THERMOGRAVIMETRIC ANALYSIS OF SECONDARY POMEGRANATE REPROCESSED EXTRACT

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Human beings have cultivated pomegranate (*Punica granatum* L.) for its medicinal and nutritious properties for over 4000 years. Pomegranate fruit with 2.5–three million tons of annual global production is used to manufacture a wide range of food products such as fruit juice, concentrate, anardana, jam, candies, toppings, and canned arils besides its fresh consumption [1]. Pomegranate juice is a polyphenol-rich fruit juice with high antioxidant capacity[2]. This study was aimed to evaluate the antibacterial and antioxidant characteristics of incorporated pomegranate juice (PJ) and pomegranate rind powder extract (PRPE) into meat burgers. The peroxide value, thiobarbituric acid reactive substances, and metmyoglobin content for different burgers during 90 days storage at −18 ^{0}C were evaluated. Total anthocyanin content, total phenolic content (TPC) and free radical scavenging activity (RSA or IC50) for PJ and PRPE were measured as 18.90 (mg/mL), 4380 ppm, 0.136 (mg/mL) and 0.40 (mg/mL), 5598 ppm, 0.084(mg/mL), respectively[3]. This review intends to provide a general and organized overview of the accumulated knowledge on pomegranates, the identification of the most bioactive varieties, their potential consumption pathways and seeks to provide knowledge on the present gaps to guide future research[4]. Punicalagins are the main ingredients of phenolic compounds in pomegranate (*Punica granatum* L.) husk. A simple and accurate method for punicalagin analysis based on ethanol extraction and RP-LC using linear gradient of methanol in 0.1% TFA solution was established. The mean value of punicalagins content in pomegranate husk was 82.4 mg g^{-1}[5].

Experimental part

Extraction method. The extraction method used in this study is the maceration technique at a temperature range of [45–85 ◦ C] for 130 min. The temperature was maintained constant at a desired value during the extraction experiment by using a thermostatic bath. Various solid–liquid ratios were used (1/2, 1/4, 1/6, 1/8, 1/10, 1/20, 1/50) (g sample/mL solvent). After extraction, the extract was centrifugated for 15 min and filtered using Whatman filter paper. The pH of the PGP extract was determined by placing 1 g of the pomegranate peel (mean particle size = 0.45 mm) in contact with 100 mL of distilled water (pH 5.6). After filtering, the pH value of the filtrate was measured using a pH meter type Schott (CG-841 model), and the value of 4.16 was obtained. The effect of pH was studied for a pH value of 2–8. The pH values were adjusted with (0.01, 0.1, or 1N) HCl or/and (0.01, 0.1, or 1 N) NaOH. To evaluate the effect of solvent nature, different extractions were carried out with water, ethanol, and acetone. To prevent solvent evaporation, the solution was protected with plastic paraffin film. Particle size and agitation effect were also studied. The effect of these parameters on extract yield was evaluated by spectro-photometric measurement.

$$\text{Extraction rate}\,(\%) = \frac{\text{extract oven dried weight} \times 100}{\text{dry raw material used}}.$$

Fresh and dried peels were used. They were initially prepared to the desired particle size and then, immersed in water under continuous magnetic stirring for 6 h at 75 ◦ C. The tannins extract so obtained, was filtered and dried at 75 ◦ C to yield tannins powder.

Results and discussion

Thermogravimetric analysis

Thermogravimetric analysis (TGA) was performed with the French LABSYS EVO STA device. LABSYS evo STA (simultaneous thermal analysis) is an easy-to-use, reliable and high-performance thermal analysis platform for TGA and simultaneous analysis of TGA-DTA, TGA-DSC analysis methods. It was studied in a derivativeograph at a speed of 10 degrees/min, T-900, TG-200, DTA - 1/10, DTG - 1/10 galvanometer sensitivity, by automatically recording the derivativeogram on photo paper. The DTA curves are characterized by four mass losses. The first one about 8% due to water evaporation for temperature between 80 and 120 C. Three mass losses are observed at 200, 239 and 332 ◦ C (Fig1). Considerable weight loss could be explained by organic material decomposition cel-lulose and hemicellulose material. The thermogravimetric analysis curve of extracted tannins from pomegranate peel shows Three mass losses (Fig.2). The first one of 6% is attributed to the moisture mass loss. The second more important loss, occurring at 215 C and corresponds to the release of

carbon dioxide during heating (decarboxylation) [6]. The last one occurs at 455 C and corresponds to the oxidation of the important carbon residues (CO_2 , H_2O, CO). The decomposition process end is characterized by the residue rate equal to 43%. Pomegranate tannins extracted form are thermally more stable then radiata pine condensed tannins, which start to degrade at 156 C [7]. Moreover, they are more stable than commercial tannins such as the quebracho, the mimosa and the maritime pine tannins which decompose at 141, 143 and 14 ◦C, respectively[8].

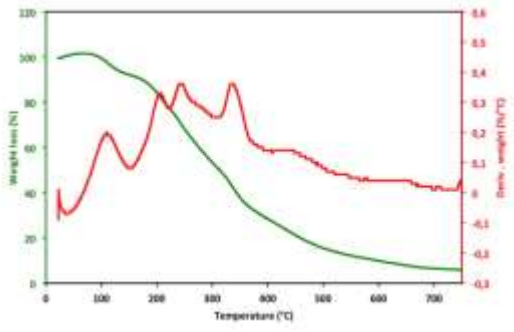

Figure-1.Thermogravimetric analysis of pomegranate peel

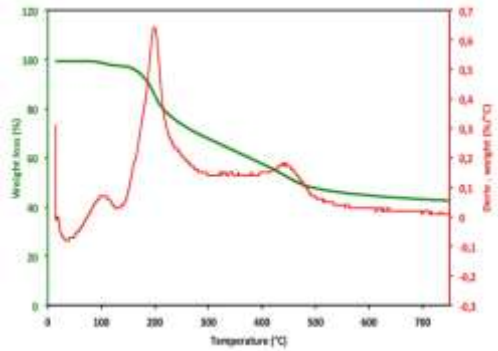

Figure-2.Thermogravimetric analysis of extracted tannins

Conclusion. In this study, tannin substance was extracted from the secondary waste of "Dashnobad" pomegranate grown in Sherabad district of Surkhandarya region. Thermal analysis was also analyzed extract of pomegranate.

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