

Determination Of Coffee Alkaloids And Their Biochemistry

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Abstract: One of the important compounds of coffee is the caffeine playing an important role in human body, whose chemical name is 1,3,7 – Trimetil 2,6 dioxypurin, or 1,3,7 – trimetil xantin. The other important compound is trigonelline, which converts to vitamin niacin when green coffee bean is roasted at high temperature.

In this study, the change of caffeine and trigonellin amount when green coffee bean roasted, was examined. HPLC (High pressure liquid chromatography) was used to detect two compounds. Column; C18, wave length; 276 nm, Mobile phase; phosphate buffer and buffer. When were examined results of caffeine and trigonelline in both green and roasted coffee, it was found that caffeine amount increased after roasting. On the other hand, trigonelline amount reduced after roasting.

Kahve Alkaloidlerinin Belirlenmesi ve Biokimyası

Özet: Kahvenin önemli bileşenlerinden biri kafeindir. İnsan organizmasında önemli rolü bulunan bu bileşenin kimyasal adı 1,3,7 trimetil - 2,6 deoksipurin veya 1,3,7 trimetil xantindir. Diğer önemli bileşen ise kavrulduğunda vitamin niyasine dönüşen trigonellindir.

Bu çalışmada HPLC (Yüksük basınç sıvı kromatografisi) bu bileşenin analizi için kullanılmıştır. Kolon; C18, dalga boyu uzunluğu, 276nm, hareketli faz fosfat tamponu ve metanolüdür. Hem yeşil hem de kavrulmuş kahvede kafein ve trigonellin miktarları incelendiğinde kafein miktarının kavruktan sonra arttığı, trigonellin miktarının ise azaldığı bulunmuştur.

INTRODUCTION

Coffee has originally consumed as a food in ancient Abyssinia and was presumably first cultivated by the Arabians in about 575 AD, by the sixteenth century, it had been a popular drink in Egypt, Syria and Turkey. The name of coffee is derived from the Turkish pronunciation kahveh of the Arabian gahweh, signifying an infusion of the bean. Coffee was introduced as a beverage in Europe early in the seventeenth century and use spreaded quickly (1).

Coffee belong to the Rubraceae subfamily Cinchonoideae Tribe Coffeae. This tribe has recently been restricted to two genera, Coffea and Psilanthus.

The beans of the commercially more important species are Coffea arabica and C.Conephora or robusto (2).

Caffeine being synthesized from xanthosine, via 7-methyl xanthosine, 7-methyl xanthine and Theobromine, and 5-adenosylmethionine is utilized as a donor of the methyl groups (3). "Thein" was isolated from thea in 1827 was later shown to be identical with coffee isolate. It was subsequently identified in cocoa, mate, cola, nuts and other plants. Caffeine is added to widely consumed cola drinks and other soda products (4,5).

Trigonelline content in coffee bean was extremely high, nearly one percent (6). Trigonelline (N-methyl nicotinic acid) was named after the leguminous plant Trigonella foenum graecum L. (fenugreek) from which the compound was first isolated and characterized.

The trigonelline content was proved to be extremely high (up to 1 % on the wet basis). When trigonelline was heated up to 180 °C, it was converted into nicotinic acid. Although the conversion rate was low, a nutritionally significant amount of nicotinic acid was formed during coffee beans because of the high content of trigonelline in the coffee beans. The optimum heating condition for nicotinic acid conversion was found at 220 °C for 20 min (7).

It has been investigated that the corresponding changes, in the coffee bean content of chlorogenic acids, caffeine and trigonellin. They had reported that these compounds change with coffee maturity(8).

The relation between consumption of coffee and its biochemistry in human body was studied. There were some investigations about its biochemistry. Except for age coffee was the most important determinant of serum cholesterol concentration. The association between coffee and cholesterol depends on consumption quantity and brewing method therefore this can be a nordic problem(9).

The acute effects of caffeine on cardiovascular system and blood pressure were explained. Acutely caffeine ingestion is equivalent to abrupt rise in blood pressure (10,11) stated with reasonable confidence that there is no firm evidence implicating long term coffee drinking cause a cardiovascular risk.

Consumption of boiled coffee thus increases the concentration of low density lipoprotein in the serum without affecting its lipid protein composition. The effect seem to be determined by the method of brewing (12).

The combination of consuming coffee and smoking cigarettes increase excess risk of pancreatic cancer (13). The caffeine intake affects absorption of some minerals like Fe, Zinc, Mg and Ca (14). It had been reported that the amount of some mutagens in roasted coffee beans raises a question of the safety of coffee brew as usually consumed (15). Caffeine contents were established as a non-alcoholic beverage based on some methods like HPLC or others(16,17).

MATERIALS AND METHODS

MATERIAL: In this research, it was studied with coffee beans (Coffea arabica) total ten samples, which were provided from five different markets as green and roasted beans; HA1, GB1, HC1, KDI, YE1. (market codes)

METHOD: Extraction of trigonelline and caffeine was made according to(18).

Samples were prepared using the anion exchange Dowex 1-X4 (100-200 mesh) and a Millipore filter (0,45 µm).HPLC was waters, UV absorbance

dedectör, C18 RP-coloumn, mobile phase: 0,01 phosphate buffer and methanol (20: 80, V/V)(17-18).

RESULTS AND DISCUSSION

The results of green and roasted coffee samples given as follows in graphics:

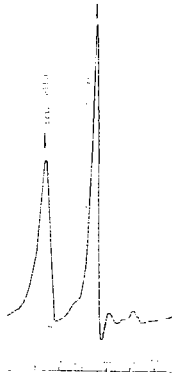


Figure 1- Chromatogram of trigonelline and caffeine of standart mixture

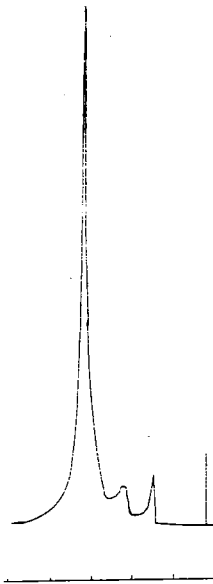


Figure-2 Chromatogram trigonelline and caffeine of sample

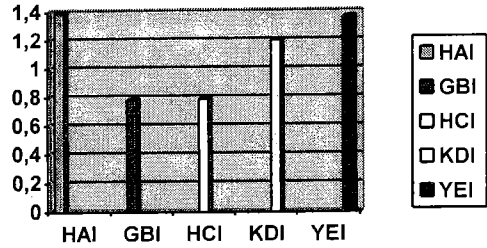


Figure-3 Caffeine contents of green coffee bean (C.arabica) samples

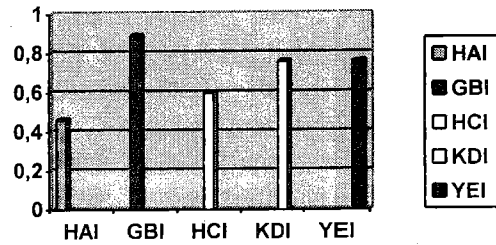


Figure-4 Trigonelline contents of green coffee bean samples

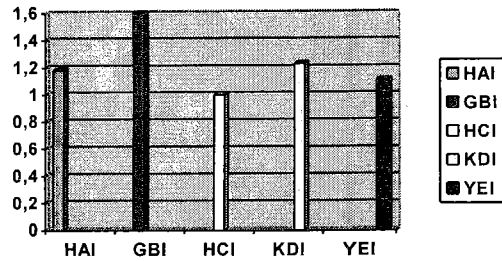


Figure-5- Caffeine contents of roasted coffee bean

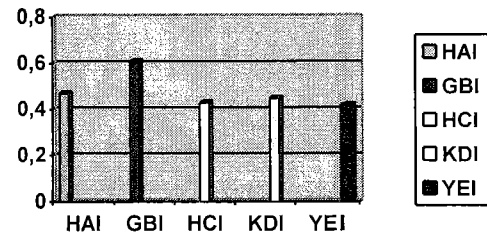


Figure-6- Trigonelline contents of roasted coffee bean.

The stimulating effect of decaffeinated was known coffee because it has 2 % caffeine content. Extracted caffeine is used in drug and food industry (1). Trigonellin compound is one of the interesting and an important coffee alkaloids (20).

In this study, trigonelline compound is almost the same amount in HAI both for green and roasted coffee samples. That shows that HAI sample was high roasted comparing with other samples. When compared green and roasted samples, it was observed that an important decrease in trigonelline quantity ratio after roasting. The reason for that Trigonelline converts into nicotinic acid when it was known stimulating effect of caffeine. Upon long-time consumption, it has addictive effect because of caffeine content (21). When caffeine quantities of between green and roasted coffee samples, were compared roasted coffee caffeine was high except in YEI sample, because of increase or dry weight basis. Similar results were found in the literature (16,17). When estimated that most of caffeine dissolved in of Turkish coffee, there is direct positive correlation between daily intake of coffee and caffeine. On the other hand, caffeine content was of C. arabica 1%. C. robusta has 2% Robusta is preferred for green coffee to be roasted at high temperature (22).

Nicotinic acid quantity of roasted coffee is sufficient for human nutrition and it is soluble in the water (22). So it can be present in "Turkish coffee" soluble extract, drinking of Turkish coffee can be contribute to nicotinic acid intake.

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