Studies on the Phytochemical properties of Fig Var. Afghan, Deanna and Brown Turkey

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Abstract— *The study entitled* ***'Studies on the phytochemical properties in Fig var. Afghan,Dienna and Brown turkey'*** *was conducted in the analytical laboratory of HC & RI, TNAU, Coimbatore 2021-2022 using the fig fruits grown in the arid zone block of the college orchard. The main objective of this study was to determine the phytochemicals present in the fig fruits of three fig varieties namely Afghan, Dienna, Brown Turkey. Fig fruits were analysed for the determination of secondary metabolites that is phenols, flavonoids, tannins, anthocyanins and antioxidants and The Physio-chemical analysis like TSS, vitamin C, carotenoids and acidity.The content of phenols, flavonoids, and tannins was determined using the standards quercetin for flavonoids, pyrocatechol for phenols and tannic acid for tannins estimation. Determination of antioxidant activity was done by DPPH scavenging method. For that, scavenging capacity of DPPH radicals and reducing power were determined. IC50 value was calculated to determine the concentration of sample required to inhibit 50% of radical.*

The experimental results showed that the major phytochemicals like phenolics, flavonoids, anthocyanins, and antioxidants were found to be the highest in the variety brown turkey when compared to the other two varieties i.e. Afghan and Deanna.

Keywords— Antioxidant activity, DPPH (2,2-diphenyl-1-picryl-hydrazyl-hydrate), flavonoids, tannins, anthocyanins.

I. INTRODUCTION

Phytochemicals, including phenolics, flavonoids, ascorbic acid, lignin, xanthones, stilbenes, etc., are plant- based secondary metabolites, which are associated with the protection of human health against chronic diseases. The relative importance of medicinal and food plant species more traditional uses exhibit high use value compared to those which have fewer ones. Nowadays, medicinal plants considered as an important source of drugs as about 25% of the drugs prescribed worldwide derive from plants. Fig tree *Ficus carica* Linn. originated in the Middle East areas such as Syria, Asia Minor, and Iran, then it was spread to the Mediterranean basin countries by old humans. It belongs to the family of Moraceae F. carica Linn. is of the unique widely spread Ficus species that has edible fruits with high commercial value. The production of commercial fig is situated in regions that possess a Mediterranean climate. *F.carica* L. has three figs yields, Early fig stays on the tree; Oxidative stress is an inequality between prooxidants and antioxidants in favor of the first contributing to the appearance of several pathologies. The uncontrolled oxygen species resulted will have serious and severe consequences for the human organism. Several studies focus on natural antioxidant sources to find new effective, safe and cheap antioxidants as there is a strong relationship between the decrease of certain chronic diseases and plants-produced antioxidants. Fruits are essential functional foods that maintain the human vital functions as they providing a well-balanced diet. Viewing the biological properties of *F.carica* fruits, our study focuses on the correlation between phytochemicals contents and antioxidant capacity of fig fruit varieties Afghan, Deanna and Brown Turkey.

II. MATERIALS AND METHODS

2.1 Collection of fruits:

Fruits from three different varieties (Afghan, Deanna, Brown Turkey) of *Ficus carica* were collected from the arid zone block of the Horticultural College & Research Institute, TNAU, Coimbatore between May and July 2022 and the fruits were utilized for phytochemical screening.

2.2 Determination of Total Phenols (TPL):

Total phenolics was estimated using Folin – Ciocalteau's reagent. A mixture of 1ml plant extract, 0.5 ml Folin- Ciocalteau reagent was incubated for 5 to 10 mins and 1ml of sodium carbonate solution was added to it. The absorbance was recorded @ 660 nm to determine the TPL as mg gallic acid per g dry weight (mg GAE/g DW).

2.3 Determination of Total Flavonoids (TFL):

To determine the total flavonoids quercitin was used as the standard. 0.5 ml of plant extract was mixed with 5% sodium nitrate solution and incubated for 3 mins. Then the mixture was added with 10% aluminium chloride and 2ml sodium hydroxide solutions and incubated for 6 mins and absorbance was recorded at 415nm.TFL resulted in mg quercetin equivalent per dry weight (mg QE/g DW)

2.4 Determination of tannins

Folin – Denis method was used to determine the total tannins level present in the sample.0.5 ml of sample extract was taken from the powdered material and it is mixed with 0.5 ml of Folin- Denis reagent and 1ml of sodium carbonate solutions and the absorbance was recorded at 700 nm. Tannins were expressed using tannic acid the standard as catechin equivalent pe dry weight (mg CE/g DW)

2.5 Determination of Total Anthocyanins (TAL):

The p H differential method was used to deduct the total anthocyanins level, by which, the absorbance of the reaction solution was measured at both 520 nm and 700 nm at two different p H 1.0 and p H 4.5 using the two buffer systems: potassium chloride and sodium acetate.

$$\text{Total monomeric anthocyanin content } \left(\text{mg}\frac{\text{C3G}}{g}\right) = \frac{\text{A (abs)} * \text{M.W} * \text{D.F} * 1000}{(\text{e} * \text{l})}$$

A (abs) =Absorbance (A520nm –A700nm) pH 1– (A520nm – A700nm) pH 4.5

M.W – Molecular weight (449.2g/mol)

D.F – Dilution factor =1:3 (2)

e =26900 L /mol

l = pathlength in cm (1 cm)

TAL was expressed as mg cyanidin-3-glucoside per g dry weight (mg C-3-G/g DW)

2.6 Determination of DPPH assay (Antioxidant capacity):

DPPH free radical scavenging test was used to estimate the capacity of each extract to scavenge hydrogen atom generated of 2,2-diphenyl-1-picrylhydrazil radical. 1ml of methanolic extract of sample was taken and mixed with 4ml DPPH solution and the absorbance was recorded at 512 nm. The inhibition percentage (% IP) of DPPH was estimated using the following formula:

$$\% \text{ IP} = \frac{\text{Absorbance of blank} - \text{Absorbance of sample} * 100}{\text{Absorbance of sample}}$$

IC 50 value was calculated to determine the concentration of the sample to inhibit 50% of the free radicals. The lower the % inhibition capacity the higher will be the level of antioxidants present in the sample. The results were expressed in mg ascorbic acid per g dry weight (mg AAE/g)

2.7 Determination of acidity

5ml of filtered sample extract was taken and mixed with 2 drops of phenolphthalein indicator and it is titrated against 0.1 N NaOH solution and the results were expressed in %

2.8 Determination of carotenoids

Petroleum ether: acetone (3:2) mixture of sample extract was centrifuged and then the absorbance was recorded at 450 nm. The results were furnished as mg/ 100 of the sample

2.9 Determination of ascorbic acid

5ml of the filtered fig fruit extracts were taken and mixed with 10 ml of 4%oxalic acid solution and it is titrated against the dye (2,2-diclorophenol-indophenol) and the results were expressed in mg/100 g.

III. RESULTS AND DISCUSSION

The experiments on phytochemical analysis of fresh fig fruits were conducted at the Department of Fruit science,HC & RI,TNAU,Coimbatore to determine the secondary metabolites namely phenols, tannins, flavonoids, antioxidants, anthocyanins and physio-chemicals like vitamin c, acidity, total soluble solids, carotenoids. The results obtained by the present study are furnished below.

Total phenolics level (TPL), total flavonoids level (TFL), total anthocyanins level (TAL) condensed tannins level (CTL), total antioxidants capacity (TAC), Carotenoids, Vitamin C, Acidity, TSS of fig fruit varieties Afghan, Dienna, Brown Turkey are presented in the Table 1.

TABLE 1
PHYTOCHEMICAL PROPERTIES IF FIG FRUIT

varieties	Total phenols (mg GAE/g)	Total flavonoids (mg QE/g)	Total anthocyanins (C3G mg/g)	Antioxidants (%inhibition capacity)	Condensed tannin (mg CE/g)	Total carotenoids (mg/100g)	Total soluble solids (degree brix)	Titrable acidity (%)	Ascorbic acid (mg/100g)
Afghan	10.75	6.25	3.27	50.36	6.55	0.117	16.35	0.22	2.5
Deanna	8.75	7.33	1.23	46.71	3.29	0.124	13	0.13	3.4
Brown turkey	12	11.25	5.29	20.43	4.61	0.27	15.2	0.15	4.7

TABLE 2
PHYSICAL CHARACTERISTICS OF FRESH FIG FRUIT

	Weight (mg)	Length (mm)	Thickness (mm)	Breadth (mm)
Afghan	26.35	37.53	30.91	35.27
Deanna	27.53	32.56	35.19	29.5
Brown turkey	25.97	38.31	31.87	36.18

The present study represents the first published data describing the changes in polyphenols, flavonoids, anthocyanins, tannins, antioxidant capacity of three fig varieties Afghan, Deanna and Brown Turkey. According to the results the total phenolics level was found to be the highest in the variety Brown turkey (12 mg GAE/ g) and lowest in the variety Dienna (8.75 mg GAE/g) and moderate in variety Afghan (10.75 mg GAE / g).

Similarly, the ethanolic extract of Brown turkey recorded the highest total flavonoids (11.25 mg QE/g) while Dienna recorded the lowest value (3.7 mg QE/ g). The total anthocyanin was also highest in the variety Brown turkey (5.29 mg C3G/ g) and lowest in Dienna (1.2 mg C3G /g). The condensed tannins was highest in the variety Afghan (6.55 mg CE / g) while compared to the other two varieties. Total carotenoids was more in Brown turkey (0.270 mg / 100 g) and less in Afghan (0.117 mg / 100 g). The chemical attributes like acidity and total soluble solids were found to be the highest in the variety Afghan (0.22 % and 16.35 degree brix) and lowest in Dienna (0.13 % and 13 ^{o}Brix).

IC 50 value was calculated to determine the concentration of sample required to inhibit 50% of radical. The lower the IC 50 value, the higher the antioxidant activity present in the samples to scavenge the free radicals.It is observed that Brown turkey variety has lower inhibition % and so the antioxidants present in this variety is higher when compared to other two varieties, Afghan has the lowest antioxidants to scavenge the free radicals. It is noticed that Brown turkey variety has the highest amount of phytochemicals like phenols, flavonoids, anthocyanins and antioxidants.It is due to the fact that dark and brown coloured varieties contribute highest amount of secondary metabolites when compared to the other varieties. (Solomon *et.al.*, 2006).

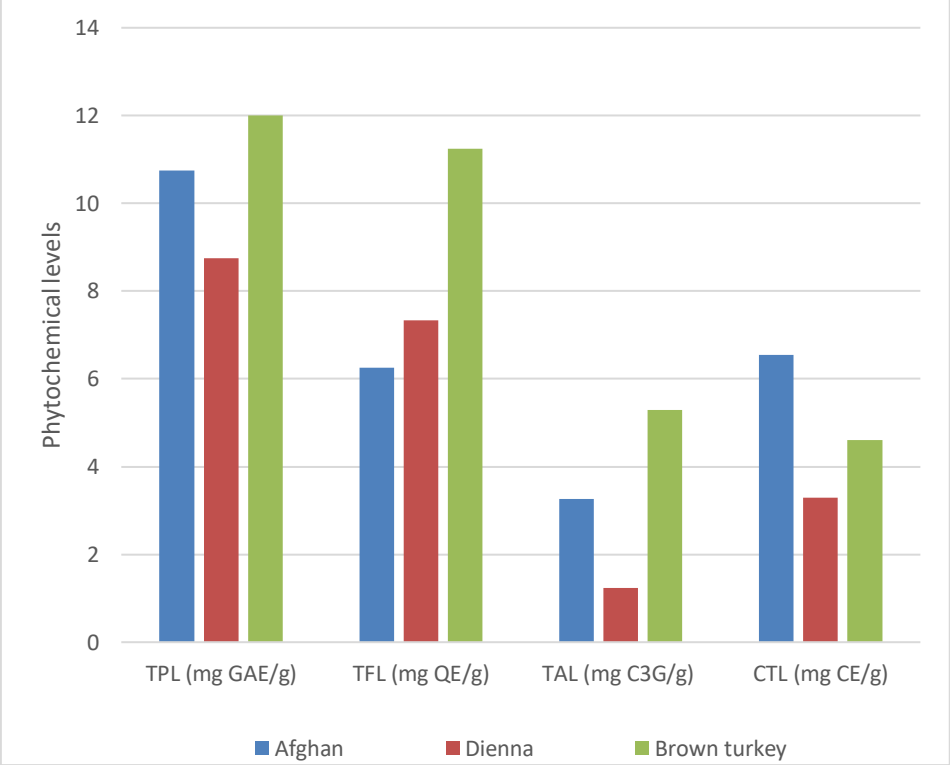

FIGURE 1: Chemical composition and bioactive compounds of fig fruits

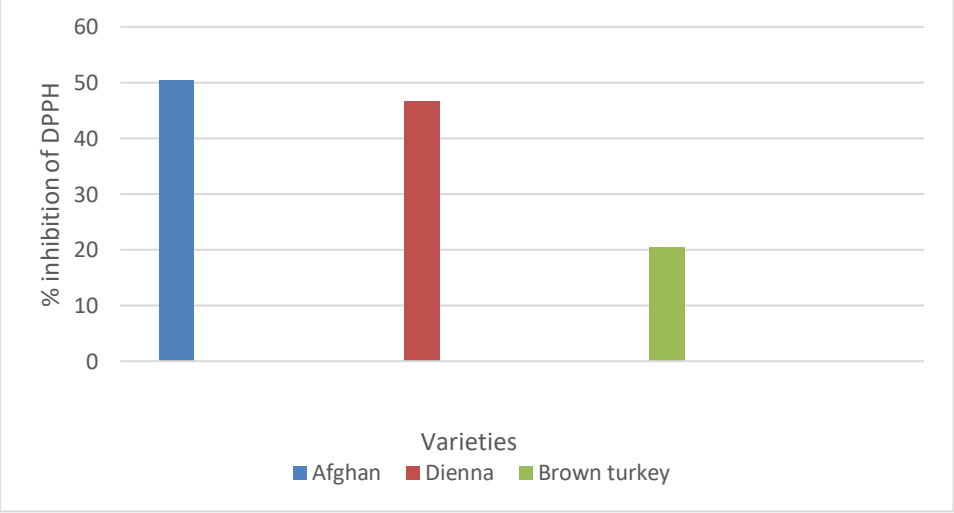

FIGURE 2: % Inhibition of DPPH

IV. CONCLUSION:

The study was conducted to determine the secondary metabolite compounds like phenols, flavonoids, tannins, antioxidants, anthocyanins and nutrient compounds like Vitamin C, Ascorbic acid, carotenoids, TSS present in the three fig varieties.

The fig variety Brown turkey was found to have more phytochemical components. It contains appreciable amounts of bioactive compounds namely anthocyanins, antioxidants, phenolic compounds and flavonoids and is a mineral rich fruit containing many macro and micro minerals namely Calcium, Phosphorous, Magnesium, Iron, Copper and Manganese etc. in appreciable amount. Hence, by the experimental results the brown and dark coloured varieties found to have highest phytochemical properties.

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