Capparis spinosa L. Propagation and Medicinal uses

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Abstract: The caper bush (*Capparis spinosa* L., Cappari daceae) has been introduced as a specialized culture in some European countries during the last four decades. The economic importance of caper plant (young flower buds, known as capers, are greatly favored for seasoning and different parts of the plant are used in the manufacture of medicines and cosmetics) led to a significant increase in both the area under cultivation and production levels during the late 1980s. The main production areas are in harsh environments found in Morocco, the southeastern Iberian Peninsula, Turkey, and the Italian islands of Pantelleria and Salina. This species has developed special mechanisms in order to survive in the Mediterranean conditions, and introduction in semiarid lands may help to prevent the disruption of the equilibrium of those fragile ecosystems.
[Sharrif moghaddasi Mohammad, Hamed Haddad Kashani, Zohre Azarbad. Capparis spinosa L. **Propagation and Medicinal uses.** *Life Sci J* 2012;9(4):684-686] (ISSN:1097-8135). http://www.lifesciencesite.com. 106

Keywords: Capparis spinosa, flower buds, medicines, cosmetics

Introduction:

Capparis spinosa is a perennial winter-deciduous species that bears rounded fleshy leaves and big white to pinkish-white flowers. A *caper* is also the pickled bud of this plant. Caper bush is present in almost all the circum-Mediterranean countries and is included in the floristic composition of most of them but whether it is indigenous to this region is uncertain(Yang, Liu et al. 2008). Although the flora of the Mediterranean region has considerable endemism, the caper bush could have originated in the tropics, and later been naturalized to the Mediterranean basin The plant is best known for the edible bud and fruit (*caper berry*) which are usually consumed pickled. Other species of *Capparis* are also picked along with *C. spinosa* for their buds or fruits(Jiang, Li et al. 2007; Tlili, Khaldi et al. 2010).

Plant

The caper bush (*Capparis spinosa* L., Capparidaceae) has been introduced as a specialized culture in some European countries during the last four decades. The economic importance of caper plant (young flower buds, known as capers, are greatly favored for seasoning and different parts of the plant are used in the manufacture of medicines and cosmetics) led to a significant increase in both the area under cultivation and production levels during the late 1980s. The main production areas are in harsh environments found in Morocco, the southeastern Iberian Peninsula, Turkey, and the Italian islands of Pantelleria and Salina. This species has developed special mechanisms in order to survive in the Mediterranean conditions, and introduction in semiarid lands may help to prevent the disruption of the equilibrium of those fragile ecosystems. (Germano, De Pasquale et al. 2002)

Capparis spinosa is highly variable in nature in its native habitats and is found growing near the closely related species *C. sicula*, *C. orientalis*, and *C. aegyptia*. Scientists can use the known distributions of each species to identify the origin of commercially prepared capers(Khanfar, Sabri et al. 2003). The shrubby plant is many-branched, with alternate leaves, thick and shiny, round to ovate in shape. The flowers are complete, sweetly fragrant, showy, 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 (Rhizopoulou and Psaras 2003).

Environmental requirements

The caper bush requires a semiarid climate. Mean annual temperatures in areas under cultivation are over 14°C and rainfall varies from 200 mm/year in Spain to 460 in Pantelleria and 680 in Salina. In Pantelleria, it rains only 35 mm from May through August, and 84 mm in Salina. A rainy spring and a hot dry summer are considered advantageous. This drought-tolerant perennial plant has favorable influence on the environment and it is utilized for landscaping and reducing erosion along highways, steep rocky slopes, sand dunes or fragile semiarid ecosystems.

Harvest duration of at least 3 months is necessary for profitability. Intense daylight and a long growing period are necessary to secure high yields. The caper bush can withstand temperatures over 40°C in summer but it is sensitive to frost during its vegetative period. The potential exposure of caper hydraulic architecture to cavitations has recently been proposed as an explanation for its susceptibility to

freezing conditions. On the other side, caper bush seems to be able to survive low temperatures in the form of stump, as it happens in the foothills of the Alps. Caper plants have been found even 1,000 m above sea-level though they are usually grown at lower altitudes. Some Italian and Argentine plantings can withstand strong winds without problems, due to caper bush decumbent architecture and the coriaceous consistency of the leaves in some populations(Ma, Lu et al. 2010; Wang, Shi et al. 2012).

The caper bush is a rupiculous species. It is widespread on rocky areas and is grown on different soil associations, including alfisols, regosols and lithosols. In different Himalayan locations, *C. spinosa* tolerates both silty clay and sandy, rocky or gravelly surface soils, with less than 1% organic matter. It grows on bare rocks, crevices, cracks and sand dunes in Pakistan, in dry calcareous escarpments of the Adriatic region, in dry coastal ecosystems of Egypt, Libya and Tunisia, in transitional zones between the littoral salt marsh and the coastal deserts of the Asian Red Sea coast, in the rocky arid bottoms of the Jordan valley, in calcareous sandstone cliffs at Ramat Aviv, Israel, and in central west and northwest coastal dunes of Australia. It grows spontaneously in wall joints of antique Roman fortresses, on the Wailing Wall, and on the ramparts of the castle of Santa Bárbara (Alicante, Spain). Moreover, this bush happens to grow in the foothills of the Southern Alps (Verona, Italy) and is a common species on city walls in Tuscany (Italy) and on bastions of Medina and Valletta (Malta).Clinging caper plants are dominant on the medieval limestone-made ramparts of Alcudia and the bastions of Palma (Majorca, Spain). This aggressive pioneering has brought about serious problems for the protection of monuments (Ma, Lu et al. 2010).

The caper bush has developed a series of mechanisms that reduce the impact of high radiation levels, high daily temperature and insufficient soil water during its growing period. (Lam, Han et al. 2009; Zhang and Tan 2009)

Caper bush has a curious reaction to sudden increases in humidity - it forms wart-like pock marks across the leaf surface. This appears to be harmless, as the plant quickly adjusts to the new conditions and produces unaffected leaves.

It also shows characteristics of a plant adapted to poor soils. (Tesoriere, Butera et al. 2007)This shrub has a high root/shoot ratio and the presence of mycorrhizae serves to maximize the uptake of minerals in poor soils. Different nitrogen-fixing bacterial strains have been isolated from the caper bush rhizosphere playing a role in maintaining high reserves of that growth-limiting element. (Lam, Han et al. 2009).

Propagation

Capers can be grown easily from fresh seeds gathered from ripe fruit and planted into well drained seed-raising mix. Seedlings will appear in 2–4 weeks. Old, stored seeds enter a state of dormancy and require cold stratification to germinate. The seed of the genus *Capparis* is bitegmic. The testa is 0.2–0.3 mm thick, with all its cell walls somewhat lignified, some of them with distinct thickening; its tegmen consists of an outer fibrous, lignified layer four to ten-cell thick, with a lignified endotegmen composed of contiguous cuboid cells, with strongly thickened radial walls. Only the mesophyll between exo- and endotegmen is unlignified. Caper seed germination shows a dependence on the integrity of the covering structures. The viable embryos germinate within 3 to 4 days after partial removal of the lignified seed coats. (Caglar, Caglar et al. 2005)The seed coats and the mucilage surrounding the seeds may be ecological adaptations to avoid water loss and conserve seed viability during the dry season.

Use of stem cuttings avoids high variability in terms of production and quality. Nevertheless, plants grown from cuttings are more susceptible to drought during the first years after planting. Caper bush is a difficult-to-root woody species and successful propagation requires careful consideration of biotypes and seasonal and environmental parameters. Rooting percentages up to 55 are possible when using one-year-old wood, depending on cutting harvest time and substrate utilized.(Caglar, Caglar et al. 2005) Propagation from stem cuttings is the standard method for growing ‘Mallorquina’ and ‘Italiana’ in Spain, and ‘Nocella’ in Salina. Hardwood cuttings vary in length from 15 to 50 cm and diameter of the cuttings may range from 1 to 2.5 cm. Another possibility is to collect stems during February through the beginning of March, treat them with captan or captafol and stratify them outdoors or in a chamber at 3–4 °C, covered with sand or plastic. Moisture content and drainage should be carefully monitored and maintained until planting. Using semi-hardwood cuttings, collected and planted during August and September, low survival rates (under 30%) have been achieved. Softwood cuttings are prepared in April from 25- to 30-day shoots. Each cutting should contain at least two nodes and be six to ten centimeter long. Basal or sub terminal cuttings are more successful than terminal ones. Then, cuttings are planted in a greenhouse under a mist system with bottom heat; 150 to 200 cuttings/m2 may be planted. (Caglar, Caglar et al. 2005; Ozcan 2008)

Medicinal uses

In Greek popular medicine, a herbal tea made of caper root and young shoots is considered to be beneficial against rheumatism. Dioscoride (*MM* 2.204t) also provides instructions on the use of sprouts, roots, leaves and seeds in the treatment of strangury and

inflammation(Ageel, Parmar et al. 1986; Tlili, Khaldi et al. 2010).

Different flavonoids were identified in caper bush and capers: rutin (quercetin 3-rutinoside), quercetin 7-rutinoside, quercetin 3-glucoside-7-rhamnoside, kaempferol-3-rutinoside, kaempferol-3-glucoside, and kaempferol-3-rhamnorutinoside. Rutin is a powerful antioxidant bioflavonoid in the body, and is used as a dietary supplement for capillary fragility. Rutin has no known toxicity(Lam, Han et al. 2009; Tlili, Nasri et al. 2009; Yang, Wang et al. 2010). Capers contain more quercetin per weight than any other plant(Darwish and Aburjai 2010; Yang, Wang et al. 2010).

Caper root bark and leaves may have some anticarcinogenic activity. In fact, the hydrolysis products of indol-3-ylmethyl glucosinolates have anticarcinogenic effects(Arena, Bisignano et al. 2008; Lam and Ng 2009). Although the consumption of capers is low in comparison with the intake of other major dietary sources of glucosinolates (white cabbage, broccoli and cauliflower) it may contribute to the daily dose of natural anticarcinogens that reduces cancer risk. Glucosinolates are also known to possess goitrogenic (anti-thyroid) activity. Also, rutin and quercetin may contribute to cancer prevention (Cao, Li et al. 2010). Selenium, present in capers at high concentrations in comparison with other vegetable products, has also been associated with the prevention of some forms of cancer. [18]Capers are good for people who suffer from mar disease(Tesoriere, Butera et al. 2007; Ramezani, Aghel et al. 2008; Daoudi, Aarab et al. 2012).

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References

1.Ageel, A. M., N. S. Parmar, et al. (1986). "Anti-inflammatory activity of some Saudi Arabian medicinal plants." Agents Actions 17(3-4): 383-384.
2.Arena, A., G. Bisignano, et al. (2008). "Antiviral and immunomodulatory effect of a lyophilized extract of Capparis spinosa L. buds." Phytother Res 22(3): 313-317.
3.Caglar, G., S. Caglar, et al. (2005). "The influence of growth regulators on shoot proliferation and rooting of in vitro propagated caper." J Environ Biol 26(3): 479-485.
4.Cao, Y. L., X. Li, et al. (2010). "Capparis spinosa protects against oxidative stress in systemic sclerosis dermal fibroblasts." Arch Dermatol Res 302(5): 349-355.
5.Daoudi, A., L. Aarab, et al. (2012). "Screening of immunomodulatory activity of total and protein extracts of some Moroccan medicinal plants." Toxicol Ind Health.
6.Darwish, R. M. and T. A. Aburjai (2010). "Effect of ethnomedicinal plants used in folklore medicine in Jordan as antibiotic resistant inhibitors on Escherichia coli." BMC Complement Altern Med 10: 9.
7.Germano, M. P., R. De Pasquale, et al. (2002). "Evaluation of extracts and isolated fraction from Capparis spinosa L. buds as an antioxidant source." J Agric Food Chem 50(5): 1168-1171.
8.Jiang, H. E., X. Li, et al. (2007). "The discovery of Capparis spinosa L. (Capparidaceae) in the Yanghai Tombs (2800 years b.p.), NW China, and its medicinal implications." J Ethnopharmacol 113(3): 409-420.
9.Khanfar, M. A., S. S. Sabri, et al. (2003). "The chemical constituents of Capparis spinosa of Jordanian origin." Nat Prod Res 17(1): 9-14.
10.Lam, S. K., Q. F. Han, et al. (2009). "Isolation and characterization of a lectin with potentially exploitable activities from caper (Capparis spinosa) seeds." Biosci Rep 29(5): 293-299.
11.Lam, S. K. and T. B. Ng (2009). "A protein with antiproliferative, antifungal and HIV-1 reverse transcriptase inhibitory activities from caper (Capparis spinosa) seeds." Phytomedicine 16(5): 444-450.
12.Ma, S. J., T. Lu, et al. (2010). "[Tissue culture and rapid propogation of seeds of Uyghur traditional herbal Capparis spinosa]." Zhong Yao Cai 33(12): 1833-1836.
13.Ozcan, M. M. (2008). "Investigation on the mineral contents of capers (Capparis spp.) seed oils growing wild in Turkey." J Med Food 11(3): 596-599.
14.Ramezani, Z., N. Aghel, et al. (2008). "Rutin from different parts of Capparis spinosa growing wild in Khuzestan/Iran." Pak J Biol Sci 11(5): 768-772.
15.Rhizopoulou, S. and G. K. Psaras (2003). "Development and structure of drought-tolerant leaves of the Mediterranean shrub Capparis spinosa L." Ann Bot 92(3): 377-383.
16.Tesoriere, L., D. Butera, et al. (2007). "Bioactive components of caper (Capparis spinosa L.) from Sicily and antioxidant effects in a red meat simulated gastric digestion." J Agric Food Chem 55(21): 8465-8471.
17.Tlili, N., A. Khaldi, et al. (2010). "Phenolic compounds and vitamin antioxidants of caper (Capparis spinosa)." Plant Foods Hum Nutr 65(3): 260-265.
18.Tlili, N., N. Nasri, et al. (2009). "Carotenoid and tocopherol composition of leaves, buds, and flowers of Capparis spinosa grown wild in Tunisia." J Agric Food Chem 57(12): 5381-5385.
19.Wang, H., S. Shi, et al. (2012). "Structural characterization of a homogalacturonan from Capparis spinosa L. fruits and anti-complement activity of its sulfated derivative." Glycoconj J.
20.Yang, T., Y. Q. Liu, et al. (2008). "[Advances on investigation of chemical constituents, pharmacological activities and clinical applications of Capparis spinosa]." Zhongguo Zhong Yao Za Zhi 33(21): 2453-2458.
21.Yang, T., C. Wang, et al. (2010). "A new antioxidant compound from Capparis spinosa." Pharm Biol 48(5): 589-594.
22.Zhang, T. and D. Y. Tan (2009). "An examination of the function of male flowers in an andromonoecious shrub Capparis spinosa." J Integr Plant Biol 51(3): 316-324.