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Research Article

**CHEMICAL COMPOSITION OF ILLICIUM VERUM  
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**Abstract:**

The present study was conducted to evaluate the chemical composition, Phenolic, flavonoid content and the antimicrobial activity of methanol extract of Star anise fruit. The chemical composition, minerals and antimicrobial investigations of star anise were analyzed using different standard techniques and HPLC analysis. Total phenols was determined (mg/kg) was 28.59. The total antioxidants 95%. Total. The chemical composition and mineral content of the star anise fruit indicate that the fruit has high carbohydrate and potassium level which can directly add nutrient value to the food. Phenolic and flavonoids are considered to be non-enzymatic antioxidants with high scavenging potential to the free radical produced from the oxidative stress. Our study indicates that the fruit contains the high antioxidative property so it can be used as the natural antioxidant to protect us from oxidative damage.

**Keywords:** Star anise, Chemical composition, Minerals, HPLC.**Corresponding author:****Nahla S Zidan,**Department of Nutrition and Food Science, Faculty of Home Economics,  
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**INTRODUCTION:**

Medicinal plants have been used to treat human diseases for centuries. Many plant-derived compounds have been used as drugs, either in their original or semi-synthetic form. Plant secondary metabolites can also serve as drug precursors, drug prototypes and pharmacological probes (1). In addition, the uses of plant derived products as disease control agents have been studied, since they tend to have low mammalian toxicity, less environmental effects and have wide public acceptance (2). *Illicium verum* Hook. f. a fruit commonly known as star anise, is native to southwest China and Vietnam and is mainly distributed in the tropical and subtropical areas of Asia. *Illicium verum* was considered as one of the things “both food and medicine, the research focus on Iverum has been mainly on food and medical fields (3).

The fruits are commonly used as an ingredient of the traditional “five-spice” powder of Chinese cooking, and the essential oil of *I. verum* can be used as a flavoring. The extraction from *I. verum* has carminative, stomachic, stimulant, and diuretic properties, and is used as a pharmaceutical supplement (4).

Shikimic acid extracted from *I. verum* is one of the main ingredients in the antiviral drug Tamiflu used to fight avian influenza (5). It has also been reported to possess antimicrobial (6) and antioxidative properties (7) as well as significant anticancer potential (8). Star anise is the dried fruit of the *Illicium verum* (Fam. Magnoliaceae), an evergreen tree, indigenous to the south eastern part of the China and Vietnam. It is one of the most important spices in Chinese cuisine for flavouring alcoholic drinks, candies, liquors and cough medicines.(9) The oil of star anise is stimulant, stomachic, carminative, mildly expectorant and diuretic. It is used in cough lozenges and important for other pharmacological activities.(10-11) There are many reports in the literature on its chemistry,(12-14) antimicrobial (13,16) and insecticidal (17,19) behaviour. However, the antioxidative properties of its volatile oil and acetone extract seem not to have been reported before. Hence, as a part of our ongoing research,(20-23) chemical constituents, antimicrobial and oxidative studies of the volatile oil and acetone extract of star anise have been undertaken. The objective of the present investigation was to study the chemical composition of volatile oil and extract as well as demonstrate antioxidative behavior of star anise.

**MATERIALS AND METHODS:****Chemical composition**

Moisture was determined by drying in an air oven at 110°C to a constant weight; crude protein, by using the Micro-Kjeldahl method to determine the total nitrogen and multiply its value by the factor of 6.25; ether extract,

in a Soxhlet apparatus using petroleum ether (40 - 60°C) as a solvent; ash content by ashing in an electric muffle at 550 °C until/constant weight. The crude fibers content was determined following the method given by (25). All determinations were done determined according to the methods described in (AOAC, 2000). Carbohydrates were calculated by a difference method ( $=100 - (\% \text{protein} + \% \text{fat} + \% \text{ash} + \% \text{fiber})$ ) as described by (26). Minerals were estimated by wet ashing method according to (AOAC, 2000). Na, K, Mn ,Co ,Zn ,Fe ,Cu ,Ni and P ) were carried out in the Central Laboratory, Kafrel Sheikh University, using atomic absorption (NC.9423-400-30042) England method by techniques described by A.O.A.C. (24)

**Preparation of methanol extract:**

10 ml of 80% methanol were added to 2 g of star anise seed powder, extracted by shaking at 150 rpm and 25°C for 24 h, and then filtered through Whatmann filter paper no. 1.

**Determination of total phenolics content:**

Determination of total phenolic contents Total soluble phenolics of each fraction (chloroform, ethyl acetate, 1-butanol, aqueous) were determined with FolinCiocalteu reagent according to the method of Singleton et al. (1999) using gallic acid as a standard phenolic compound. A volume of 40  $\mu\text{L}$  of each fraction and standard was transferred into separate test tubes and to each added 3.16 mL water and 200  $\mu\text{L}$  of FolinCiocalteu's reagent. The mixture was mixed well, waited for 8 min and then added 600  $\mu\text{L}$  of sodium carbonate solution with continuous stirring. The solution was allowed to stand for 1 hour at room temperature in a dark place and the absorption was measured at 750 nm using a spectrophotometer. The concentration of total phenolic compounds of all fractions of *A.unedo* fruit was determined as milligrams of gallic acid equivalent (GAE) (27).

**Determination of total flavonoids content:**

The total flavonoid content of different fractions was analyzed by using catechin as standard Kim et al. (2003). To 1 ml of extract solution (each of 100  $\mu\text{g}/\text{ml}$  concentration), 4 ml of distilled water, 300  $\mu\text{L}$  of sodium nitrite and aluminium chloride were added. The mixture was incubated at room temperature for 5 min. After the completion of incubation, 2 ml of sodium hydroxide was added and final volume of solution was raised to 10 ml by addition of distilled water. The absorbance of samples was measured at 510 nm. The total flavonoid content for all the fractions was expressed in terms of catechin equivalents (mg/g)(28).

**Statistical Analysis**

All the obtained data were statistically analyzed by SPSS computer software. The calculated occurred by analysis of variance ANOVA according to (33).

**RESULTS AND DISCUSSION:**

The proximate chemical composition of star anise(mg/g) was determined in terms of Protein ,fat, fiber,

carbohydrates ,ash, dry matter (Table (1) The contents were 6.41,3.93,27.74,58.56, 3.36 and 86.65 .which is indicating the high carbohydrate content. Total phenols (in mg/kg) and antioxidant (in %) also recorded and the result was 28.59mg/kg and 95.67% respectively. There is less report available regarding nutritional composition of star anise (34) but our studies indicate that the star anise has highest amount of carbohydrate followed by the fiber content and the lowest amount of fat.

**Table:1 Chemical composition of star anise (mg/g)**

| SNo. | Chemical composition  |       |
|------|-----------------------|-------|
| 1.   | Protein               | 6.41  |
| 2.   | Fat                   | 3.93  |
| 3.   | Fiber                 | 27.74 |
| 4.   | Carbohydrates         | 58.56 |
| 5.   | Ash                   | 3.36  |
| 6.   | Dry matter            | 86.65 |
| 7.   | Total phenols (mg/kg) | 28.59 |
| 8.   | Antioxidant %         | 95.67 |

**Values are mean  $\pm$ SD. Mean(s) bearing different superscript(s) in a row are significantly different ( $P \leq 0.05$ ) according to Duncan's Multiple Range Test (DMRT).**

Table 2 indicates the mineral content of star anise (in mg/g). the result was as follows the values of Na, K, Mn ,Co ,Zn, Fe, Cu, Ni, P were 868.0 ,5550.0 109.5 , ND, 13.5 ,56.5 ,12.25 ,ND, 904.72. The results showed that the potassium content of star anise is very high and even better than the Hawaii's bananas (3300.6 mg/1kg).( 35 ) extracts showing presence of phytochemicals alkaloids, phenols, flavonoids and steroids .Proximate study showed protein, fat, ash and carbohydrates. Presence of ash percentage highlights the good enough minerals present in star anise.

It is an aromatic plant which produces oils such as anethol and contains some polyphenols, including flavonols (quercetin and kaempferol), anthocyanins, tanins and phenolics acids like shikimic and gallic acid (36). The oil of star anise is stimulant, eupeptic, carminative, mildly expectorant and diuretic (37). The oil is employed as an applicant in rheumatism and also used as an antiseptic. It is useful against body lice, bedbugs and is an ingredient of cattle sprays. It is used in fevers and scabies. It is also highly useful in constipation and insomnia (38).

**Table 2: Mineral content of star anise (mg/g)**

| SNo. | Minerals (mg/kg) |        |
|------|------------------|--------|
| 1.   | Na               | 868.0  |
| 2.   | K                | 5550.0 |
| 3.   | Mn               | 109.5  |
| 4.   | Co               | ND     |
| 5.   | Zn               | 13.5   |
| 6.   | Fe               | 56.5   |
| 7.   | Cu               | 12.25  |
| 8.   | Ni               | ND     |
| 9.   | P                | 904.72 |

Values are mean  $\pm$ SD. Mean(s) bearing different superscript(s) in a row are significantly different ( $P \leq 0.05$ ).

Table 3 and 4 showed the Phenolic and flavonoid contents of star anise (mg/g); Gallic, Caffeine, P-Coumaric, Catechol, Caffeic, Vanillic, 3,4,5-methoxy cinnamic, Catechin, Protocatechoic, Ferulic, Coumarin, P-OH benzoic, Cinammic, Chlorogenic, Iso ferulic, Benzoic, 4-amino benzoic acid, alpha Coumaric and Salicylic.

**Table (3) Phenolic compounds of star anise (mg/g).**

| SNo. | Phenol compound        |          |
|------|------------------------|----------|
| 1.   | Gallic                 | 1.7503   |
| 2.   | Caffeine               | 4.0941   |
| 3.   | P-Coumaric             | 0.3258   |
| 4.   | Catechol               | 2.5010   |
| 5.   | Caffeic                | 2.7115   |
| 6.   | Vanillic               | 5.70435  |
| 7.   | 3,4,5-methoxy cinnamic | 1.4489   |
| 8.   | Catechin               | 2.5258   |
| 9.   | Protocatechoic         | 6.05215  |
| 10.  | Ferulic                | 4.07141  |
| 11.  | Coumarin               | 18.38435 |
| 12.  | P-OH benzoic           | 2.14885  |
| 13.  | Cinammic               | 4.45735  |
| 14.  | Chlorogenic            | 11.9321  |
| 15.  | Iso ferulic            | 5.59205  |
| 16.  | Benzoic                | 4.5755   |
| 17.  | 4-amino benzoic acid   | 4.22805  |
| 18.  | alpha Coumaric         | 6.58344  |
| 19.  | Salicylic              | 4.87323  |

Values are mean  $\pm$ SD. Mean(s) bearing different superscript(s) in a row are significantly different ( $P \leq 0.05$ ).

**Table 4: Flavonoids of star anise (mg/g)**

| Sno. | Flavonoids                       |           |
|------|----------------------------------|-----------|
| 1.   | Rutin                            | 1.524685  |
| 2.   | Naringin                         | 4.42444   |
| 3.   | Apigenin                         | 0.531975  |
| 4.   | Narengenin                       | 1.0971415 |
| 5.   | Hesperitin                       | 0.58835   |
| 6.   | Kampferol                        | 1.27790   |
| 7.   | Quercetin                        | 3.753705  |
| 8.   | Quercitrin                       | 2.427615  |
| 9.   | Acacetin neo.rutinoside          | 3.802675  |
| 10.  | Luteolin 7 glucose               | 5.15140   |
| 11.  | Apigenin 6-rhamose 8-glucose     | 5.3332505 |
| 12.  | Apigenin 6-arabinose 8-glactose  | 1.4732849 |
| 13.  | Apigenin-7-O-neohes              | 15.2710   |
| 14.  | Kaempferol3-2-p-coumaroylglucose | 3.57870   |

Values are mean  $\pm$ SD. Mean(s) bearing different superscript(s) in a row are significantly different ( $P \leq 0.05$ ).

Star anise fruits could be considered a good source of natural compounds with significant antioxidant and antimicrobial activities, mainly antifungal, which can be attributed to the high percentage of the main constituents or to synergy among the different oil constituents which provoke a biocide effect against pathogenic fungi and mycotoxin production. The antifungal activity of the oil can be attributed to its high content of trans-anethole, which was confirmed as the main active component among the volatile compounds in the oil. Star anise volatile oil could be applied, in different industries, like the cosmetic, the pharmaceutical or the food industry; in the latter it might replace the synthetic antioxidant used nowadays in order to overcome the dangerous effects of the synthetic additives on the public health (39).

It has also been reported to possess antimicrobial (40) worked on antimicrobial properties of star anise and reported that a major portion of this antimicrobial property is due to anethole present in the dried fruit (39) have also reported that the antimicrobial activity of star anise is mainly due to anethole. However, other constituents of the volatile oil and extract which are present in minor quantities could also be taken into account for their possible synergistic and antagonistic effects. The antibacterial activity of silver nanoparticles of methanol extract of *I. verum* was studied against *Staphylococcus aureus*, *Escherichia coli* and *Candida albicans*. Silver nanoparticles of methanol extract of *I. verum* showed maximum zone of inhibition against *E. coli*. Antimicrobial activity of fruit extract might be related to their phenolic compounds synthesized by plants and also by the presence of different secondary metabolite like hydroxyl groups on the active constituents. Antimicrobial activity is understood as the ability of some agents to eliminate microorganisms or by inhibiting their growth. An alarming increase in bacterial strains resistant to existing antimicrobial agents demands a renewed effort to seek agents effective against pathogenic bacteria resistant to current antimicrobial agents in foods. Addition of spices in foods not only imparts flavor and pungent stimuli but also provides antimicrobial property (41-44). The spread of multi-drug resistant pathogens is one of the most serious threats to successful treatment of microbial diseases. Down the ages, spices have evoked interest as sources of natural products for their potential uses as alternative remedies to heal many infectious diseases.

### CONCLUSION :

The approximate chemical composition indicated that star anise contained higher amounts of crude fiber and carbohydrates. Its nutritional value lied in its good

content of minerals. Also showed higher antioxidant activity.

### CONFLICT OF INTEREST:

The authors showed no conflict of interest.

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