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Ethnobotanical and pharmaceutical evaluation of *Capparis spinosa* L, validity of local folk and Unani system of medicine

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This paper describe ethnobotanical and pharmaceutical importance of *Capparis spinosa* L, (Capparidaceae) used by many local people since century under the traditional, Ayurvedic, Chinese and Unani system of medicine. The present endeavour was, therefore, conducted during summer 2010 with the aim to document and prepare detail ethnobotanical inventory and pharmaceutical importance of *C. spinosa* and also to explore its agro-industrial potentialities for the Kingdom of Saudi Arabia. Information's about *C. spinosa* were collected through semi-structured interviews and discussion with the local elderly and experienced people up to age group 60 by using standard protocol. Additionally, all available literature on *C. spinosa* was reviewed and studied. The results showed that *C. spinosa* is a multipurpose plant and used for the curing of various human ailments including gastro-intestinal problems, strangury, inflammation, emmenagogue, anemia, liver dysfunction, rheumatism, antispasmodic analgesic; anthelmintic; antihemorrhoidal; aperient; deobstruent; depurative; diuretic; expectorant; and general body tonic in indigenous, Ayurvedic, Chinese and Unani system of medicines. The current study also documented that *C. spinosa* has peculiar aroma and therefore, used in pasta sauces, pizza, fish, meats and salads in many places. The young fruits and tender branch tips are used in pickled and also as a condiment agent. The study also revealed that the tender young shoots including immature small leaves are eaten as a vegetable. Additionally, ash from burned caper roots has been used as a source of salt in indigenous system. The present study concluded that *C. spinosa* is "Plant of the Millennium, has applications for the development of pharmaceutical and food industries and also possess agro-industrial potentialities. Therefore, sustainable utilization and exploration of *C. spinosa* is suggested for the socio-economic uplift of the inhabitants of the Kingdom of Saudi Arabia.

Key words: *Capparis spinosa*, pharmaceutical value, economic uses, traditional system of medicine, human ailments.

INTRODUCTION

In cultures worldwide, natural products such as medicinal plants, minerals, and materials from animal sources were used as traditional remedies by man due to their healing properties. A medicinal plant is one used by people for medicinal purposes – to build or maintain health, stave off disease, or promote recovery from illness or misfortune. No precise definition is possible, given this wide scope and because the use of plants as medicines grades into

their use for other purposes, for example, for food, personal hygiene, beauty care, psychological support and spiritual practices (Chevallier, 1996; Hamilton and Hamilton, 2006). *Capparis spinosa* is one such plant established to have highly diverse economic and medicinal value in different system of medicines like in Iranian, Unani, Chinese, Ayurvedic and Greco-Arabi System of medicines. *C. spinosa* is well known with its common name 'Capers' in different countries (Azaizeh et al., 2003). Traditional medicine, based largely on herbs, still supports the primary healthcare of more people worldwide than 'conventional' or western medicine. Up to

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80% of the population in Africa, for example, uses traditional medicine for their primary healthcare according to the World Health Organization, and natural remedies are also very popular in many western countries (Larsen and Smith, 2004; Al-Quran, 2008). The majority of species of plants in traditional or herbal medical treatments are harvested in the wild rather than cultivated. The use of plants for medicines is by far the biggest use of plants in term of the number of species specifically targeted. Plants provide the predominant ingredients of medicines in most traditional systems of healing and have been the source of inspiration for several major pharmaceutical drugs (Chevallier, 1996; Sher et al., 2010a). According to Plantlife International, the scale of trade in medicinal plants ranges from local to international. Much of this trade is unrecorded or poorly documented in official statistics. Due to the poor documentation, decision makers usually have little awareness of the significance of trade and consumption of medicinal plants, or of the problems of un-sustainability and sometimes deleterious impacts on natural habitats of wild collection (Hamilton and Hamilton, 2006).

The geographical location of Saudi Arabia has provided an ideal environment for the growth and nourishment of different medicinal plant species including *C. spinosa*. The country is gifted with diverse vegetation types occurring in the desert, semi-desert, and mountainous ecosystems (Ahmad and Ghazanfar, 1991). In addition, there is no shortage of places in Saudi Arabia with occasional glimpse of sub-alpine and alpine vegetation types (Sher et al., 2010b). *C. spinosa* is one of the most important species among the medicinal plants of the Kingdom and possesses high pharmaceutical, economic and ecological values. The global importance of MAPs is evident from the fact that in 2006, world wide trade of MAPs touched upon 60 billions of US dollars. With the increase in demand for MAPs, such trade is expected to further grow to 5 trillion by the year 2050 (Lang, 2008). It is also estimated that Europe alone annually imports about an average market value of US\$ 1 billion from Africa and Asia (Larsen and Smith, 2004, Sher and Hussain, 2009). The use of medicinal herbs is getting more popular day by day with gradual increase in the percentage of the people using herbal medicines. It is also worth mentioning that the use of wild edible herbs/culinary plants is increasing in the global food market for diverse items ranging from salads to desserts.

The pressure arising from the implementation of WTO is opening new avenues for the diverse use of wild herbs such as their uses as herbal dyes, herbal fertilizers and pesticides and other biocides. *C. spinosa* possess incalculable number of pharmaceutical and ethnobotanical importance that contains important bioactive agents and has the potential of producing useful biochemical compounds valuable for various pharmaceutical and food industries (Gadgoli and Mishra, 1999). However, the development and commercialization of *C. spinosa* based on bio-industries in the Kingdom of Saudi Arabia dependent upon the availability of facilities and information concerning upstream and downstream bio-processing,

extraction, purification and marketing of the industrial potential of *C. spinosa*. The present study was, therefore, initiated to document the ethnobotanical and pharmaceutical importance of *C. spinosa* and also to explore its agro-industrial potentialities for the Kingdom of Saudi Arabia.

MATERIALS AND METHODS

The rationale for selection *C. spinosa* for the current study is its high agro-based industrial potentialities and was the threatened of over exploitation due to high demand in both national and international herbal markets. The study aims at contributing suitable measures to make sustainable utilization and thus providing additional income to the inhabitants of the Kingdom. *C. spinosa* L. (Capparidaceae family) is known with a number of common names capers Kaber or lussef (Ababi), Bergesodab (Persian) and Titali, ab karir, kachia phal (Urdu). The genus is represented by 250 species including shrubs, trees and woody climbers. *C. spinosa* is distributed in almost all parts of Saudi Arabia, and also occur in many countries of Europe and South Asia. It prefer to grow in saline habitat with halophytic ecological community (Al-Yemeni and Zayed, 1999). It is a medium size perennial spiny bush that bears rounded, fleshy leaves and big white to pinkish-white flowers in July to August. The plant is best known for the edible bud and fruit (*Caper berry*) which are usually consumed in pickled. Leaves are alternate, round to ovate, thick, and glistening. 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 gray-brown colour seeds in September.

During current study, attempts were made to collect all possible ethnobotanical and pharmaceutical details, by the people about *C. spinosa* growing wild in the Central Region of Saudi Arabia. The survey was conducted during summer 2010 following standard methods. A semi-structured questionnaire was devised to document the traditional knowledge of local people regarding *C. spinosa* (Al-Yemeni and Zayed, 1999; Sher et al., 2010a; b). Generally, local healers and elder persons having practical knowledge, were interviewed to document the uses, local names, part used, time of collection, preparation of recipe, and associated benefits to *C. spinosa*. It was interesting to notice that the local young folk avoided to comment and had no, or limited knowledge about the plant under study. Plants specimens were collected, dried, preserved and mounted on standard herbarium sheets and was identified (James, 1990). The voucher specimen number (CS-6-10) was deposited at the National Herbarium of Saudi Arabia. Additionally, a thorough literature survey was conducted to document and compile the importance of *C. spinosa* (Al-Said et al., 1988; Gadgoli and Mishra, 1999; Fici, 2001; Inocencio et al., 2002; Lemhadri et al., 2007; Sushila et al., 2010; Sher et al., 2010b).

The study included to record the places with geographical and ecological status where *C. spinosa* was abundantly available in the Central region of Saudi Arabia. The literature survey allowed to document details about the origin, chemical constituents, biological activities, pharmacological manifestations, and possible industrial implication of *C. spinosa* in Saudi Arabia.

RESULTS AND DISCUSSION

During current field survey, it was noticed that the local people use different parts of *C. spinosa* (locally called 'Al-Kabara') as vegetable and for spicy food aroma. Various parts of *C. spinosa* are also used as drug to treat different diseases. It was also observed that in some areas of the

Central region (Saudi Arabia), the dried fruits of *C. spinosa* were taken orally with a glass of water for curing hypertension and diabetic complications by the traditional healers. The tea prepared by *C. spinosa* buds and leaves was found to be a popular remedy against cold and related infections. The pastes prepared from the root bark of this plant are used externally to treat swollen joints, skin rashes, and dry skin. The unopened buds of capers were used externally to treat eye infections.

The study revealed that majority of the people living within and around the study area relies on the plant resources for centuries. It was also found that the local people have rich indigenous knowledge about Traditional system of Arab medicine. However, the elderly men were more aware about the use of their natural resources as compared to the younger members of the community. A similar observation was also recorded by Sher and Hussain (2009) and Azaizeh et al. (2003). They reported that the gathering and processing of medicinal and aromatic plants for family use in human and livestock treatment is centuries old practice, and have been used virtually in all cultures. The present study also documented that *C. spinosa* is a multipurpose plant used as a medicinal plants, culinary agent, cosmetic and ornamental plant, pickles, condiment, and food plant (vegetable). *C. spinosa* possess high ethnobotanical and pharmaceutical importance in various parts of Saudi Arabia. The results of the present study are in line with the previous studies on different Capers growing elsewhere (Sushila et al., 2007; Sher et al., 2010b).

Ethnopharmaceutical importance

The study showed that *C. spinosa* is used for the treatment of various human ailments including gastrointestinal problems, hypertension, strangury, inflammation, emmenagogue, anemia, liver dysfunction, rheumatism, dropsy, antispasmodic, antidiabetic, analgesic; anthelmintic; antihemorrhoidal; aperient; deobstruent; depurative; diuretic; expectorant and general body tonic in Arab traditional system of medicines. The study reported that in some area the dried fruits of *C. spinosa* are taken orally with a glass of water for curing of hypertension and diabetic problem in traditional system of Arab medicine. Similarly, decoctions from the root bark have been used in traditional medicines for the curing pf dropsy, anemia, and rheumatism. The present findings are supported by Inocenico et al. (2002); Eddouks et al. (2004); Lemhadri (2007). They reported that the root bark of Caper is used as an analgesic and carminative agent and possess antihypertensive activity. Moreover, it was also witnessed that a herbal tea made of *C. spinosa* root and young shoots was considered beneficial for the treatment of rheumatism and stomach and intestinal complaints. In the Saudi folklore, *C. spinosa* was also believed to be diuretic and a general body tonic.

The nutritional value chart (Capers, 2008) of capers

Table 1. The nutritional value of caper berries (per 100 g).

Contents	Amount per 100 g
Energy	20 KCal
Carbohydrates	5 g
Fats	0.9 g
Dietary fibers	3 g
Sugar	0.4 g
Sodium	2960 mg
Iron	1.7 mg
Protein	2 g
Vitamin C	4 mg

berries (per 100 g), as shown in (Table 1): The study showed that decoction of the stem bark is bitter and diuretic. If taken before meals it will increase the appetite. One of the reasons for its effectiveness for these purposes may be the fact that the plant contains the anti-oxidant bioflavinoid rutin which also contributes to the flavour. These findings are in line with the study of Fragiska (2005), who reported that *C. spinosa* has the potential to support the formations of different agro-based industrial products. Moreover, Sushila et al. (2007) also reported that in ayurvedic medicine capers are recorded as hepatic stimulants and protectors, improving liver function and also act as a appetizer agent.

The present study also documented that the decoction of the floral buds and young leaves of *C. spinosa* is used internally for curing of gastrointestinal infections, diarrhea, and dysentery and also useful for the removal of kidney stone. Externally, the same recipe is used to treat skin diseases like wet and dry eczema. The study also showed that this recipe is used to improve eyesight and to treat all kinds of eye diseases in traditional system of Arab medicine. Their findings are supported by earlier reports where decoction of the unopened flower buds of Caper are laxative and externally treat eye infections. The buds are a rich source of compounds known as aldose-reductose inhibitors - it has been shown that these compounds are effective in preventing the formation of cataracts. The buds are harvested before the flowers open and can be pickled for later use - when prepared correctly they are said to ease all kind of stomach problem (Al-Said et al., 1988; Gupta and Ali, 1997; Fici, 2001). Another study proved that *C. spinosa* decoctions treat skin, while the first recorded use of the caper bush was for medicinal purposes in 2000 BC by the Sumerians. It has been suggested that Capers have been used or are still being used in reducing flatulence, in the treatment of rheumatism, anemia and gout. Further medical uses include ingesting for improving liver functions, as diuretics, kidney disinfectants (Aghel et al., 2007). Infusions and decoctions from caper root bark have been traditionally used for dropsy, anemia, arthritis and gout (Brown, 1995; Chopra et al., 1986; Aghel et al., 2007).

It is worth mentioning that various studies conducted on the pharmacological potential of *C. spinosa* proved its local folk medicinal uses. The extract of the root bark of *C. spinosa* possess hepatoprotective activity. *C. spinosa* root bark extract given orally (100, 200 and 400 mg/kg) once daily for 4 days showed dose dependent hepatoprotective activity. However, highly significant effect was seen with 400 mg/kg body weight against CCl₄ induced hepatic damage (Gadgoli and Mishra, 1999; Aghel et al., 2007). Similarly, other worker proved the hypotensive, anti-inflammatory and analgesic activities of *C. spinosa* (Purohit and Vyas, 2005). Moreover, Eddouks et al. (2004); Lemhadri (2007) documented that the aqueous extracts of *C. spinosa* exhibits potent antihyperglycaemic and anti-obesity effects. These plants may exert their antidiabetic and anti-obesity effects through actions that improve insulin sensitivity and the balance between food intake and energy expenditure. Al-Said et al. (1988) reported anti-inflammatory properties of *C. spinosa*, their findings proved different folk uses of *C. spinosa* in traditional system of medicine.

Culinary uses

The present study revealed that the caper plant is well known for the culinary properties of the caper, the immature flower buds which have been pickled in vinegar or preserved in granular salt. They have long been used in recipes of salads, pasta, meat, sauces and garnishes to add a pungent spicy flavour and aroma to food. The caper had other uses prior to its use in cooking. The current study reported that its floral buds and fruits are mainly collected for commercial purposes. Manual labour is required to gather capers and the buds must be picked early in the morning just as they reach the proper size. After the buds are picked, they are usually sun-dried, and then pickled in a vinegar brine. Capers generally come in brine but can also be found salted and sold in bulk. Either way, rinse before using to flush away as much salt as possible. The taste is slightly astringent and pungent, and they can lend piquancy to many sauces and condiments; they can also be used as a garnish for meat and vegetable dishes. Similar finding was reported by Fici (2001), who stated that the salted and pickled caper bud is often used as a seasoning and garnish. Furthermore, he also reported that Capers are a common ingredient in Mediterranean cuisine, especially Italian. Capers are categorized and sold by their size, defined as follows, with the smallest sizes being the most valuable: Non-pareil (up to 7 mm), surfines (7 - 8 mm), capucines (8 - 9 mm), capotes (9 - 11 mm), fines (11 - 13 mm) and grusas (14+ mm). Capers are picked daily, since the youngest flower buds (about the size of peas) have the highest quality. Capers are valued in proportion to the smallness of their size. The young fruits and tender branch tips can also be pickled and used as a condiment. The flower buds are pickled and used as flavouring in sauces, salads. They are pickled in vinegar, or

sometimes in salted vinegar. Both the capers and the young berries are used in sauces and pickling, primarily by Europeans. Tender young shoots including immature small leaves may also be eaten as a vegetable, cooked and used like asparagus or pickled. More rarely, mature and semi-mature fruits are eaten as a cooked vegetable. Additionally, ash from burned caper roots has been used as a source of salt (Chevallier, 1996).

Similar results were also reported by Khanfar et al. (2003); Sher et al. (2010a); Ozcan (2005), they reported that Caper has considerable nutritional value and the floral buds are extensively used in diet as vegetable. The ripened fruits are rich from protein, lipid, carbohydrates, and vitamins and mineral. Fragiska (2005); Ozcan (2005) reported that outside of the Mediterranean and the Caucasus mountains, capers are not much known, although the pickled fruits of some Central Asian species (e.g., *Capparis aphylla*) are used as a vegetable in Afghanistan, Pakistan and North Western India.

Chemical constituents

Besides bitter flavonoid glycosides, rutin, quercetin, quercetin 3-O-glucoside and quercetin 3-O-glucoside-7-O-rhamnoside, quercetin 3-O-[6"- α -L-rhamnosyl-6"- β -D-glucosyl]- β -D-glucoside (Sushila et al., 2010), and kaempferol glycosides, *C. spinosa* also contain lipids, glucocapparin (methyl glucosinolate), methyl isothiocyanate, isopropyl isothiocyanate, *sec*-butyl isothiocyanate, benzyl-isothiocyanate, β -sitosterylglucoside-6'-octadecanoate, 3-methyl-2-butanyl- β -glucoside, stachydrine (a pyridine alkaloid), and cadabicine (a 24-membered polyamine lactam alkaloid). Furthermore, homologous polypreols namely; cappaprenol-12, cappaprenol-13, and cappaprenol-14 with 12, 13, and 14 isoprene units were also isolated from the alcoholic extract of *C. spinosa* (Al-Said et al., 1988; Inocenico et al., 2002).

In the volatile oils of *C. Spinosa* 145 compounds were identified, however, the major constituents were: aldehydes 22%, esters 21%, and sulfur containing compounds 8.42%. The presence of sesquiterpenes, monoterpenes, and capric acid was also confirmed (Arena et al., 2008). Total phenols and glucosinolates were isolated by fractionation, and both classes of chemical compounds were found not to interfere with the activity of one another. New (6S)-hydroxy-3-oxo- α -ionol glucosides together with corchoinoside C (6S, 9S)-roseoside, and prenyl glucosides were isolated from the mature fruits of *C. spinosa* (Calis et al., 2002). *C. spinosa* fruits also contained cappariloside A, stachydrine, an adenosine nucleoside, hypoxanthine, β -sitosterol, vanillic acid, p-hydroxybenzoic acid, protocatechuric acid, daucosterol, uracil, butanedioic acid, and uridine (Calis et al., 2002).

The composition of carotenoid (β -carotene, lutein, neoxanthin, violaxanthin) and tocopherols was distinct in the leaves, buds, and flowers of *C. spinosa* as shown by using high performance chromatographic technique.

Capers oil was found to contain Al, P, Na, Mg, Fe, and Ca which are used in the evaluation of nutritional information. The heavy metal concentration was below the permissible limits defined (Ozcan, 2008). *C. spinosa* oil was also investigated for its chemical composition and it was found to contain: fatty acids, tocopherols, and sterols as well as glucosinolates.

Biological activities

The flower buds and leaves of *C. spinosa* were studied for their total phenolic compounds, rutin, tocopherols, carotenoids and vitamin C contents and correlated with its medicinal uses (Tlili et al., 2010). In a study, the anti-oxidant activity of capparaside, 4-hydroxy-5-methylfuran-3-carboxylic acid and several other organic acids from *C. spinosa* was confirmed (Tlili et al., 2009; 2010; Sher et al., 2010a). A closely related plant *Capparis ovate* was found to possess antinociceptive effects both at the peripheral and central levels (Tlili et al., 2009). *C. spinosa* also showed profound antimicrobial and photoprotective activity (Tlili et al., 2009). New anti-inflammatory and antioxidant compounds, lignin glucosides, 1H-indole-alkaloid glucosides, and phenolic glucosides were isolated from roots of another capers species *Capparis tenera*. The extracts of *C. spinosa* and *Capparis deciduas* were found to possess marked anti-inflammatory activity but both were devoid of analgesic activity as proved in animal models (Al-Said et al., 1988). Nonetheless, capparenol-13 isolated from *C. spinosa* showed significant anti-inflammatory activity and antioxidative potential (Al-Said et al., 1988).

During present literature review *C. spinosa* extract was shown to possess prominent activity against *Plasmodium falciparum* (Arena et al., 2008). The chondroprotective effect of *C. spinosa* suggested that it might be used in the management of cartilage damage during the inflammatory process (Tlili et al., 2009). In diabetic rats, *C. spinosa* treatment, significantly reduced plasma glucose, triglyceride levels and plasma cholesterol levels (Sher et al., 2010a). On the other side, the extracts of *C. spinosa* flowering buds, showed the ability to protect against histamine-induced bronchospasm (Gadgoli and Mishra, 1999; Arena et al., 2008).

A popular compound finished herbal drug formulation Liv-52 (containing *C. spinosa* as its essential ingredient) was used in patients with liver cirrhosis following hospital based clinical protocol. Liv-52 showed significant hepatoprotective effect in cirrhotic patients. The protective effect of Liv-52 was attributed to the diuretic, anti-inflammatory, anti-oxidative, and immunomodulating properties of the component herbs (Arena et al., 2008). However, antihepatotoxic activity of p-methoxy benzoic acid isolated from *C. spinosa* was confirmed by earlier researchers (Gadgoli and Mishra, 1999).

It is worth mentioning that the ethanol extract of *C. spinosa* fruits exhibited a notable protective activity against oxidative stress and interrupting of ROS-ERK1/2-

Ha-Ras signal loop in systemic sclerosis, signifying its potential protective effects against skin sclerosis (Sher et al., 2010a). The same researchers also reported that the ethanol extract from *C. spinosa* was found to effectively inhibit the fibroblast proliferation and type I collagen production in progressive systemic sclerosis (Zhang and Tan, 2009). *Herpes simplex* virus type 1 (HSV-1) and type 2 (HSV-2) are common human pathogens that in particular cases, can also cause severe problems especially in immunodeficient patients. The methanol extract of *C. spinosa* contributed well in improving immune surveillance of PBMCs (human peripheral blood mononuclear cells) toward virus infection by up-regulating expression of peculiar pro-inflammatory cytokines; indicating the possibility of successful use of *C. spinosa* for treatment of HSV-2 infections in immunocompromised hosts (Arena et al., 2008).

In a recent study, it was exhibited that the male flowers of *C. spinosa* save resources for the female function and that they primarily serve to attract pollinators as pollen donors (Zhang and Tan, 2009). A monomeric protein with molecular mass of 38 kDa was also purified from *C. spinosa* seeds. The protein exhibited an N-terminal amino acid sequence with some similarity to imidazole-glycerol phosphate synthase. It inhibited HIV-1 reverse transcriptase and mycelia growth in fungus without having hemagglutinating, ribonuclease, mitogenic or protease inhibitor properties. Furthermore, a novel dimeric 62-kDa lectin was purified from caper (*C. spinosa*) seeds which inhibited HIV-1 reverse transcriptase and proliferation of both hepatoma HepG2 and breast cancer MCF-7 cells (Lam et al., 2009).

Toxicity of capers

C. spinosa was found to be a safe plant and there are no reports available in the scientific literature on its toxic manifestations after acute, sub-acute, or chronic treatment. However, allergic contact dermatitis caused by *C. spinosa* was reported (Angelini et al., 1991).

Miscellaneous uses

The results of the present study confirmed that *C. spinosa* is a multipurpose plant and used nearly in all traditional systems of medicine known worldwide. In addition, it as a culinary agent and consumed by food industries. The study also revealed that the use of capers in food as a flavouring agent and by food industry is a centuries old practice. The roots of *C. spinosa* are also utilized for cosmetic purposes. The other popular use of capers is to treat rose-coloured rashes and capillary weaknesses. It is worth to point out that *C. spinosa* grows in ecologically fragile rocky saline niches of the Central region and elsewhere in Saudi Arabia. Based on the results of the present study, capers is found to be a commonly recognized plant, therefore, it is recommend

for *in-situ* conservation and *ex-situ* management for its sustainable production. It is only possible with the participation and involvement of local plant scientists and community members.

Conclusion

Based on the current detailed ethnopharmaceutical survey and literature review, it is concluded that *C. spinosa* is a multipurpose plant having diverse economic and medical importance. *C. spinosa* has been found to be used for the treatment of more than ten different human ailments in different traditional medicine systems. Several folklore claims about the usefulness of *C. spinosa* and its low toxicity were justified by experimental evidences. *C. spinosa* is already in use by pharmaceutical industry for the preparation of drugs for Ayurvedic, Chinese, Unani and also for orthodox system of medicines. Besides medicinal significance, various parts of *C. spinosa* were found to have food value, potential culinary value, and possessed cosmetic ingredients. It is worthy to conclude that *C. spinosa* provide key resources for raw materials for pharmaceutical, aromatic and food industries, hence it is called "Plant of the Millennium". The present study, therefore, suggest its full sustainable exploitation with the aim to benefit Saudi Arabia from its agro-based industrial potentialities. In addition, it is also recommended that the youth in the Central region (Saudi Arabia) should be encouraged to learn about their natural plant resources and to preserve their traditional knowledge.

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