

Pharmacological Studies

Coagulative effect

The stachydrine present in the plant, when given to dogs, rabbits and rats, quickened the coagulation of blood and reduced loss of blood.[6]

Anti-obesity

Eddouks *et al*. (2005) demonstrated that there was a significant weight loss in diabetic rats fed with the aqueous extract of powdered fruits of C. spinosa (20 mg/kg) after 2 weeks ($p < 0.01$).[30] Another study by Lemhadri *et al*. (2007) reported that repeated oral administration of aqueous extracts of *C. spinosa* was associated with a significant loss of body weight in high fat diet-fed mice after 2 weeks. Therefore, it is suggested that *C. spinosa* may be used for weight loss management.[31]

Anti-diabetic

In a randomized, double-blind, placebo-controlled clinical trial of 54 type 2 diabetic patients, reported that patients who took 1200 mg *C. spinosa* fruit extracts daily for 2 months had a significantly lower level of glycosylated hemoglobin and fasting blood glucose than the control group ($p = 0.043$ and 0.037, respectively). The findings of their study demonstrated an improvement in hypertriglyceridemia and hyperglycemia in diabetic patients. In addition, no renal and hepatic adverse events were reported in the patients.[32]

Cholesterol-Lowering

C. spinosa has been reported to be associated with improved plasma lipid parameters. Huseini *et al.* (2013) reported a significant decrease in the triglyceride level of type 2 diabetic patients who were supplemented with 1200 mg *C. spinosa* fruit extracts daily for 2 months ($p = 0.029$).[32] Therefore, C. spinosa may be useful for the treatment of fatty liver disease and metabolic syndrome because it plays an important role in the inhibition of gluconeogenesis in liver.[1]

Anti-hypertensive

C. spinosa has the potential to be used for the treatment of hypertension. In a study of spontaneously hypertensive rats, Ali *et al*. (2007) reported that when the aqueous extract of powdered fruits of *C. spinosa* (150 mg/kg) was administered for 20 days, the systolic blood pressure was significantly decreased after 8 days, 12 days and 16 days. In addition, there was also a significant increase in the concentration of urinary sodium, potassium and chloride after 20 days. No change in heart rate was observed during the period. In addition, there was also no difference in the activity of plasma angiotensin-converting enzyme (ACE) and renin after 20 days.[33] It is suggested that *C. spinosa* decreases blood pressure by increasing the excretion of renal electrolytes and inhibiting the ACE activity. The inhibition of ACE activity is associated with a decrease in blood pressure. Therefore, *C. spinosa* may play an important in the reduction of blood pressure.[1]

Anti-microbial

In a study investigating the antibacterial activity of C. spinosa, Boga *et al* (2011) reported that the growth rate of *Deinococcus radiophilus* was significantly inhibited by the addition of aqueous extracts from roots of *C. spinosa* as compared to the control. However, no inhibition was shown on the growth rate of *Escherichia coli* by the addition of aqueous extracts from roots of *C. spinosa*.[34] Aqueous extract of root has more antibacterial effect than aqueous extract of fruit against a number of pathogens. Ethanolic extract of roots has greater antifungal efficacy than ethanolic extract of fruits. Different extracts of *C. spinosa* root shown inhibitory efficacy against *Staphylococcus* species. The roots' aqueous extract had an inhibiting effect on the antifungal activity of *A. niger*, *A. parasiticus*, and *A. flavus*. Roots ethanolic extract and ethyl acetate extract both showed greater sensitivity to *C. albicans*. With the exception of fruit ethanolic extract, the antibacterial activity of roots extract was greater than fruit extract against strains of *K. pneumonia* and *P. aeruginosa*. Root ethanolic extract displayed increased antibacterial activity against *Streptococcus* genus strains.[35]

Gull *et al* (2015) reported that the methanolic extracts of *C. spinosa* stem barks and shoots has the greatest antibacterial activity against *B. subtilis* with growth inhibition zones of 26.8 mm and 24.6 mm, respectively. While the methanolic extracts of *C. spinosa* fruits had the highest growth inhibition zones (24.9 mm) against *Pasteurella multocida* followed by *B. subtilis* (23.9 mm), *E. coli* (20.9 mm) and *S. aureus* (17.7 mm). On the other hand, the highest antibacterial activity of the methanolic extracts of *C. spinosa* flowers and roots was observed against *E. coli* with growth inhibition zones of 26.5 mm and 23.9 mm, respectively.[36] In addition, polysaccharides of *C. spinosa* leaves have been suggested to exhibit antimicrobial activity. Mazarei *et al* (2017) reported that polysaccharides of *C. spinosa* leaves had a higher antimicrobial activity against *E. coli*, *S. dysenteries* and *Salmonella typhi*.[37]

Anthelmintic activity

In an in vitro study of *Capparis spinosa* L. against *Lumbricus terrestris* (Annelida), *Fatin AA.* showed that aqueous and alcoholic extracts of the aerial parts of *C. spinosa* has anthelminthic activity of *C. spinosa* extract, it may be related to the presence of tannin, which is a polyphenolic compound capable of producing the same effect as that of some synthetic phenolic anthelminthic, such as niclosamide, oxyclozanide and bithionol. Another possible anthelminthic effect of tannins is that they can bind to free proteins of host GIT or glycoprotein on the parasite cuticle and ultimately causing parasite death.[3]

Anti-inflammatory

In an in vivo mouse model, El Azhary *et al*. (2017) reported that Swiss albino mice treated with *C. spinosa* leaf extracts has a significantly reduced edema than control, demonstrating the anti-inflammatory activity of *C. spinosa*. In addition, the authors also found that *C. spinosa* had significantly decreased the dermis thickness and immune cell infiltration in the inflammatory site.[38] Moutia *et al*. (2016) reported that *C. spinosa* leaf extract was shown to exhibit anti-inflammatory activity in vitro on human peripheral blood mononuclear cells (PBMC) obtained from healthy subjects. The authors also found that PBMC treated with the aqueous fraction of *C. spinosa* leaf extract had a significant increase in interleukin (IL)-4 gene expression (an anti-inflammatory cytokine) and a significant decrease in IL-17 gene expression (pro-inflammatory cytokine).[39] Therefore, these studies suggested that *C. spinosa* leaf extracts exhibit anti-inflammatory activity by inhibiting the pro-inflammatory cytokines expression and immune cell infiltration.[38,39] These findings were consistent with

another study by Feng *et al*. (2011) who demonstrated that the fraction eluted by ethanol-water (50:50, v/v) from *C. spinosa* fruits was shown to exhibit the most significant anti-arthritic response in male Wistar rats, providing additional evidence that *C. spinosa* possesses anti-inflammatory effects.[40] *C. spinosa* root extracts were reported to relieve pain in complete Freund's adjuvant (CFA) - induced rheumatoid arthritis and mono-iodo acetate (MIA)-induced osteoarthritis male Sprague-Dawley rats.[41]

Anti-hepatotoxic

Gadgoli and Mishra 1999 evaluated the effects of *C. spinosa* on rats against paracetamol and carbon-tetra chloride induced hepato-toxicity in vivo. In addition, the authors also investigated the effects of *C. spinosa* on galactosamine and thioacetamide induced toxicities in vitro.[42] Kazemian *et al*. 2015 reported that both groups of diabetic rats receiving 0.2 g/kg and 0.4 g/kg of hydroalcoholic extract of *C. spinosa* had a significant reduction of alanine aminotransferase (ALT) and alkaline phosphatase (ALP) ($p < 0.05$ for both groups) after 4 weeks of treatment. Therefore, it is suggested that *C. spinosa* extract does not cause any toxic effect on the liver.[43]

Anti-carcinogenic activity

C. spinosa root bark and leaves have some anti-carcinogenic activity. In fact, the hydrolysis products of indol-3-yl methyl glucosinolates have anti-carcinogenic effects.[44,45] Despite the fact that consumption of capers is less than that of other significant dietary sources of glucosinolates (white cabbage, broccoli and cauliflower), it could support daily nutrition. Dose of organic anti-cancer agents that lowers cancer risk. Additionally, it is known that glucosinolates activity that is goitrogenic (anti-thyroid). Moreover, rutin and Quercetin may aid in the prevention of cancer.[46] Capers contain higher quantities of selenium than other vegetable products, which has also been linked to the protection of various cancers.[47]

Immunomodulatory activity

It has been demonstrated that the methanolic extract of *C. spinosa* buds, which is abundant in derivatives of flavonoids like quercetin and kaempferol, has immunomodulatory effects on human peripheral blood mononuclear cells in vitro (PBMCs)[44] Further in vitro and in vivo studies on the methanolic extracts of leaves and fruits of *C. spinosa* confirmed the immunomodulatory activity. Albino mice treated with cyclophosphamide and myelosuppressed experienced a considerable rise in the number of total white blood cells (WBC) after receiving 100 and 200 mg/kg b. wt. of both methanolic extracts. The presence of flavanol derivatives in the extracts likely mediates this action.[48]

Broncho-relaxant effect

Benzidane *et al.* showed in vitro broncho-relaxant effects of *C. spinosa* L. aqueous extracts on rat trachea. The outcomes demonstrated that *C. spinosa* leaf aqueous extracts can cause broncho-contractant effect. Contrarily, *C. spinosa* capers had a broncho-relaxant effect or acted as an antagonist to the receptors in the rat trachea that acetylcholine stimulated. Decreased Ca2+ influx through voltage-dependent calcium channels may therefore be caused by blocking effects. The outcomes demonstrated that *C. spinosa* leaf aqueous extracts can cause broncho-contractant effect.[49]

Anti-arthritic activity

The anti-arthritic activity of the caper fruit's ethanol-water (70:30) extract and four of its fractions was tested on male Wistar rats and male and female Imprinting Control Region (ICR) mice. Column chromatography was used to separate the fractions with the highest activity, which produced the main chemicals p-hydroxy benzoic acid, 5-(hydroxymethyl) furfural, bis(5-formylfurfuryl) ether, daucosterol, methyl-D-fructofuranosides, uracil, and stachydrine. Notably, fraction 2 had anti-arthritic activity comparable to that of diclofenac and was the most active. The reaction to thermal stimulation might be delayed and the acetic acid-induced abdominal constriction response could be blocked by this stachydrine-rich fraction. Additionally, carrageenan and xylene-induced ear and paw edoema were diminished.[40]

Anti-oxidant activity

The phenolic content and antioxidant properties of *Capparis spinosa* L. extracts. Due to its stable radical structure and ease of measurement, the chemical molecule 2,2-diphenyl-1-picrylhydrazyl (DPPH) is one of the most often employed free radicals for the direct evaluation of antioxidant activity (AA). The outcomes of the hydro-methanol extracts' antioxidant activity as determined by the maceration and Soxhlet techniques. A dose-dependent anti-radical action is present in *C. spinosa*. Up until it reaches the plate, antioxidant activity rises as we increase concentration. As a result, the Soxhlet method-obtained hydro methanol extract showed the highest antioxidant activity (AA = 86.88%), followed by the maceration method-obtained hydro methanol extract, which had a percentage inhibition of 85.79%.[13]

CONCLUSION

Capparis spinosa L. exhibits important pharmacological effects because of the presence of many bioactive compounds. Traditionally it has been used for the treatment of various human ailments including gastrointestinal problems, hypertension, strangury, anemia, liver dysfunction, rheumatism, dropsy, antispasmodic, antidiabetic, analgesic, anthelmintic, anti-hemorrhoidal, general body tonic etc. Therefore, it is concluded that *C. spinosa* is a multi-purpose plant having diverse economic and medical importance.

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