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Research Article

Qualitative evaluation of five popular marketed brands of coffee available in Bangladesh

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Abstract: Five different popular marketed brands of coffee available in Bangladesh, Viz. Nescafe, Black and gold, Maccoffee originial, Macoffee premium, and Moccona were studied before their expiry dates to evaluate their caffeine and polyphenol contents. The values of caffeine content were found to be varied from 1.56-1.78% whilst the maximum value was obtained in Nescafe and minimum in Moccona. The studied brands may, therefore be ranked as follows on the basis of their caffeine content so far determined : Nescafe > Black and Gold > Mac Original > Mac Premium > Moccona. The polyphenol Contents were found to be ranged from 5.53-6.45% where the highest value was obtained in Moccona and the lowest value in Nescafe. In concerning the polyphenol contents so far determined the studied brands may also be ranked as: Moccona > Mac Premium > Black & Gold >Mac Original > Nescafe.
Keywords: Qualitative evaluation, coffee, brands, Bangladesh..

INTRODUCTION

Everyday millions of people around the world begin their day religiously with a morning cup of coffee. Today, Coffee is the third most popular drink in the world behind water and tea [1]. Tea and coffee are largely used as popular drink where caffeine is one of the most desired components. Chemically caffeine or 1, 3, 5 trimethyle xanthenes ($C_8H_{10}O_2N_4$) is an alkaloid. Caffeine is a pharmacologically active substance and depending on the dose, can be a mild central nervous system stimulant [2]. It imparts bitterness and also acts as a flavour constituent [3]. Caffeine also contributes to the characteristic taste of a tea or coffee infusion, forming a physico-chemical complex with polyphenols [4, 5].

Phenolic compounds are ubiquitous constituents of higher plants found in a wide range of commonly consumed plant foods such as fruits, vegetables, cereals and legumes, and in beverages of plant origin, such as wine, tea and coffee [6,7]. Most of these compounds have received considerable attention as potentially protective factors against human chronic degenerative diseases (cataracts, macular degeneration, neurodegenerative diseases, and diabetes mellitus), cancer and cardiovascular disease [8].

While condensed tannins are the main phenolic compounds in coffee pulp, in the seed, phenolic compounds are present predominantly as a family of esters formed between certain hydroxycinnamic acids and quinic acid, collectively known as chlorogenic acids (CGA) [9]. Other phenolic compounds, such as tannins, lignans and anthocyanins are also present in coffee seeds although in minor amounts. CGA, which are present in high concentrations in green coffee seeds (up to 14 %), have a marked influence in determining coffee quality and play an important role in the formation of coffee flavor [10- 14].

Polyphenols especially clorogenic acids (CGA) are known to be important determinants of coffee flavor. They contribute to the final acidity [15] and confer astringency [10, 11, 13] and bitterness [16] to the beverage. As a result of Maillard and Strecker´s reactions, bitterness increases during roasting due to release of caffeic acid and formation of lactones and other phenol derivatives responsible for flavor and aroma [13, 17, 18].

So far the literature review is concerned no experimental work on the comparative evaluation of marketed brands of coffee available in Bangladesh has yet been done. With these views in mind a laboratory experiment was done to screen out the comparative status of caffeine and polyphenol contents in five popular marketed brands of coffee available in the markets of Bangladesh.

MATERIALS AND METHODS

Five different brands of coffee namely Nescafe, Moccona, MacCoffee Premium, MacCoffee Original, Black & Gold were collected from various supershops of Chittagong city in Bangladesh. All the glasswares were soaked overnight with chromic acid solution and washed thoroughly with water and detergent, then rinsed with de-ionised water before use. The chemicals and reagents used in this study were of high quality. The coffee samples were kept in a desiccator at room temperature throughout the analysis.

Determination of caffeine content in coffee samples:
Preparation of stock solution

5g coffee sample was taken in a 500ml conical flask. 10g crystal of MgO and 200ml of distilled water were added to the sample simultaneously. The mixture was then warmed in the water bath maintained at 40°c for 2hrs. Then, it was fittered through whatman- 42 and the filtrate was collected in 200 ml volumetric flask. The volume of the filtrate was made upto the mark by adding distilled water and used as stock solution.

Extraction

200ml of filtrate was taken in 500ml conical flask and 20ml diluted H_2So_4 (2ml conc. H_2So_4 + 18ml dist. H_2O) was added. This mixture of 220ml volume was then heated, at temperature 90°c ±2°c maintained in a water bath and reduced the volume of the mixture to about 50ml. The concentrated mixture was again filtered through whatman-42 and collected in the separating funnel. Then 20ml chloroform was added with the filtrate in the separating funnel and shaken well for 20 times. The separating funnel was then kept undisturbed on a stand for 10 minutes. The washed chloroform from the bottom of the separating funnel was collected in 50ml conical flask. The same filtrate was then washed thoroughly with different volumes (viz, 20, 15, 10 and 5ml) of chloroform and the total volume of the collected chloroform was washed with 5ml 1% KOH in a clean separating funnel and was collected in a 50ml oven dried conical flask which was previously weighed.

Procedure:

Each conical flask was cleaned; dried (oven-dry); marked and weighed in electric balance before receiving the washed chloroform. After receiving the chloroform the respective conical flask was kept in electric oven at 70°c for complete dryness. The weight of the dried concial flask was recorded in electric balance [19].

Calculation:

Caffeine = (S-B) mg/g

Where, S= weight of conical flask with caffeine after dryness, B= weight of conical flask before filtrate collection.

Determination of Polyphenol in coffee samples:
Preparation of 1000 ppm tannic acid stock solution:

1g tannic acid was taken in a 1000ml volumetric flask. Then, small amount of distilled water was added and shaken well to dissolve tannic acid. Then, the volume was made up to the mark with the addition of distilled water. This solution was used as 1000 ppm stock solution. From 1000ppm stock solution 1ppm, 2ppm, 3ppm, 4ppm & 5ppm solution were prepared.

Procedure:

100 mg of powdered coffee sample was boiled in a water bath with 100 ml of water for 30 minutes and filtered. 0.2 ml of the sample solution and 5ml of the reagent (100mg of $FeS0_4$. $7H_2O$ and 500mg of Rochelle salt in 100ml of water) were taken in a 25ml volumetric flask and filled to the mark with Sorensen's phosphate buffer of pH 7.5. Then the absorbance was measured at 540 nm against a blank solution substituting water for the reagent and the amount of polyphenol was determined using the correction factor (cf) obtained from the calibration curve made by using different concentration of tannic acid [20].

RESULTS AND DISCUSSION

The results as shown in Figure-1 exhibit that the levels of caffeine content in five popular marketed brands of coffee available in the markets of Bangladesh were found to be ranged from 1.56-1.78%. The results also indicate that caffeine content was found to vary with brands of coffee. The maximum value of caffeine content was found to be 1.78% (Nescafe) and the minimum value was found to be 1.56% (Moccona) and showed the following sequence as Nescafe> Black and Gold > Mac Original >Mac Premium > Moccona. LSD of caffeine content was found to be 0.029 at 5% level.

Generally coffee contains 1% caffeine [13]. It is reported that caffeine content of coffee beans may vary from 1.1–2.2% [21]. So the results of this study regarding the caffeine status reveal that all the five studied brands of coffee contained satisfactory amount of caffeine in comparison with the ISO standard. Yet, Nescafe was found to be superior among the other studied brands of coffee in concerning the caffeine content.

The results as shown in Figure-2 exhibit that polyphenol content was found to vary with brands of coffee. The results also show that the level of polyphenol content in five popular marketed brands of coffee available in the markets of Bangladesh were found to be ranged from 6.45-5.53%.

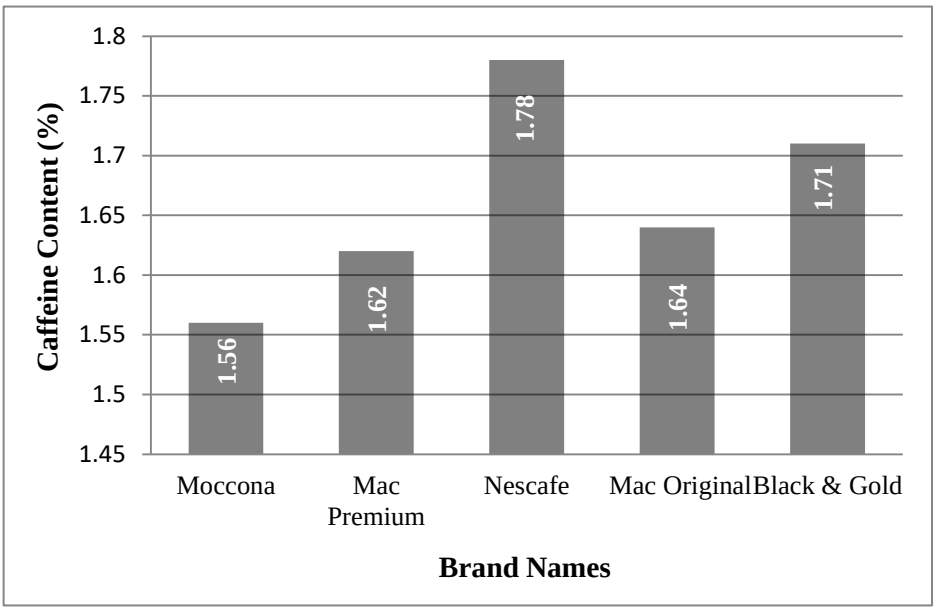

Fig-1: Variation of caffeine content in five popular brands of coffee available in the markets of Bangladesh.

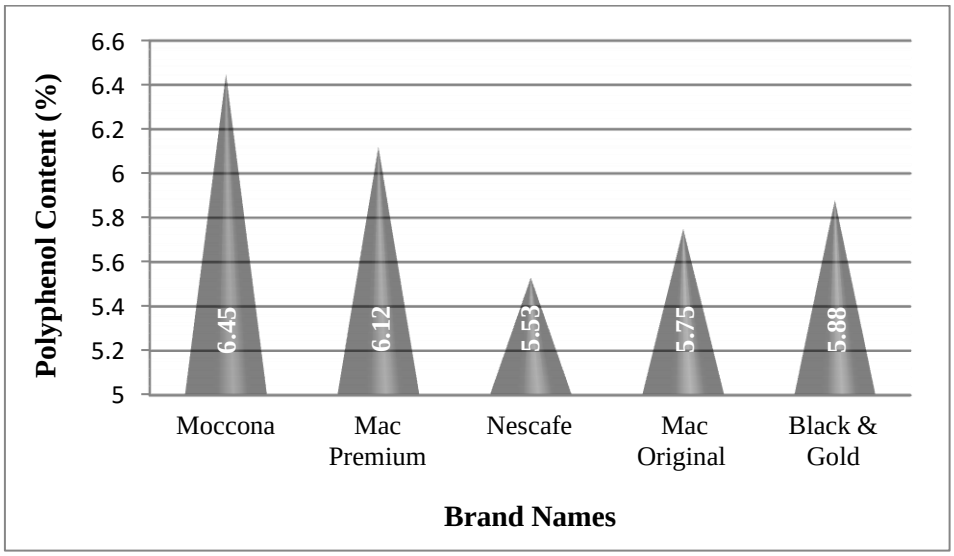

Fig-2: Variation of polyphenol content in five popular brands of coffeeavailable in the markets of Bangladesh.

The highest value of polyphenol content was found to be 6.45% (Moccona) and the lowest value was found to be 5.53% (Nescafe) and showed the following sequence as Moccona > Mac Premium > Black and Gold > Mac Original > Nescafe. LSD of polyphenol content was found to be 0.091 at 5% level.

Generally coffee contains 8% polyphenol content [13]. Phenolic compounds are secondary metabolites generally involved in plant adaptation to environmental stress conditions. Chlorogenic acids (CGA) and related compounds are the main components of the phenolic fraction of green coffee beans, reaching levels up to 14 % (dry matter basis) [22]. So the results of this study regarding the polyphenol status prove that all the five studied brands of coffee contained comparatively lower amount of polyphenol content than the ISO standard. Therefore, Moccona was found to be superior among the other studied brands of coffee in concerning the polyphenol content.

There might be some factors for which the studied brands of coffee varied in case of the amount of caffeine and polyphenol contents. Such factors include growing conditions, cultivation practices, processing techniques and other variables such as soil chemistry, altitude, the type of coffee bean, brewing time and water temperature etc.

Total CGA content of green coffee beans may vary according to genetics - species and cultivar,

degree of maturation and, less importantly, agricultural practices, climate and soil [9, 23- 25]. Severe weather conditions such as cold, high visible light and water stress conditions tend to increase the contents of phenolic compounds not only in the coffee plant and seed but also in other plants [26- 29].

Drastic roasting conditions may produce losses of up to 95% of CGA [16], with 8-10% being lost for every 1% loss of dry matter [30- 32]. Total CGA content in commercial roasted coffee ranges from about 0.5 to 7 % depending on the type of processing, roasting degree, blend and analytical conditions [33]. Water temperature may affect the amount of caffeine and polyphenol extracted from coffee beans. A longer infusion time also increases the caffeine and polyphenol contents and Brewed coffee has more caffeine than instant coffee [30- 32].

CONCLUSION

From the results, it can be concluded that in respect to caffeine content Nescafe was found to be superior among the studied five different brands of coffee. On the other hand, in respect to polyphenol content Moccona was found to be superior among the studied five different brands of coffee.

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