



Ficus carica L

Muhammad Aiman, MOHAMMAD RAHIMI,^{a*} Siti Zaharah SAKIMIN,^b &
 Mohd Fauzi, RAMLAN^c

^{a,b,c}Department of Crop Science, Faculty of Agriculture,
 Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

*muhdaimanm.r@gmail.com

Abstract – *Ficus carica* L. or fig is the oldest fruit tree that being cultivated by man. Grouped under genus *Ficus*, this species is grown widely in Mediterranean region and now being cultivated in an area with temperate or sub-temperate climate. Fig planting in Malaysia is still new, which was brought by a man as a hobby at first. Fig is a unique fruit tree as some variety can produce fruits without pollination. Contain lots of carbohydrates, essential amino acids, vitamins and minerals such potassium, fibre, calcium, iron compared to other fruits, fig have become an important source of diet to people especially in Mediterranean region since ancient time.

Keywords: *Ficus*, *F. carica* L., Fig

Introduction

Ficus carica L. or its common name is common fig is a *Ficus* species that belong to Eusyce section of mulberries family, Moraceae (Table 1) (Andersen & Crocker, 1994; Flaishman, Rodov, & Stover, 2007; Himelrick, 1999). Being known to be the oldest fruit species that are cultivated by man, it is believed that common fig is now being cultivated since 5000 BC (Andersen & Crocker, 1994; Aytekin Polat & Siddiq, 2012; S. Hossain & Boyce, 2009) based on the archaeobotanical evidence that found in Jordan (Kislev, Hartmann, & Bar-Yosef, 2006).

Table 1: The Official Classification of Common in Taxonomic Rank (USDA, 2016b)

Rank	Scientific name	Description
Kingdom	Plantae	Plant
Subkingdom	Tracheobonta	Vascular trees
Superdivision	Spermatophyta	Seed trees
Division	Magnoliophyta	Flowering trees
Class	Magnoliopsida	Dicotyledons
Subclass	Hamamelididae	
Order	Urticales	
Family	Moraceae	Mulberry family
Genus	<i>Ficus</i> L.	Fig
Species	<i>Ficus carica</i> L.	Edible fig

Beside common fig, these species also have others different name which include figue (French), feige (German), figo (Italian and Portuguese), higo or brevo (Spanish) (Flaishman et al., 2007), tin (Malaysia), ficu and piku (ITIS, 2011).

Ficus

Ficus is a genus under family Moraceae and known to be the most illustrious member of this family due to its large number of species (Lansky & Paavilainen, 2011; Stover, Aradhya, Ferguson, & Crisosto,

2007). Ranging from 600 – 1900 tropical and subtropical tree, shrub, vine and climber species, this genus can be found mostly in the tropic and subtropic region (Himelrick, 1999; Mawa, Husain, & Jantan, 2013; Stover et al., 2007). With this number of species, *Ficus* is probably the leader of all plant genera of flowering plants in term of the number of species it has (Lansky & Paavilainen, 2011).

Although this genus has a large number of species, only a few species have fruits that considered as edible. From these few number of edible fruits, the only species that is cultivated by man *F. carica* and *F. sycamorus*. The fruits of all *Ficus* species is synconium with enlarged, fleshy, hollow peduncle that bears closely massed of tiny flower on its inner wall (Himelrick, 1999).

Known to be one of the largest genera of medicinal plant, this genus has very important genetic resources as it has high economic and nutrient value (Lansky & Paavilainen, 2011; Mawa et al., 2013).

Morphology

The fig tree is deciduous, fast-growing, and spreading in the habit which tends to be greater in width than in height and will produce multiple branches shrubs. The wood of this tree species is in low density and can break easily. The small branches tend to have a pithy interior than completely woody. These species will produce a milky latex when the branches or other parts of this tree is cut or damages. This special milky latex is very irritant to human skin when in contact (Andersen & Crocker, 1994; Stover et al., 2007).

Fig have a large (up to 30 cm long) with thick, bright dark green colour, single and alternate. These leaves are deeply lobed with usually three to five sinuses. The leaves also contain trichomes which rough on abaxial and smooth on adaxial. The pubescence leaf can irritant to the skin when contact (Andersen & Crocker, 1994).

The flower of figs is tiny and usually out of sight and cluster and form a ‘fruit’ structure called syconium. The structure of the flower is minute, unisexual, bearing either stamens or pistil (depending on fig type) and borne to leaf axils (Andersen & Crocker, 1994; Stover et al., 2007).

The fig fruit is unique and derived from a hollow shell of receptacle drupelets that develop from the individual female flowers lining the receptacle wall. Matured fruits have tough peel and contain inner pulp that bound with a mass of seed with jelly-like flesh (Andersen & Crocker, 1994; Lansky & Paavilainen, 2011). The seed of fig fruit may be large, medium or small depending on variety and the number of seed per fruit can be ranging from 30 – 1600 seed (Lansky & Paavilainen, 2011).

Fig tree produces areal roots that can spread easily spread to three times the diameter of its canopy (Himelrick, 1999). The fig tree will produce a vascular liquid with rubber-like quantities known as a latex from all broken plant structure (Lansky & Paavilainen, 2011; Stover et al., 2007). This latex contains a protein-degrading enzyme called ficin which will cause irritating to human skin (Andersen & Crocker, 1994; Flaishman et al., 2007). This latex is believed to be one of self-defence mechanism to the plant itself (Lansky & Paavilainen, 2011).

Type and Variety

Generally, there is two basic type of *F. carica* L. They are caprifig and edible fig. Caprifig is a type of fig that bears both female and male flower but generally unpalatable. This type of fig also has chaffy stamen structure. Caprifig usually uses as a source of pollination. Edible fig is fig type that only bears female flower. This fig type can be divided more into three group of fig tree which caduceus, persistent and intermediate. Caducous fig or Symrna fig is a fig type that they need pollination to set crop and any fruit form without pollination will drop before matured. Persistent or common type of fig is fig that does not need pollination to set a crop. Lastly is Intermediate or San Pedro fig, this type of fig usually does not need pollination for breba crop but do need pollination for main crop in certain environment (Andersen & Crocker, 1994; Himelrick, 1999; Pereira et al., 2015; Stover et al., 2007).

According to Condit (1955), there are about total 720 fig variety (89 Caprifigs, 129 Symrna, 21 San Pedro and 481 common figs) have been identified. Ipoh Blue Giant (IBG) has a small to medium size, light brown to violet fig fruit colour with strawberry pulp. The shape is turbinate to oblique with usually without neck. It has a sweet flavour. It belongs to common fig type (figure 2.1) (Himelrick, 1999).

Distribution

Believed to be indigenous to western Asia, *F. carica* is originated from the Old World Tropics, the Asia Minor and the Mediterranean region (Andersen & Crocker, 1994; Morton, 1987). In the Mediterranean, this species has been cultivated since 5000 BC (Andersen & Crocker, 1994). Currently, this species can be found growing wild mostly in Mediterranean region (Flaishman et al., 2007).

World Planting

Since it can adapt well to drought and high temperature, it now can be found cultivated either for commercial or non-commercial purposes in an area that possess either temperate or sub-temperate climate (Irget, Aksoy, Okur, Ongun, & Tepecik, 2008; Stover et al., 2007) especially in Mediterranean region (Morton, 1987).

According to FAO (2016), there is approximately 358494 ha of land (Table 2) all around the world that are planted with fig given total fruit production of fig per year is more than one million metric tons. Turkey is the largest fig fruit producer producing about 27% (Table 3) from the total world fig fruit being produce all around the world. This followed by Egypt, Algeria, Morocco, Iran and Syria with combined these top six countries contributes about 71% of fig fruit produce from the total world fig fruit being harvested in a year.

Table 2: World Fig Production from 2004-2013 (FAO, 2016)

Year	Area Harvested (ha)	Production (tons)
2004	389259	1025405
2005	415593	1102361
2006	455747	1215783
2007	441889	1023582
2008	375050	1092165
2009	378005	1174520
2010	381586	1111261
2011	384493	1082737
2012	381946	1098867
2013	358494	1117452

Table 3: Top 10 country for fig production in the year 2013 (FAO, 2016)

Country	Area harvested (ha)	Country	Total production (tons)
Portugal	82824	Turkey	298914
Morocco	52606	Egypt	153089
Turkey	49401	Algeria	117100
Algeria	44608	Morocco	101989
Egypt	21897	Iran (Islamic Republic of)	78392
Tunisia	18120	Syrian Arab Republic	46443

Iran (Islamic Republic of)	17926	Spain	30400
Spain	12400	Brazil	28253
Syrian Arab Republic	9483	United States of America	26212
Albania	8500	Afghanistan	24000

Planting in Malaysia

Fig cultivation in Malaysia is still new. There is only quite a number of fig orchards available throughout Malaysia. According to a report by Kosmo! on 2015, it reported that fig was brought to Malaysia by an unknown individual for hobby purposes. This becomes new problem to Malaysia agriculture since it enter Malaysia in a wrong way without pest and disease control and quarantine procedure. Due to this, Jabatan Pertanian had found a fungus, *Cerotelium fici* on this imported fig tree that can cause a very serious problem on other crops. *C. fici* is a fungus that causes rust on fig tree leaves and fruits (Kosmo!, 2015)

Up to now, fig cultivation in Malaysia is still on probation and no technical scientific research been done or published for commercial purposes in Malaysia (Kosmo!, 2015). Mostly, fig cultivation in Malaysia is for hobby purposes. Now, besides marketing the fig product such fresh fruits, jam and other, the farmer also focus on planting material for propagation purpose to be sold since it has high demand and market value. The price of cutting alone can be sold up to RM30 - RM100 or more depending on the variety of fig (Yusoff, personal communication, April 24, 2016).

Growth Requirement

Nowadays, figs are being cultivated all around the world especially in warm and temperate climate region. But, the quality and yield of the fruits may not at the best state as the one grows in a Mediterranean climate which is hot, dry summer and wet winter (Andersen & Crocker, 1994; Flaishman et al., 2007; Himelrick, 1999; Joseph & Raj, 2011).

Fig can be planted in a wide range of soil from well-drained loam soil which either in coarse sandy soil to the high relative heavy clay soil and average soil to poor soil (Kamas, Nesbitt, & Stein, 2016). The best soil to a planted fig is in well-drained loam soil that contains plenty of organic matter with pH between 5.5 – 8.0. The preferable pH to plant a fig in 6.0 – 6.5. (Himelrick, 1999). To ensure the optimum fig grow to avoid any soil that can hold water more than 24 hours especially after rain (Sauls, 2008).

Sunlight is very important in growing fig. To maximize the fruit yield, ensure the site can receive at least 8 hours of sunlight and heat in a day (Himelrick, 1999; Sauls, 2008).

Propagation

A fig tree can be propagated either by seed, cutting, air layering or grafting (Flaishman et al., 2007). The most popular propagation technique that being apply to the fig tree in Malaysia is cutting and air layering (Yusoff, personal communication, April 24, 2016).

For cutting, fig usually propagates using hardwood cutting. The selected hardwood cutting with 15 – 20 cm long and less than 2 cm in diameter are chosen. The best cutting will have some last year wood on them. Then place the cutting on moist media with at least half the length of the cutting should be below the soil. Don't frequently irrigate the media until they are very dry. Only irrigate them more frequently when the leaf is formed. Transplant the cutting into a larger pot when cutting is big enough (Andersen & Crocker, 1994; Himelrick, 1999).

Uses

Fig is one of the earliest cultivated fruits tree in the world (Loizzo, Bonesi, Pugliese, Menichini, & Tundis, 2014) in Mediterranean region. It is considered to be one of the healthiest fruits (Çalışkan & Aytakin Polat, 2011).

Rich in carbohydrates, essential amino acids, vitamins and minerals such potassium, fibre, calcium, iron compared to other fruits (Hung, Tanaka, Uchino, & Hiruma, 2011; Loizzo et al., 2014) (Table 4) it has become the most popular and important as part of dietary people in Mediterranean region (Çalışkan & Aytakin Polat, 2011). Besides that, fig fruits also a good source of flavonoid and polyphenols especially anthocyanin that acts as an antioxidant (Joseph & Raj, 2011; Slatnar, Klancar, Stampar, & Veberic, 2011).

The fruits either can be eaten fresh or been dried. Generally, the fresh fig fruits are eaten with the skin. However, due to high perishability of fig fresh fruits, most of the production is used as dried fig to make them easier to be store and ship to expand the potential markets (Aytakin Polat & Siddiq, 2012; Pereira et al., 2015). Besides that, peel or unpeel fig fruits may also be used in various food preparation which includes pies, puddings, cakes, jam and others (Aytakin Polat & Siddiq, 2012; Yusoff, personal communication, April 24, 2016). Other than that, the fig leaves can be made into a tea (Yusoff, personal communication, April 24, 2016).

Various part of fig tree includes bark, leaves, fruits, tender shoot, seeds and latex are medically important. Fig parts contain a laxative, antioxidant, antiviral, antibacterial, cancer suppressive effects. Which this important in preventing or treating some human diseases (Joseph & Raj, 2011; Loizzo et al., 2014). Figs also rich in flavonoid, phenol and some other bioactive compound which useful to treat gastrointestinal respiratory, inflammatory, cardiovascular disorder, ulcerative disease and also cancer (Joseph & Raj, 2011).

Figs have been used widely as a traditional medicinal treatment to treat fever, asthma, epilepsy, swelling, tumour, inflammation and hepatitis. It also important sources for the diabetic patient as it is sugar-free fruits (Cuquel et al., 2011; Joseph & Raj, 2011; Lynch, Goldweber, & Rich, 1954).

Table 4: Nutritional profile of raw fresh fig fruits (per 100g) (USDA, 2016a)

Nutrient	Units	Raw
<i>Proximate</i>		
Water	g	79.11
Energy	kcal/kg	74/310
Protein	g	0.75
Total lipid (fat)	g	0.3
Ash	g	0.66
Carbohydrate	g	19.18
Fibre, total dietary	g	2.9
Sugar, total	g	16.26
<i>Minerals</i>		
Calcium	mg	35
Iron	mg	0.37
Magnesium	mg	17
Phosphorus	mg	14
Potassium	mg	232
Sodium	mg	1
Zinc	mg	0.15
Copper	mg	0.07
Manganese	mg	0.128
Selenium	mg	0.2
<i>Vitamins</i>		
Vitamin C	mg	2

Thiamin	mg	0.06
Riboflavin	mg	0.05
Niacin	mg	0.4
Panthenic acid	mg	0.3
Vitamin B-6	mg	0.113
Folate, total	micro g	6
Choline, total	mg	4.7
Carotene, beta	micro g	85
Vitamin A, IU	IU	142
Lutein + zeaxanthin	micro g	9
Vitamin E (alpha-tocopherol)	mg	0.11
Vitamin K (phylloquinone)	micro g	4.7

Notes: The value shown is for the fruits grown and processed in the United State and therefore some differences can be anticipated in the composition of fig in other parts of the world due to differences climate, soil condition, agriculture practice, postharvest handling and others that may affect the fruit composition.

Conclusion

Being the oldest fruits that being cultivated by man, this species is one in few fruit tree that does not need pollination to produce fruits. Able to growth optimally under Mediterranean region (warm and temperate climate), the performance of this species under Malaysia climates is still now known. Fruits rich in carbohydrates, essential amino acids, vitamins and mineral make this fruit species became suitable for daily diet.

References

- Andersen, P. C., & Crocker, T. E. (1994). *The Figs*. Florida, US.
- Aytekin Polat, A., & Siddiq, M. (2012). Figs. In M. Siddiq, J. Ahmed, M. G. Lobo, & F. Ozadali (Eds.), *Tropical and Subtropical Fruits: Postharvest Physiology, Processing and Packaging 2* (pp. 455–478). Iowa, USA: Wiley-Blackwell.
- Çalışkan, O., & Aytekin Polat, A. (2011). Phytochemical and antioxidant properties of selected fig (*Ficus carica* L.) accessions from the eastern Mediterranean region of Turkey. *Scientia Horticulturae*, 128(4), 473–478. <https://doi.org/10.1016/j.scienta.2011.02.023>
- Condit, I. J. (1955). Fig Variety: A Monograph. *A Journal of Agriculture Science*, 23(11), 322–538.
- Cuquel, F. L., Carlos, A., Motta, V., Tutida, I., Larissa, L., & Mio, M. A. Y. D. E. (2011). Nitrogen and Potassium Fertilization Affecting the Plum Postharvest quality. *Rev. Ras. Frutic*, 328–336.
- FAO. (2016). FAOSTAT. Retrieved April 16, 2016, from <http://www.fao.org/faostat/en/#data>
- Flaishman, M. A., Rodov, V., & Stover, E. (2007). The Fig: Botany, Horticulture, and Breeding. In J. Janick (Ed.), *Horticultural Reviews, Volume 342* (pp. 113–196). New Jersey, USA: John Wiley & Sons, Inc.
- Himelrick, D. G. (1999). *Fig Production Guide*. Alabama, USA.
- Hung, D. Van, Tanaka, F., Uchino, T., & Hiruma, N. (2011). Using Nanomist Humidifier to Maintain Postharvest Quality of Fig (*Ficus carica* L.) Fruit in High Humidity Storage Environment. *Journal of Faculty of Agriculture Kyushu University*, 56(2), 361–365.
- Irget, M. E., Aksoy, U., Okur, B., Ongun, A. R., & Tepecik, M. (2008). Effect of Calcium Based Fertilization on Dried Fig (*Ficus carica* L. cv. Sarılop) Yield and Quality. *Scientia Horticulturae*, 118, 308–313. <https://doi.org/10.1016/j.scienta.2008.06.024>
- ITIS. (2011). *Ficus carica* L. Retrieved March 5, 2016, from http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=19093
- Joseph, B., & Raj, S. J. (2011). Pharmacognostic and Phytochemical Properties of *Ficus carica* Linn – An Overview. *International Journal of PharmTech Research*, 3(1), 8–12.
- Kamas, J., Nesbitt, M., & Stein, L. (2016). *Figs*. Texas, USA.
- Kislev, M. E., Hartmann, A., & Bar-Yosef, O. (2006). Early Domesticated Fig in the Jordan Valley. *Science*, 312(5778), 1372–1374.
- Kosmo! (2015). Penanaman Pokok Tin Perlu Ikut Peraturan. *Kosmo!* Kuala Lumpur, MY. Retrieved

- from
http://www.kosmo.com.my/kosmo/content.asp?y=2015&dt=0323&pub=Kosmo&sec=Varia&pg=va_01.htm
- Lansky, E. P., & Paavilainen, H. M. (2011). *Figs: The Genus Ficus*. Florida, USA: CRS Press.
- Loizzo, M. R., Bonesi, M., Pugliese, A., Menichini, F., & Tundis, R. (2014). Chemical Composition and Bioactivity of Dried Fruits and Honey of *Ficus carica* Cultivars Dottato, San Francesco and Citrullara. *Journal of the Science of Food Agriculture*, 94, 2179–2186.
- Lynch, S. J., Goldweber, S., & Rich, C. E. (1954). Some Effects of Nitrogen, Phosphorus and Potassium on the Yield, Tree Growth, and Leaf Analysis of Avocados, 220–224.
- Mawa, S., Husain, K., & Jantan, I. (2013). *Ficus carica L. (Moraceae): Phytochemistry, Traditional Uses and Biological Activities*. Kuala Lumpur, MY.
- Morton, J. F. (1987). Fig: *Ficus carica*. In *Fruits of Warm Climates* (pp. 47–50). Florida, USA: Creative Resource Systems, Inc.
- Pereira, C., Serradilla, M. J., Martín, A., Villalobos, M. del C., Pérez-Gragera, F., & López-Corrales, M. (2015). Agronomic behaviour and quality of six fig cultivars for fresh consumption. *Scientia Horticulturae*, 185, 121–128. <https://doi.org/10.1016/j.scienta.2015.01.026>
- S. Hossain, A. B. M., & Boyce, A. N. (2009). Fig Fruits Growth and Quality Development. *Bulgarian Journal of Agriculture Science*, 15(3), 189–196.
- Sauls, J. W. (2008). *Home Fruit Production*.
- Slatnar, A., Klancar, U., Stampar, F., & Veberic, R. (2011). Effect of drying of figs (*Ficus carica L.*) on the contents of sugars, organic acids, and phenolic compounds. *Journal of Agricultural and Food Chemistry*, 59(21), 11696–11702. <https://doi.org/10.1021/jf202707y>
- Stover, E., Aradhya, M., Ferguson, L., & Crisosto, C. H. (2007). The fig: Overview of an ancient fruit. *HortScience*, 42(5), 1083–1087.
- USDA. (2016a). Basic Report: 09089, Figs, raw. Retrieved July 30, 2016, from <https://ndb.nal.usda.gov/ndb/foods/show/2201?fgcd=&manu=&facet=&format=&count=&max=50&offset=&sort=default&order=asc&qlookup=ficus+carica&ds=&qt=&qp=&qa=&qn=&q=&ing=>
- USDA. (2016b). *Ficus carica L.* Retrieved March 5, 2016, from <http://plants.usda.gov/core/profile?symbol=FICA>