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Phytochemical screening from different extracts of dried figs (*Ficus carica* L.)

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Abstract

The medicinal properties of fig fruit (*Ficus carica* L., Moraceae) have been known for centuries and people in Algeria still use it as a traditional medication. The present work was conducted to investigate the phytochemical profile of different cultivars of F. figs. The fig powder was successively extracted with different solvents which are named aqueous, hydroalcoholic and chloroform, to compare the efficacy of different solvents. Phytochemical analysis reveals the presence of flavonoids, tannins, reducing compounds, alkaloids and saponins. The results of the research could be useful in describing and justifying plant monographs. In general, hydroalcoholic proved to be the most efficient as it can extract a number of phytochemicals. The presence of various phytochemicals has also confirmed previous findings that dried figs are good sources of therapeutic compounds.

Keywords:*Ficus carica* L., phytochemical screening, hydroalcoholic, extraction

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1. Introduction

Plants are an important part of human nutrition and provide nutrients with normal metabolism; they also provide bioactive chemical components to improve their health [1]. Thus, plant medicines have a benefit over synthetic drugs in having low human toxicity. In addition, the chemical diversity of plant secondary metabolites resulting from plant development is equivalent or greater than that of synthetic combinatorial chemical libraries [2].For years, nature has been a supplier of medicines and medicinal agents and a large number of modern drugs have been isolated from natural sources. Medicinal plants have been cured human and animal diseases because they hold phytochemicals of therapeutic value [3].

Recently, there has been a worldwide trend for the use of natural phytochemicals in berries, crops, herbs, teas, beans, oilseeds, fruits and vegetables [4-5].Figs (*Ficus carica* Linn.) have been cultivated for over 11,000 years, and figs which almost certainly made before human consumption are the first crops to be cultivated [6]. Fig treesand figs from all over the world and the genus *Ficus* were also one of the earliest and best origins of cultivated medicine, as well as food for humans, and for their domesticated animals [7].Dried figs are a great source of nutrients such as minerals, fibers, and sugars (fructose and glucose) and thus a good choice for snacking. Besides nutrients, they contain a set of health-promoting bioactive compounds [8].

The phytochemical content of plant material is also affected by many factors like phenological stage, genotype, cultivation techniques and ecophysiological conditions. In the case of fruits in particular, the phenological stage is the very important factor, because during growing and ripening, a series of physiological, biochemical, and structural changes take place which determine the quality of the fruit composition and are of a great importance from nutritional dietary and biological viewpoint [9]. Effective determination of biologically active compounds relies mostly on the use of the kind of solution in the extraction method from plant material [10]. Therefore, it highlights the need to test as many dissolvent as possible in phytochemicals screening. With all these facts, this research was conducted to elucidate the qualitative screening of the dried figs for the presence of various phytochemicals from various extracts of solvent that are included in the potential drugs lists.

2. Materiel and methods

2.1. Collection of plant material

The plant material used consists of dried fruits of *Ficus carica* L. plants were collected during July-September 2014 from ITAFV Station (Technical Institute of fruit trees and vines), Emdjez-edchiche, Skikda, North Eastern Algeria. The twenty two varieties are represented by a

sample taken from adult fig. The figs are selected based on established criteria; healthy fruit in full maturity. After harvest, the fruits were cleaned, washed with water and dried in air oven at 40° C, and reduced to a fine powder using an electric grinder (Moulinex), this powder was used for phytochemical characterization and extraction of phenolic compounds. This study was affected in April 2015 in the laboratories of University Center Abdelhafid Boussouf Mila.

2.2. Preparation of plant extracts

The extraction is the separation of the active parts of plants by means of standard procedures by using selective solvents.

2.2.1. Aqueous extract

The fruit powder (10g) was boiled in distilled water (100ml) for 15-20 min, remained in room temperature overnight and filtered. The filtrate was evaporated to dryness in hot air oven and stored in refrigerator.

2.2.2. Hydroalcoholic& chloroform extract

Fifty grams of the powder's fruit was suspended in a solvent mixture of hydroalcoholic (methanol: water (70:30); ethanol: water (80/20) or in chloroform (500 mL) and heated to reflux boiling for 30 min. The decoction obtained was filtered via Whatman filter paper No.1.

2.3. Phytochemical screening

Phytochemical tests were carried out on different extracts prepared from dried fruit powder using different polarities of solvents: water, ethanol and chloroform, according to the method described by [11-12].

2.3.1. Test for flavonoids (Lead acetate test)

To 2ml of plant extract was added 2 ml of 10% lead acetate solution. Formation of yellow green color precipitate indicates the flavonoids presence.

2.3.2. Test for saponins (Foam test)

5 ml of plant extract was vigorously shaken with 5 ml of distilled water in a test tube. The appearance of foam which lasted at least 15 min confirmed the presence of saponins.

2.3.3. Tests for tannins (Ferric Chloride test)

5 ml of plant extract was placed in a test tube. Then 1 ml of 5% Ferric chloride solution was added. Greenish black precipitate was indicated the presence of tannins.

2.3.4. Test for alkaloids (Wagner's tests)

2 ml of plant extract and 0.2 ml of dilute hydrochloric acid (1% HCl) were placed in a test tube. Then 1 ml of Wagner's reagent (Iodine in Potassium Iodide) was added. Turbidity of the resulting precipitate was used as evidence for the presence of alkaloids.

2.3.5.Tests for reducing sugar (Fehling's test)

2 ml of plant extract was added to 1 ml of a mixture of equal volumes of Fehling's solutions A and B, and was boiled for few minutes. A brick red precipitate color formed would indicate the reducing sugar presence.

2.4. Data analysis

The results obtained in this study were calculated using the correlation coefficient. The hierarchical classification analysis for the different phytochemical markers was carried out using SPSS version 21 software based on the aggregation method from Ward.

3. Results and discussion

3.1. Phytochemical analysis of different preparations extracts of dried figs (F. carica)

Phytochemical tests allowed us to highlight the presence of secondary metabolites in the fruit. Detection of these chemical compounds is based on the solubility of test components, reactions precipitation, and a specific color change. From the results obtained, we noticed that the fruits of *Ficus carica* are very rich in reducing sugars which are present in aqueous and hydroalcoholic extracts for all different varieties. Similarly, we recorded the presence of tannins in the aqueous and hydroalcoholic extracts for all varieties with the alkaloids in the chloroform extract. Results showed the presence of flavonoids in aqueous and hydroalcoholic extracts was depending on the ecotypes, the search tests for saponins in chloroform extracts were positive in all cultivars, Whereas for the aqueous and hydroalcoholic extracts found in some ecotypes. This investigation noticed that the hydro-methanolic extract have the best contents in different secondary metabolites (Table 1).

The preliminary phytochemical screening test is an available step for detecting bioactive principles and can lead to drug development and discovery. Thus, these tests support their quantitative evaluation and qualitative separation of pharmacologically active chemical compounds [13]. Phytochemical tests carried out on the various crude extracts of *F. carica* showed the presence of alkaloids, tannins, flavonoids, saponins and reducing sugars, with different proportions depending on the extraction solvent.

In general, the presence of the chemical families detected for *Ficus carica* in our study is confirmed by the work of Azziwhere he found the presence of saponins, alkaloids, flavonoids, coumarins, steroids, triterpenes and especially reducing sugars in the extracts of figs (*Ficus carica*) [14], by Gilani *et al*., where they have revealed that the aqueous extract of dry fruits of *F. carica* contains alkaloids, flavonoids, saponins. Concerning flavonoids [15], Veberic *et al*., confirm that the figs harvested in the coastal

zone of the Slovenia (northern part of the Mediterranean) are rich with them [16]. The pulp and skin of fig are important sources of polyphenols and anthocyanins [17]. The phenolic compounds are large class of phytochemicals that have biological activities as diverse as an astringent, anti-cancer, antioxidant, anti-inflammatory and antibacterial activity, etc [18].

The phytochemical composition of *carica* shows that it is a potent source of flavonoids and polyphenols, as well as other compounds likearabinose, glycosides, β-amyrins, β-setosterols, β-carotines, and xanthotoxol [19-20]. Alkaloids, flavonoids, saponins, coumarins and terpenes have also been described in aqueous extract of dried fruit of figs[18-21-15]. Teixeira *et al*., have separated the different chemical families present in the fruits of fig tree [21]. This result indicates the existence of constituents that are known for their medicinal and biological activity [3, 22]. The methanolic extracts have been used for various phytochemical tests that reveal most of the biological activities of each plant species are responsible for secondary metabolites, these tests have carried out as stated by [23-24-25]. Furthermore, various phytoconstituents presence in the three different extracts may be responsible for the therapeutic properties of fig fruit.

3.2. Hierarchical classification analysis

The results of the phytochemical screening of fruits, we grouped the varieties according to their contents in secondary components with the hierarchical classification analysis, established the first relationships between the different cultivars. Indeed, the resulting dendrogram perfectly reveals the existence of a significant level of inter-accession biochemical polymorphisms. Thus, the dendrogram showed seven clusters on the twenty-two accessions. As shown in figure 1, according to the components of the secondary metabolites of fruits of twenty-two varieties of fig tree, it appears that the most distant varieties are ‘Bezoul el khadem’ and ‘Alekak’ with a distance of 2,189, whereas the varieties the nearest are‘Avouacou’ and ‘El fessi’; ‘Black dourou’ and ‘Tameriout’; ‘Gentille’, ‘Karoute’,‘ backor blanc’and‘Cavaliere’ with a distance of 0,000.

The position of ‘Celeste’ was at the end of dendrogram showing it the most divergent variety. This is why this variety can be considered as an out group since it is the most diverse [26].This could be explained by differences at phytochemical level that reflect well the differences observed in biochemical characterization. As confirmed by the work of Belattar *et al*., where they revealed the low diversity in the collection, therefore the difference might be due to physiological, morphological and physiochemical differences in cultivars [27].

Table 1. Phytochemical constituents of selected Algerian fig in the different extracts

	Aqueous extract					Hydroalcoholic extract					Chloroform extract				
Cultivar	Flavonoids	Saponins	Tannins	Alkaloids	Reducing sugar	Flavonoids	Saponins	Tannins	Alkaloids	Reducing sugar	Flavonoids	Saponins	Tannins	Alkaloids	Reducing sugar
Albo	+	+	++	+	+	+	-	++	+	++	+	++	-	++	+
Celeste	+	+	++	++	++	-	-	+	+	+++	+	++	-	+++	+
Cavaliere	+	-	++	+	+	+	-	++	+	+	+	++	-	++	+
Boule d’or	-	-	+	-	+	-	+	+	-	+	-	++	-	+	+
Blanquette	+	+	++	+	+	-	+	+	+	+	+	++	-	+	+
Black dourou	-	+	++	+	++	+	+	++	+	++	+	++	-	++	++

Bifer de telaamara	+	+	+	+	+	-	+	++	+	+	-	++	-	+++	+
Bakor blanc	+	-	++	+	++	+	-	++	+	+	+	++	-	++	+
Avouacou	+	+	+++	++	++	+	+	++	+	+	+	++	-	+++	+
Alekak	-	-	++	++	+	-	+	+++	+	+	-	++	-	+++	+
Abiarous	-	+	+++	++	++	+	++	+	+	+	-	++	-	+++	+
Fraga	++	+	++	+	+	++	+	++	+	+	+	++	-	++	+
Gentille	-	+	++	-	+	+	-	++	+	+	+	++	-	++	+
Hamri	+	+	++	+	++	+	-	+	+	+	+	++	-	++	+
Karout	++	+	++	+	+	+	-	++	+	+	-	++	-	+++	+
Roudane	++	+	++	++	+	+	-	+	+	+	+	+++	-	+++	+
Taranimt	++	-	++	++	++	++	-	++	+	+	++	+	-	+++	++
Tameriout	+	+	+	+	+	+	+	++	+	++	+	++	-	++	+
Verbale	-	+	++	-	+	-	+	++	-	++	-	++	-	++	+
Zreka	-	-	+	-	+	-	+	+	-	++	+	++	-	+	+
El fessi	+	+	++	+	+	+	+	++	+	+	+	++	-	++	+
Bezoul el khadem	-	+	++	-	+	++	-	+	-	+	-	++	-	++	+

-: Absent, +: Fainthy present, ++: Moderately present, +++: Highly present

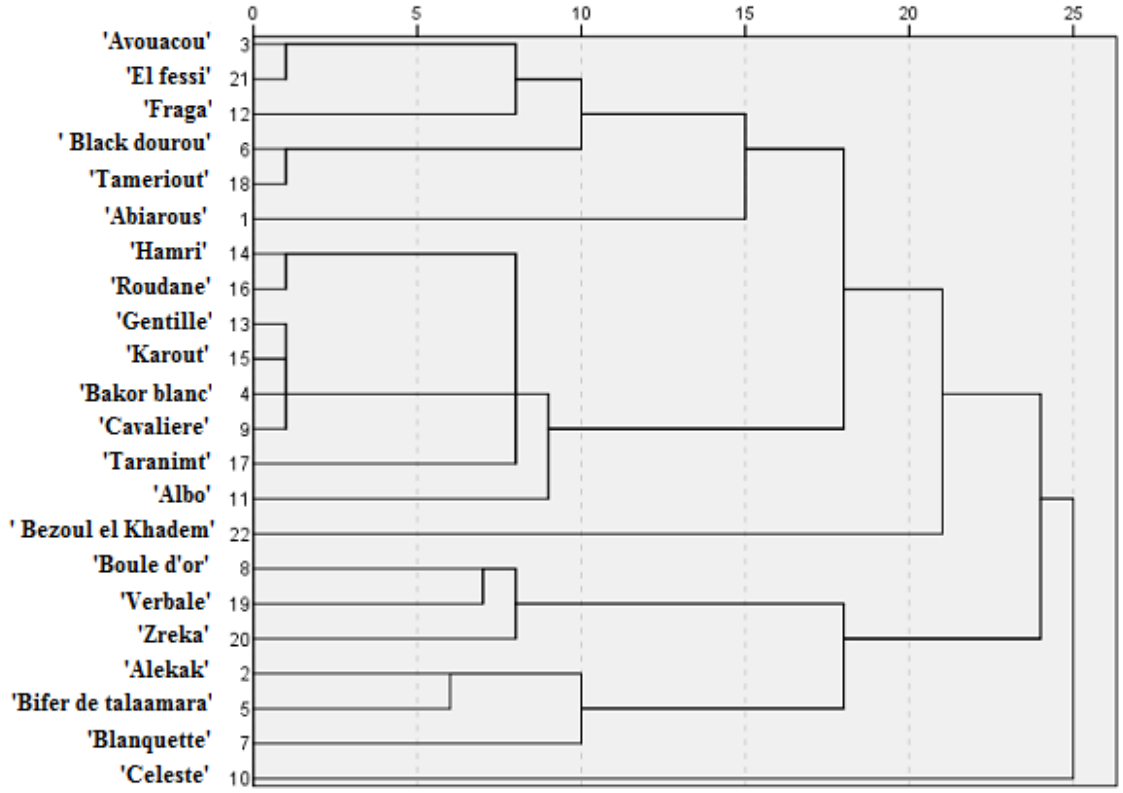

Fig.1: Dendrogram representing different clusters for selected phytochemicals in 22 cultivars *of F.carica*

4. Conclusion

In conclusion, we found that most of the biologically active phytochemicals were present in the aqueous, hydroalcoholic and chloroform extracts of *Ficus carica* dried fruit. Since hydroalcoholic extracts of different varieties contain more constituents, they can be considered beneficial for further studies. The medicinal properties of *F. carica* dried fig extract may be due to the presence of above mentioned phytochemicals which have a potential of providing useful drugs for human use. In addition, the characterization, isolation and purification of the phytochemicals present will lead to interesting studies.

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