

Caper (*Capparis* spp.) Growing Techniques and Economical Importance

Muharrem Gülerüz
Ataturk University Agricultural Faculty
Department of Horticulture
25240 Erzurum-Turkey

Gürsel Özkan
Ataturk University Agricultural Faculty
Department of Horticulture
25240 Erzurum-Turkey

Sezai Ercişli
Ataturk University Agricultural Faculty
Department of Horticulture
25240 Erzurum-Turkey

Abstract: Caper has been using as a medicinal and aromatic plant for a long time in particular Mediterranean basin. More recently there have been obvious increased interest to this plant because of a wide culinary and medicinal use areas of this plant. Anatolia is one of the natural growing areas of this plant and local people use it in several ways. The plant has an important commercial value. Particularly in dry areas, the plant naturally found and preventing erosion. In this review we gave information about caper production possibilities, growing techniques, history etc.

Introduction

Capers has been known for a long time as a aromatic and medicinal plant and it is naturally grown in mostly in Mediterranean countries (Toncer and Tansi, 2000; Kan et al., 2006). The seeds has been reported in Yanghai cemetery in China (Jiang et al., 2007). In old Egypt civilation the seeds was also found together with Pharaoh tombs. Capers were mentioned by Dioscorides as being a marketable product of the ancient Greeks. In Aristo and Hipokrat time, the plant particularly its buds was known as a secret plant (Bilgin, 2004). Capers are also mentioned by the Roman scholar, Pliny the Elder. The plant had been a part of the Mediterranean diet for over 5,000 years and several archaeologists has unearthed caper seeds, along with grape, pistachio, almond and olive seeds in Mediterranean basin, which belonged to the middle Bronze age. Capers widely distributed in some areas in Italy and it has been extensively reviewed in Ronesans time (Barbera and Lorenzo, 1984). The peoples consumed caper flower buds and fruits (caperberry) for a long time. The famous traveller, Evliya Celebi mentioned caper plants 400 years ago in Osmancik town of Corum city in Anatolia region.

There is a strong association between the caper plant and seas. The important caper specie, *Capparis spinosa* is said to be native to the Mediterranean basin, but its range stretches from the Atlantic coasts of the Canary Islands and Morocco to the Black Sea to the Crimea and Armenia, and eastward to the Caspian Sea and into Iran. Therefore it is believed that capers originated from dry regions in Mediterranean and Near Asia.

Currently, capers naturally grown in Spain, France, Morocco, Monaco, Italy, Malta, former Yugoslavia, Greece, Tunisia, Algeria, Africa, Southeast Asia, Himalayas, Pacific islands and some parts of Australia (Bilgin, 2004). In these countries, locally capers are collected from wild plants within their natural range. European main sources are Spain, France and Italy (especially Sicily and the Aeolian island of Salina and the Mediterranean island of Pantelleria). Capers are also cultivated in Dalmatia as well. In Turkey, it is widely distributed in Western cities, middle Anatolia, East Black Sea and Sothem cities (Davis, 1965; Olmez et al., 2004). It is locally known as 'Kebere', 'Gebre otu', 'Gebere' or 'Yılan kabağı' in different part of Turkey (Ozcan et al., 2004).

Systematic, Morphology and Anatomy

Capers belongs to Capparidaceae family and the family include around 46 genus. Caper is belong to *Capparis* genus and *Capparis spinosa* L. and *Capparis ovata* Desf. are the main cultivated species (Kan and

Arslan, 2004). *C. spinosa* has three sub species; *C. spinosa* var. *inermis* Turra, *C. spinosa* var. *spinosa* Zoh. and *C. spinosa* var. *aegyptia* Lam. On the other hand, *C. ovata* Desf. is also included three sub species such as *C. ovata* var. *palestina* Zoh., *C. ovata* var. *canescens* (Coss.) Heywood and *C. ovata* var. *herbacea* Willd. In general caper plant is a shrub with 30–50 cm height. However, *C. spinosa* can be reach up to 2.5 m and can be found between 200–300 a.s.l (Kan and Arslan, 2004). *C. ovata* is generally has horizontal growth habit with 20–30 cm height. This specie can be seen at the altitude of between 300–1500 a.s.l (Davis, 1965). The aerial parts of capers can be cover approximately 15 m² soil area. The plant has very strong perianial root system. It can be reach up to 40 m under the soil (Olmez et al., 2004). For this reason, the plant are used in erosion control studies. The plant is also suitable for dry areas. Leaf stipules may be formed into spines. Flowers are born on first-year branches (Rivera et al., 2002; Yilmaz et al., 2002). Capers flowers has mild aroma and it include 4 sepal and 4 petals which has white to pink color and numerous anthers and only one stamen. The anthers are in violet color. The flowers has nectarium. It can be pollinated by bees or wasps (Sozzi, 2001; Rivera et al., 2002). The caper fruits named as caperberry and it is ellipsoid or ovate shape. The maturated fruits suddenly opened and seeds go outside (Sozzi, 2001).

Climate

Capers can be grown on semi-arid conditions. Dry heat and intense sunlight make the preferred environment for caper plants. Plants are productive in zones having 200–600 mm annual precipitation and easily survive summer time temperatures higher than 35–40°C. However, caper is a cold tender plant and has a temperature hardiness range similar to the some kind of subtropical fruits for example pomegranate, fig and particularly olive trees (–9 °C) (Kan and Arslan, 2004). However in Northeast Anatolia, caper plants can be seen in colder areas where olive trees can not be found

Soil

Plants grow well in nutrient poor sharply-drained gravelly soils. Mature plants develop large extensive root systems that penetrate deeply into the soil. Therefore it can be grown in very poor soils as well. Capers are salt-tolerant and flourish along shores within sea-spray zones. The caper's vegetative canopy covers soil surfaces which helps to conserve soil water reserves (Olmez et al., 2004).

Propagation

Capers can be propagated either from seed or cuttings. For seed propagation, caper seeds are miniscule and are slow to nurture into transplantable seedlings. Fresh caper seeds germinate readily-but only in low percentages. To obtain high germination percentage, stratification should be apply on caper seeds. In this way, seeds placed moist medium and waited 2–3 months in cold storage near 0 °C (Tansu and Kocabaa, 1997; Sozzi, 2001; Yilmaz et al., 2002). The seed coats of capers very resist to obtain water inside (Cesari, 2003). The seed coats are also include lignins. The use of plant growth regulators, particularly gibberellins has been reported increased seed germination ratio in caper seeds from 22% to 64% (Macchia and Casano, 1993; Soyler and Khawar, 2007; Suleiman et al., 2009). The seeds can be dispersed by some animals (Tansu and Kocabaa, 1997; Sozzi, 2001). Caper cuttings are hard-to-rooting (Soyler and Arslan, 2000; Kan et al., 2002). The best cutting collection time are February, March or April in Mediterranean areas. The stem cuttings can be prepared from basal portions, greater than 1 cm diameter and 8 cm in length with 6–10 buds. The rooting media must be well drained with bottom heat. The use IBA can be helpful to increase rooting.

Planting, Irrigation, Pruning and Fertilization

For commercial production, the planting can be start in January, February or March. The planting distances can be applied 2x2 or 3x3 in dry areas and 4x4 or 5x5 in irrigated areas. Depending on the roughness of the topography; about 2,000 plants per hectare can be planted. The first year plants do not prefer excess irrigation. If possible, drip irrigation is better. A full yield is expected after 3 to 4 years. Plants are pruned back in winter to remove dead wood and watersprouts. Pruning is crucial to high production. Heavy branch pruning is necessary, as flower buds arise on one year old branches. Three year old plants will yield 1 to 3 kilograms of

caper flower buds per plant. Caper plantations can be lasted 20 to 30 years. Fertilization is a not big issue in caper production.

Harvest and Processing

As well known caper is produced mainly for unopened flower buds. These unopened flowers are exported after harvest (Soyler and Aslan, 1999). For harvest, it is very crucial that only unopened flower buds should be picked on a dry days. Harvesting is carried out regularly throughout the growing season. In Turkey and the other producer countries, caper flower buds are collected mainly by hand. The unopened flowers can be picked up 5-6 time per season.

After harvest, unopened flowers are preserved either in vinegar or under layers of salt at the concentration of 20 % in a jar. In Turkey, the export companies mostly located in Izmir, Istanbul, Bursa etc. The collected caper buds classified according to diameter of buds. In Italy, capers are graded on a scale from '7' to '16', which indicates their size in millimeters. The diameter lower than 7 mm is accepted the best one. This classification is not applied in Turkey. Among two main species, *C. ovata* is better physical and chemical properties for processing (Ozcan and Akgul, 1999; Giuffrida et al., 2002).

Culinary Uses

As mentioned before, unopened flower buds of capers have an important commercial value in capers producer countries. These flower buds either pickled in vinegar or preserved in granular salt. Moreover, semi-mature fruits (caperberries) and young shoots may also be pickled for use as a condiment. Capers have a sharp piquant flavor and add pungency, a peculiar aroma and saltiness to comestibles such as pasta sauces, pizza, fish, meats and salads. It was interesting that the flavor of caper similar to that of mustard and black pepper which comes from mustard oil: methyl isothiocyanate (released from glucocapparin molecules) arising from crushed plant tissues. Capers make an important contribution to the pantheon of classic Mediterranean flavors that include: olives, rucola (argula, or garden rocket), anchovies and artichokes. In most parts of the world, tender young shoots of caper plants can be eaten as a vegetable, or pickled. More rarely, mature and semi-mature fruits are eaten as a cooked vegetable.

Medicinal Uses

There is very old belief that capers reduce flatulence and to be anti-rheumatic in effect. In ayurvedic medicine capers are recorded as hepatic protectors, improving liver function. Capers have reported uses for arteriosclerosis, as diuretics, kidney disinfectants, vermifuges and tonics. Infusions and decoctions from caper root bark have been traditionally used for dropsy, anemia, arthritis and gout. Capers contain considerable amounts of the anti-oxidant bioflavinoid rutin. Caper extracts and pulps have been used in cosmetics, but there has been reported contact dermatitis and sensitivity from their use.

Economic Importance

The European Union countries are the biggest markets for capers. They need high quality caper flower buds. As far as we know, the EU rejected imports from some North African countries recently because of the toxic residue found in the products. However, for the caper products that are appropriately certified, the world market is wide open. Further, organic production of capers will open an additional market niche. A good marketing concept will bring this local plant to an export success because the growing conditions for capers are outstanding in Turkey. On the other hand the plant needs to be advertisement on it. Therefore an effective advertisement can also increase its consumption in Turkey as well.

References

Barbera, G., & Lorenzo, R.I. (1984). The caperculture in Italy. *Acta Horticulturae*, 144, 167-171.

- Bilgin, M. (2004). Kapari yurt içi piyasa ve ürün araştırması. İstanbul Ticaret Odası Dış Ticaret Şubesi Araştırma Servisi (in Turkish).
- Davis, P.H. (1965) Flora of Turkey and the East Aegean Islands, Edinburgh, Edinburgh University Press.
- Giuffrida, D., Salvo, F., Ziino, M., Toscano, G., & Dugo, G., (2002). Initial investigation on some chemical constituents of capers (*Capparis spinosa* L.) from the island of Salina. *Italian Journal of Food Science*, 1(14),25-33.
- Jiang, H.E., Li, X., Ferguson, D.K., Wang, Y.F., Liu, C.J., & Li, C.S. (2007). The discovery of *Capparis spinosa* L. (Capparidaceae) in the Yanghai tombs (2800 years B.P.), NW China, and its medicinal implications. *Journal of Ethnopharmacology* 113,409-420.
- Kan , Y., & Arslan, N. (2002). Konya'da doğal olarak yetişen kapari (*Capparis ovata* Desf. var.*canescens* (coss.) Heywood)'de bazı fenolojik ve morfolojik özellikler üzerine bir araştırma. Bitkisel ilaç maddeleri toplantısı, Bildiriler, 29-31 Mayıs. Eskişehir,.144-148 (In Turkish).
- Kan, Y., Akay, A., Kan, M., & Kan, A. (2006). Kebere (*Capparis ovata* Desf. var *canescens* (coss.) Heywood)'nin doğal olarak yetiştiği lokasyonların toprak özellikleri ve bunların tomurcuk verimi üzerine etkileri. *Selçuk Üniversitesi Ziraat Fakültesi Dergisi* 20(40), 90-93.
- Macchia, M., & Casano, S. (1993). Propagation of caper (*Capparis spinosa*). *Sementi Elette*, 39, 37-42.
- Ozcan, M., & Akgul, A. (1999). Influence of species, harvest date and size on composition of capers (*Capparis* spp.) flower buds. *Molecular Nutrition & Food Research*, 42 (2),102-105.
- Ozcan, M., Haciseferogulları, H., &Demir, F., (2004). Some physico-mechanic and chemical properties of capers (*Capparis ovata* Desf.var. *canescens*(coss) Heywood) flower buds. *Journal of Food Engineering*, 65, 151-155.
- Olmez, Z., Yahyaoglu, Z., &Ucler, A.O. (2004). Effects of H₂SO₄, KNO₃ and GA₃ treatments on germination of caper (*Capparis ovata* Desf.) seeds. *Pakistan Journal of Biological Sciences* 7(6), 879-882.
- Rivera, D., Inocencio, C., Carreno, E., Reales, A., & Alcaraz,F. (2002). Archaeobotany of capers (*Capparis*) (Capparaceae). *Veget Hist Archaeobot*, 11, 295-313.
- Soyler, D., & Khawar, K.M. (2007). Seed germination of caper (*Capparis ovata* var. *Herbacea*) using α naphthalene acetic acid and gibberellic acid. *International Journal of Agriculture & Biology*, 9(1),35-37.
- Sozzi, G.O., (2001). Caper bush: Botany and Horticulture, *Horticultural Reviews*, 27, 125-128.
- Söyler, D., & Arslan, N. (1999). Kebere (*Capparis spinosa* L.) tohumlarının çimlenmesine farklı sıcaklık ve ışıklandırmanın etkisi. *Ege Tarımsal Araştırma Dergisi*, 9(1), 63-75.
- Söyler, D., & Arslan, N. (2000). Kebere (*Capparis spinosa* L.) çeliklerinin köklenmesi üzerine bazı büyüme düzenleyici maddelerin etkileri. *Turkish Journal Agricultural Forestry*, 24, 595-600.
- Suleiman, M.K., Bhat, N.R., Abdal, M.S., Jacob, S., Thomas, R.R., Al-Dossery, S., V Bellen, R. 2009. Germination studies of *Capparis spinosa* L., Propagation of Ornamental Plants, 9(1), 35-38.
- Tansu, S., & Kocabaa, F. (1997). Importance of caper (*Capparis spinosa* L.) under forest ecosystem and its cultivation. In: Mukerji A.K. (Ed). XI World Forestry Congress, Antalya, Turkey, Vol 3, Topic 15: 259 (Abstract).
- Tonçer, Ö., & Tansı, S. (2000). The caper (*Capparis ovata* Desf.var.*palaestina* Zoh.) culture in Turkey. *Pakistan Journal of Biological Sciences*, 3(4),568-570.
- Yılmaz, H., Karahan, F., Bulut, Z., Demircan N., & Alper H. (2002). Kurak bölgelerde havza planlamasında bazı sekonder bitkilerin biyolojik onarım yönünden değerlendirilmesi. Su havzalarında toprak ve su kaynaklarının korunması, geliştirilmesi ve yönetimi sempozyumu,Hatay, Turkey, (pp.77-84).