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EVALUATION OF EXTRACTION METHODS FOR HOUSEHOLD HERBAL PRODUCTS

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ABSTRACT

Microwave assisted extraction is a modern and novel approach for rapid and efficient extraction of the plant material which is of prime importance in herbal medicinal industry. For household herbal products (different tea samples, qehwa (Peshawari Qehwa), coffee (Nescafe Classic) and joshanda (Qarshi), their qualitative and quantitative analysis of phytochemicals were compared. Microwave assisted extraction gave the maximum amount of extracts than that of stove heating with significant difference of amount of phenolics and flavonoids. Maximum gallic acid (standard phenolics) was observed from microwave assisted extract of Tapal Tez dam. Stove extracts produced maximum phenolics from Lipton tea. Maximum catechin (Standard of flavonoids) was observed from microwave assisted extract of Johar Joshanda while stove extracts produced maximum catechin from Coffee sample.

Keywords: Microwave assisted extraction, stove heating, herbal products, phenolics

INTRODUCTION

Coffee and Tea are considered as the trendiest beverages for centuries, basically due to their pleasing taste and stimulant effects (Alan and Iris, 2004). Throughout the world, a cup of tea or coffee in the morning is considered as the sign of wakefulness; these are also in use to reduce the effects of wholeday work and resultant mental and physical exertion. These herbal products have a number of biologically active secondary metabolites such as phenolics, alkaloids, tannins and flavonoids. These all above mentioned plant secondary metabolites are beneficial to human health as antioxidants. There are scientific proofs in favor of tea and coffee which show that their regular use protect us from development of many chronic diseases and their acute effects (Al- Rasbi and Khan, 2013). Joshanda, herbal product which is in use as tea, is also considered as a treatment of some diseases. It was tested for the presence of acetyl salicylic acid and antioxidant character and positive results were obtained. It is obvious that the presence of these biochemicals in any extract make it much beneficial for human health (Soomro et al. 2011).

Scientific methods turned out to be more superior and preferred techniques in early 19th century, after this revolution people started to call the practice as quackery. But with increasing knowledge of side effects of conventional medicines as well as the increased resistance in pathogens, once again the trend of people began to transfer from conventional medicines to herbal medicines (Winslow and Kroll, 1998). Recent advances in functional foods also support the use of such products like tea, coffee and joshanda.

Extraction is a very basic step in formulation of herbal products and it involves the partition of medicinally activecomponentsof plant from the inactive, inert or undesired portion by using solvents of different polarity. The extract attained in this way may be prepared for use as a medicinal agent directly in the form of fluid extracts and tinctures and the most common example is tea, coffee and traditional Qehwa etc. These are the primary plant extracts which are in daily use, in further steps their extraction method may be checked for its efficiency to give more and more plant metabolites with its maximum capacity per unit of plant material (Handa et al. 2008).

After World War II, microwaves have been in use and now commercially used as domestic ovens. While use of microwave energy in science laboratories started in the late 1970s and for first time these were used in acid digestion. Microwaves are part of electromagnetic spectrum and have a frequency range of 0.3 to 300 GHz (Camel, 2000; Javad et al., 2014). Microwave assisted extraction (MAE) is going to be an efficient replacement of the conventional extraction methods like cold maceration, simple heating and boiling, Soxhlet, digestion, percolation and sonication. The majorbenefit of MAE is hidden in its

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heating source. The high temperature attained by microwave heating in turn reduces the extraction time and ultimately the volume of solvent essential (Camel, 2000).

In present study, extraction of tea, coffee and Joshanda was done by using simple boiling method on hot flame and by using microwave assisted extraction. Then a comparison for the amount of extract, phenolics and flavonoids was made for all of above mentioned products.

MATERIALS AND METHODS

Ten different samples were taken including tea samples (Green tea, Vital tea, Supreme tea, Danedar tea, Tez Dam tea, Tetley and Lipton tea), Qehwa (Peshawari Qehwa), coffee (Nescafe Classic) and Joshanda (Qarshi Joshanda). For each extraction, 10g of the samples were weighed accurately and placed in the beakers. Measured quantity of distilled H_2O (50ml) was added in beaker as an extracting solvent along with the plant material and then heated for extraction. Two different methods i.e., microwave heating and stove heating were then opted to extract the bioactive compounds from plant material. For microwave assisted extraction, each sample was heated in the microwave at full power level, described 1000W (Model HGN-45100EB) for 2 minutes for each sample each time. For obtaining the extract by stove heating extraction, each sample was heated at normal heat of stove for 2 minutes for each sample each time. For both extraction methods, each plant sample was strained after heating by using common household strainer and poured into pre-weighed glass vials and was subjected to shade drying. After drying, extracts were weighed and tabulated. Phytochemical analysis (Qualitative and Quantitative) of the extracts were done for phenolics and Flavonoids.

Phenolics: For1 ml sample (1mg/ml), there was added 1 ml of Folin and Ciocalteu's phenol reagent. After 3 minutes saturated Na_2CO_3 (1ml) was added. After that, by adding distilled water, the total volume of reaction mixture was made upto 10 ml. The reaction mixture was then kept in dark for about 90 minutes. Absorbance was checked at 725nm. Gallic acid was used as standard phenolics to construct the standard curve (100-200µg/mL) (Arabshahi and Urooj, 2007).

Flavonoids: 250µL extract (1mg/ml) was added with 1.25ml distilled water and 75µL of 5% $NaNO_2$. After 5 minutes, 150µL of 10% $AlCl_3$ were added. After 6 minutes of this addition, 500µL of 1M NaOH and 275µL of distilled water were added. Then the solutions were mixed well. Absorbance was measured at 510nm. Catechin was used to construct the standard curve (20-120µg/ml) (Wierong et al., 2004). Statistical analysis was done by comparing the means by applying the ANOVA and each value is representative of five replicates (Mean ± SD). Meansnot sharing a common superscript significantly differ at 5% level of significance by applying Duncan's new multiple range test. Statistical software (COSTAT) was used for this purpose.

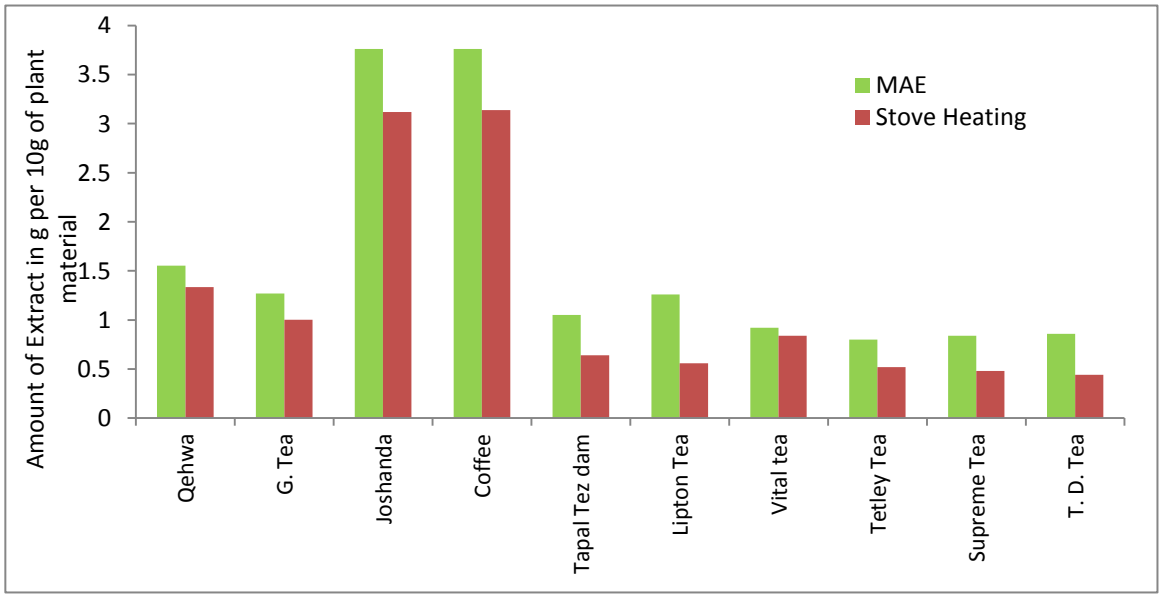

Figure 1: Comparative quantity of extract from ten different herbal products by two different methods of Extraction

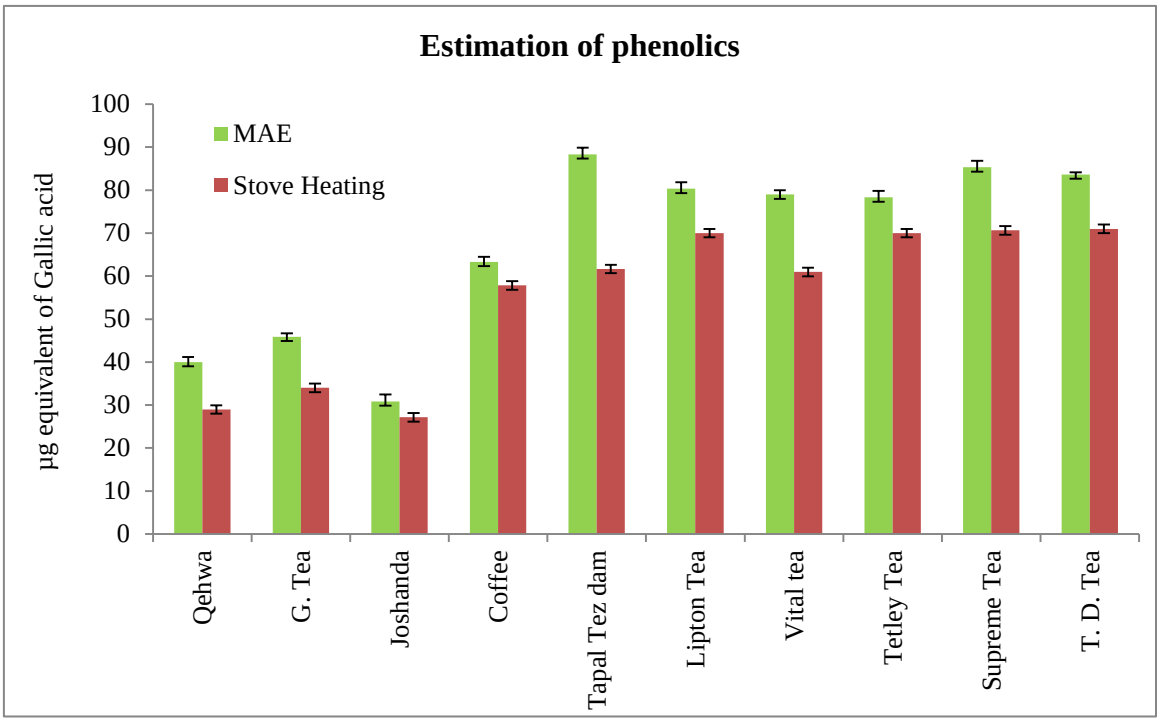

Figure 2: Comparative quantity of phenolics in extract from ten different herbal products by two different methods of extraction

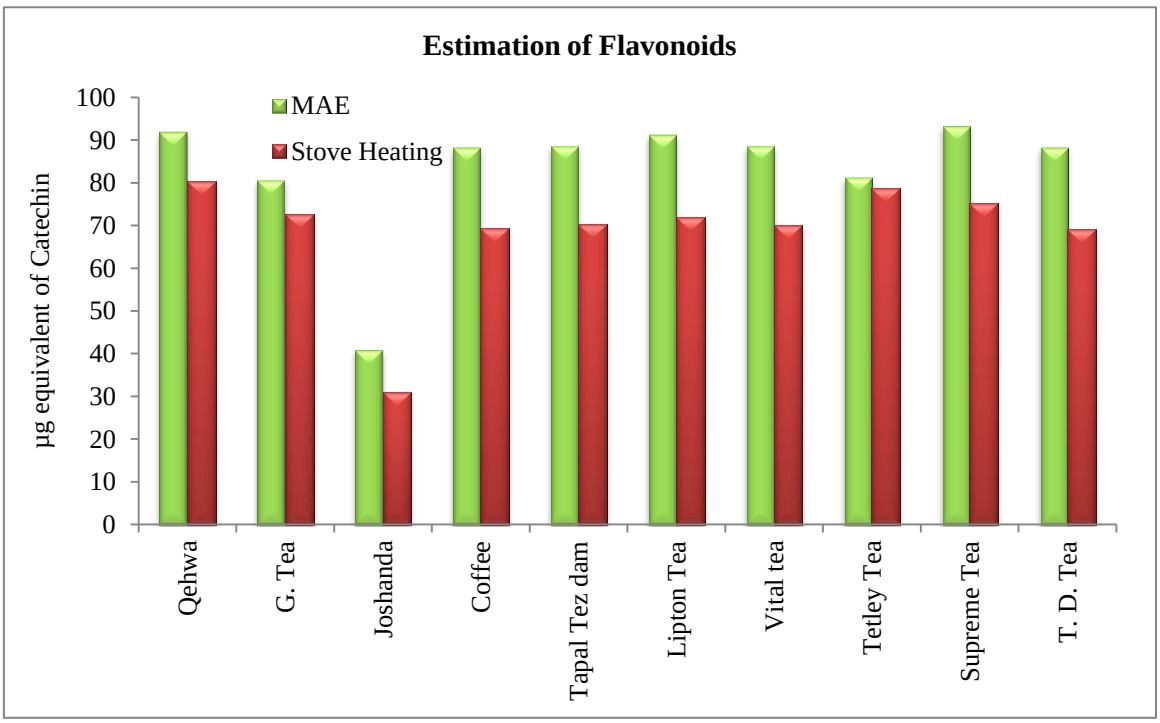

Figure 3: Comparative quantity of flavonoid extracts from ten different herbal products by two different methods of extraction

RESULTS AND DISCUSSION

In using the samples of Green Tea, Joshanda, Coffee, Tapal Tez Dam Tea, Tetley Tea, Supreme Tea and Tapal Danedar Tea, microwave assisted extraction method gave the higher extracts as compared to the stove heating extraction method. In case of Green Tea, the extract produced by the microwave assisted extraction was 1.27g and that by stove heating was 1.0g/5g of sample. Similarly in case of Joshanda, the value of the extract obtained by microwave assisted extraction was 3.76g and by stove heating extraction it was 3.12g (Fig. 1). On the other hand, samples of Qehwa, Vital Tea and Lipton Tea showed non-significant differences between the extracts obtained by microwave assisted extraction and stove heating extraction method. Similarly, significantly higher quantities of phenolics and flavonoids were found in microwave assisted extracts as compared to that in stove heated extract.

Microwave assisted extraction proved to be a rapid, efficient and modern method of extraction. When it is compared with conventional extraction methods, it showed targeted extraction, lesser by products, high extraction selectivity in a very short time and less labor. Microwaves are in fact electromagnetic radiations (Camel, 2000). The electric field of these waves causes heating with help of two mechanisms which are named as dipolar rotation and ionic conduction (Sinquin et al., 1993). Dipolar rotation is caused by the alignment of the dipolar molecules along the electric field. These dipolar molecules may be from both solvent as well as plant matrix. This alignment and resultant oscillations produce collisions with surrounding molecules and as a result a lot of heating energy is released. It is also reported that this phenomenon of heating occurs 4.91times per second if microwaves of 2.45 GHz are used (Onuska and Terry, 1995) and the resulting heating is very much fast. So it is clear that if a solvent with larger dielectric constant like water is used, there will be more resultant heating. Indeed, water is the common solvent used for household herbal products, showing more efficiency in microwaves as compared to conventional stove heating (Jassie et al., 1997). In such polar solvents, microwaves heat the whole sample at a time as compared to conductive heating method of stove heating. Another advantage of microwave heating is the breakage of weak hydrogen bonds in solvent as well as plant matrix, adding to its extraction efficiency (Camel and Bermond, 1999). Thirdly, Ionic currents are produced by electric field of microwaves in the solution, and the medium usually resists these currents. Due to these resistant effects once again heat is produced by a Joule effect. In fact, water content is very vital in MAE due to its polarity, heating effect and extraction efficiency which favor making teas, coffees and joshanda in microwaves. In addition, control of the water content of the matrix allows more reproducible results.

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