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Comparative study of Wild bay leaves (*Laurus nobilis* L.,) growing in Northern of Morocco: A nutritional value

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Abstracts

Today, the growing interest in the use of plant and their crude extracts in food industry as nutraceutical and dietary supplement is observed. For this reason, the analyses, and determination of the nutritional value of herbs and spices such as *laurus nobilis* L., are more interesting at the moment in heath human promotion and in reducing the risk of chronic diseases. This research examined the nutritional value including moisture content, total sugar content and protein content extracted from wild *laurus nobilis* L., growing in Northern of Morocco, which have been commonly used as spice and herbs. To our knowledge, this is the first reports to examine the nutritional value such as (moisture content, total sugar content and protein content) of hydroacetonic and hydroethanolic extracts from *laurus nobilis* L. The moisture content was measured according to the conventional method. Besides, the total sugar content and protein content were determined by colorimetric methods.

Therefore, the quantification of total sugar content of *laurus nobilis* L., leaves has shown that all crude extracts are rich in sugar contents with different concentrations (107.696-140.945 mg GE/g of DW and 101.01-125.23 mg GE/g of DW).Furthermore; the results of protein content were globally similar with lower concentration in all studied extracts.

The result showed that *laurus nobilis* L., leaves contain essential nutrients that can be used as nutraceutical supplements which have a beneficial effect to human health by elimination of body toxin and regulation of glucose level in blood.

Keywords: Bay leaves (*laurus nobilis*.), nutritional value, moisture content, protein content, and total sugar content.

1-Introduction

Currently, there is an increased demand for medicinal plant such as spices and herbs in both developed and developing countries. A reason for this growing because consumers are becoming more interested in using these natural ingredients for their potential health benefits in worldwide **(Ngugen *et al.*, 2019).**

Laurus nobilis L. (Bay leaves, Lauraceae) is an important aromatic and medicinal plant of the Mediterranean region. The leaves of the plant are nowadays used as a spicy for cooking purposes in the local gastronomy. The bay leaves can be used in a fresh or a dried form for their distinctive flavour and fragrance. It has a sweet aroma when crushed or bruised, but taste bitter and aromatic. It's an active ingredient, used as sparingly in various preparations including soups, meat, seafood, vegetable dishes, sauces, and fish and removed before serving **(Riabov *et al.*, 2020)**.

As nutritional value, *Laurus nobilis* L leaves are a good source of various natural compounds such as fat, fiber, protein, ash, carbohydrate, energy but also considered as an important source of micro-and macroelements (Fe, Cu, Mn Zn and Na, Ca, P, Ka , Mg), vitamins (A, E , C, and B2), free sugars (fructose, glucose, and sucrose), and organic acids (oxalic acid, malic acid and total organic acid). However, literature reflects enormous variability in determined concentrations. Its leaves gave better content, which can be an assessed by their consumption **(Dias *et al.*, 2014)**.

Additionally, *Laurus nobilis* L. leaves contains a significant amounts of dietary compounds in particularly polyphenols (**Dobroslavić *et al.*, 2021, Dobroslavić *et al.*, 2022),** which can be consumed as a part of the daily diet**.** These phenolic compounds have been described as interesting bioactive compounds with biologicals activities and beneficial effects for human health against oxidative stress-related disorders **(Salehi *et al.*, 2020).**

This research aimed to the determine the nutritional value of bay leaves (*laurus nobilis* L.,) in female, male and shrubs trees grown in Northern of Morocco from Moulay Abdesalam commune of Tangier-Tetouan, Morocco. Herein, the moisture content, total sugar content and protein contents are estimated in hydroacetonic and hydroethanolic to explore their potential nutritional value as a natural product for use in the culinary and foods industries as a spice and flavoring agent , as well as for food preservation.

2-Materials and Methods

2-1-Study site

This current study was achieved in Northern of Morocco from Moulay Abdesalam commune of Tangier-Tetouan, Morocco **(Figure 1)**. This area was chosen mainly for the important popular use of this aromatic species in cooking and traditional medicine.

Northern Morocco is characterized by a Mediterranean climate humid in winter and semi-arid in summer. The province of Tetouan is located in the western part of the Rif east of the Tingitane peninsula. It is located at an altitude of 65 m not far from the Mediterranean coast. It is bordered to the north by the provinces of M'diq-Fnideq and Fahs Anjra, to the west by the Tangier wilaya and the province of Larache, to the south by the province of Chefchaouen and to the east by the Mediterranean Sea. From a bioclimatic point of view, it is a subhumid region with a warm winter **(Sauvage, 1963).**

Figure 1: Geographical location of the study site of Tazia (Abdeslam Commune of Tetouan region, Morocco)

2-2-Plants materials

Laurel leaves were harvested from wild trees (male, female and shrubs) in 2016 in Moulay Abdesalam region of Tanger-Tetouan of Morocco **(Figure 2)**. The identification and confirmation of this species was performed in the laboratory of the biotechnology of plant by Professor Ahmed Lamarti, a specialist in plant physiology at faculty of sciences, (Abdelmalek Essaadi University, Tetouan, Morocco).Then, the sample were immediately transported to laboratory and a sample of 40 leaves from each group was considered for determination of moisture content. The sample weight was measured with precision balance (presica, accuracy 0.01g).

Figure 2: Leaves of Bay leaves (*Laurus nobilis* L.,) from Northern of Morocco

2-3-Determination of moisture content (water content) of leaves

The leaves from Moroccan *laurus nobilis* L., were transported to laboratory after collection. Then, the initial moisture content of fresh leaves was estimated by drying the sample in hot air oven at 50 ^{0}C until constant weight was carry out. All experiment was achieved in triplicate.

The water content (moisture), considered as the loss of weight of the sample after drying, and was calculated using the following formula:

$$Moisture\ content(\%) = (mo - m1)/mo \times 100$$

mo= weight of sample before drying (g);

m1=weight of sample after drying (g);

2-4-Preparation of the extracts

2-5-Extraction method

2-6-Maceration extraction

Approximately 2 grams of the powder was extracted with acetone 70 % and ethanol 70% for 1 hour at room temperature by magnetic stirring extraction. Thus, the crude extracts were centrifuged for 15 min at a speed of 5000 rpm. The obtained extracts were stored in a freezer at 4^{0}C till analysis.

2-7-Quantification of total sugar content

The total sugar content was estimated according to the method of **Dubois et al., (1956)**, with some modifications. 1ml of suitably diluted sample, 1ml of the phenol solution (5% phenol in distilled water) is added, followed by 5ml of 95 concentrated sulphuric acid. After carful mixing with a vortex, the mixture is incubated at room temperature for 10 minutes. The mixture was then incubated in water bath at 30^{0}C for 20 minutes. The absorbance was measured at 488 nm against a blank. All measurement was repeated three times. The results are expressed in milligram equivalents per gram of powder of the plant studied (mg GE/g).

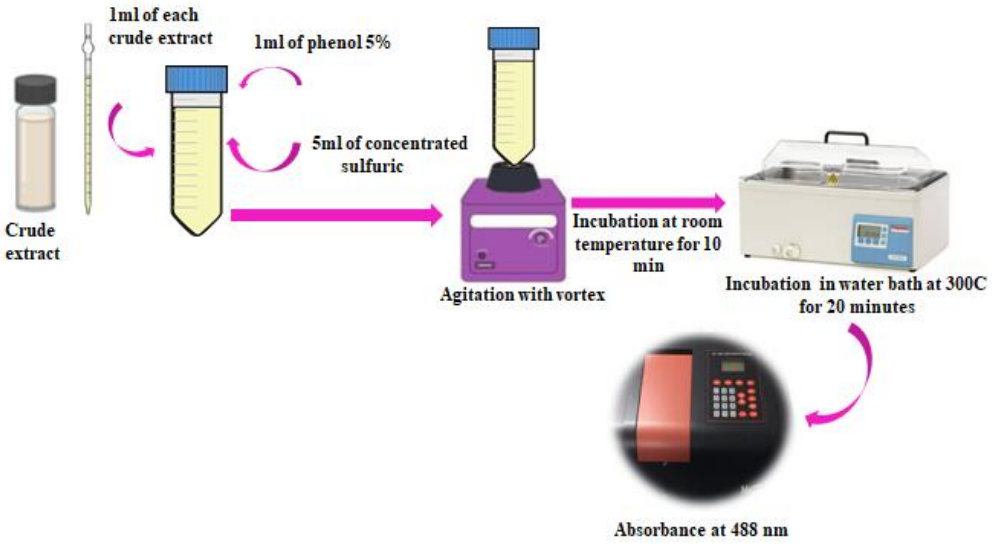

Figure 3: Procedure of estimation of total sugar content by colorimetric method.

2-8-Quantification of proteins content

In order to quantify the amount of protein in our plants, we opted for the method described by **Gornall, Bardawill and David (1949)** with certain modifications to adapt our extracts. In soda-lime glass containers we added 1ml of sample and 3ml of biuret reagent. The mixture was then incubated in the dark at room temperature for 30 min. the absorbance was measured at 540 nm against blank

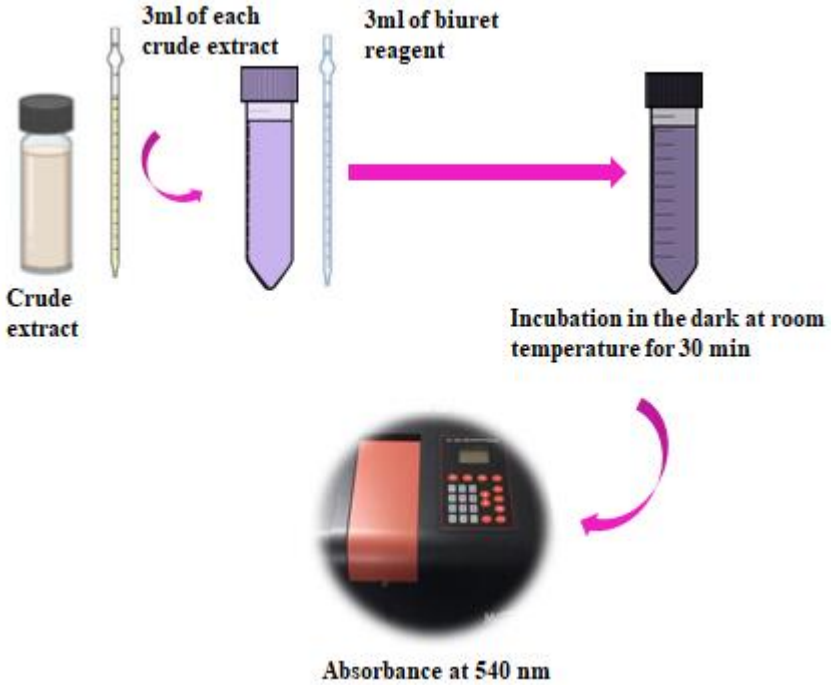

Figure 4: Procedure of estimation of proteins content by colorimetric method.

3-Result

3-1-Proximate analysis of *laurus nobilis* L.,

3-1-1-Determination of moisture content (water content) of leaves

The moisture contents of different dried *laurus nobilis* L., leaves growing in northern of Morocco was determinated by using standard oven method and the results expressed as percentage was represented in **Figure 5.** The result obtained for the moisture content of bay leaves is mean of triplicate determination.

The highest moisture content was estimated in leaf of shrubs with percentage (54.203%), followed by leaves from male (42.242%) and female (28.003%) trees, respectively.

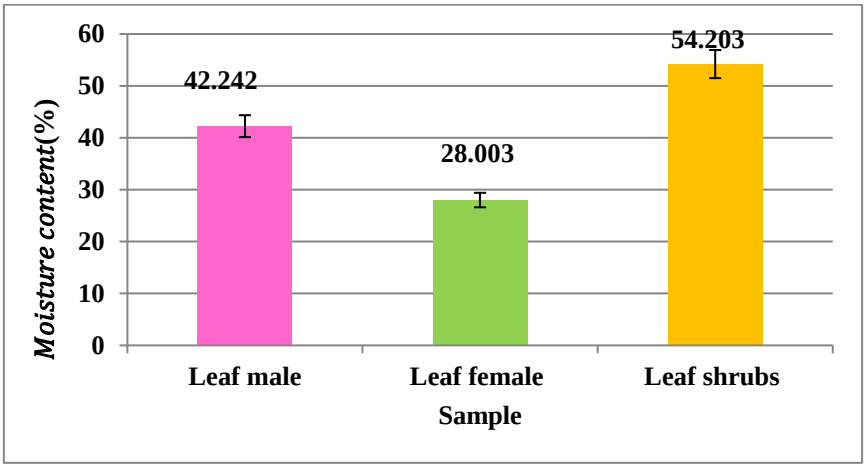

Figure 5: Moisture content of different *laurus nobilis* L., leaves

3-1-2-Total sugar content in *laurus nobilis* L.,

The quantification of total sugar contents from three bay leaves (male, female and shrubs) in both hydroalcohlic extracts (acetone and ethanol) are examined with simple and reliable colorimetric method and the results are reported in **Figure 3.** As depicted in this figure, all extracts revealed that *laurus nobilis* leaves are rich in total sugar content with different concentrations, whereas the acetone shown the highest amounts of total sugar content in female (140.945 mg GE/g of DW), male leaves (137.06 mg GE/g of DW) and finally leaf shrubs (107.695 mg GE/g of DW).

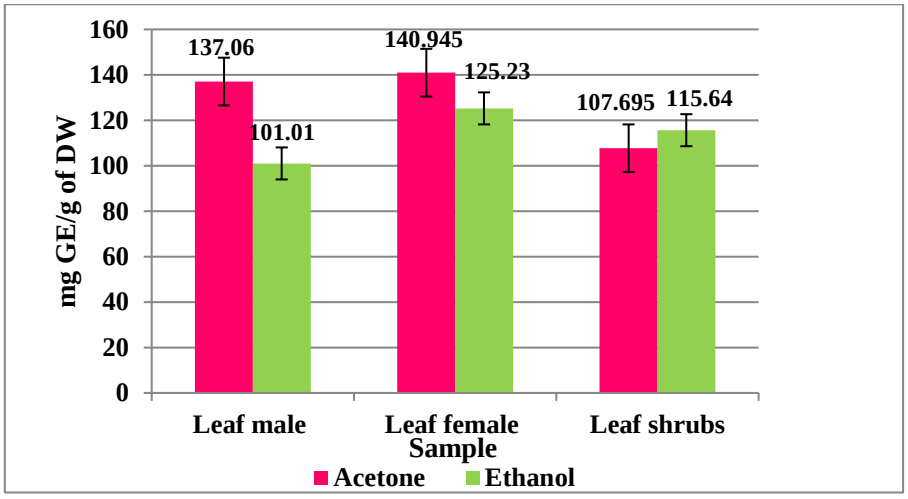

Figure 6: Total sugar content in hydroacetonic and hydroethanolic laurel leaf extracts

3-1-3-Proteins content in *laurus nobilis* L.,

The proteins content of various leaves of laurel trees was studied and the results are presented in **Figure 4**. The sample herein studied showed similar content of proteins with concentration varied from 0.02 to 0.033 BSAE /g of DW. In general, both solvents (acetone and ethanol) are the most effective solvents for the extraction of proteins contents from the leaves of *Laurus nobilis* L.

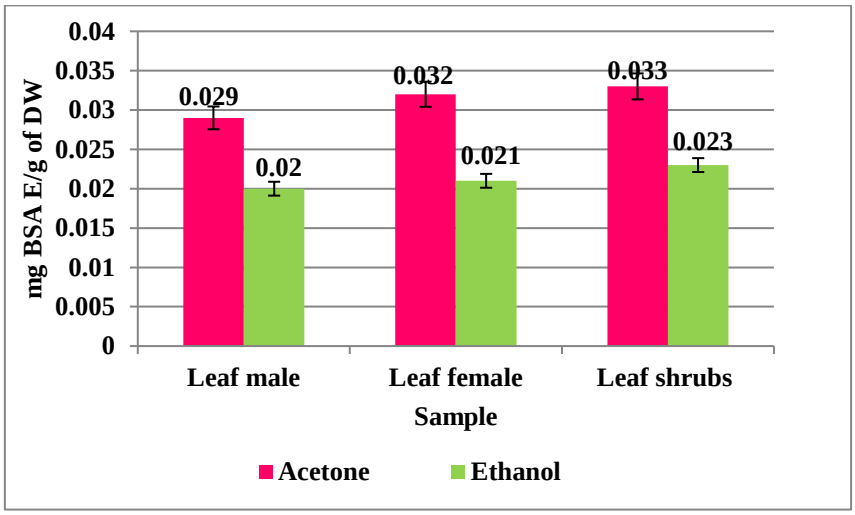

Figure 4: Proteins content on both hydroalcoholic laurel leaf extracts

4-Discussion

4-1-Proximate analysis of *laurus nobilis* L.,

4-1-1- Moisture contents

The moisture content of different *laurus nobilis* L., leaves in the present study was disagree with previous studies in literature **(Al-Hashimi et Mahmood, 2016 ; Onuminya *et al.*, 2017 Shahidi *et al.*, 2018 ; Aduloju *et al.*, 2019 ; Victor *et al.*, 2021)**. Indeed, those authors given that the moisture content of *laurus nobilis* leaves collected from different regions the world had lowly variable (4 to 10.84%). Nonetheless, the moisture content of our leaves was higher in water content (28.003-54.203%), this shows that they are the most subject to deterioration since perishability of food increases with high moisture content.

4-1-2-Total sugar content

The finding data indicated that all extracts studied are rich in sugar contents with different concentrations (107.696-140.945 mg GE/g of DW). Comparisons with existing literature revealed important variations in the total sugar content of bay leaves **(Dias *et al.*, 2014; Alkurdi *et al.*, 2015; Al-Hashimi and Mahmood, 2016, Fagbenro and Usman, 2022).** In fact, **Dias *et al.*, (2014)** reported the highest amounts of total sugar content in cultivated (79.27 g/100g of DW) and wild (76.26 g/100g of DW) samples of *laurus nobilis* L., leaves. Furthermore, **Fagbenro and Usman, 2022** described the high carbohydrate content (70.46%) of bay leaves from Nigeria.

In addition, the leaves purchased from Basrah local market was rich in total carbohydrates (50.83%) **(Al-Hashimi et Mahmood, 2016).** On other hand, **Alkurdi *et al.*, 2015** revealed the lower amount of total sugar in leaves planting in the ground (9.83%) and in pots (7.86%).

The differences in total sugar content may be due to the difference in locality, stage of maturity (juvenile and mature phase) and environmental conditions (temperature, soils, humidity, and pH).

4-1-3-Protein content in *laurus nobilis* L.,

The results obtained by biuret reagent in this study shows lower amount of protein content in all crude extracts tested. Therefore, this data is in agreement with previous literature reports on other geographic region **(Dias *et al.*, 2014; Al-Hashimi et Mahmood, 2016; Sanaeirad *et al.*, 2017; Barroso *et al.*, 2018; Fagbenro and Usman, 2022).**Variations in protein content observed in *laurus nobilis* leaves can be explained at the first time by the difference of sex but also period stage of plant and secondly it's may be related to several factors including pH, temperature, genetic of plant, and research methodology.

5-Conclusion

The present study has been devoted to determine the nutritional value of various *laurus nobilis* L., leaves such as moisture content, total sugar content and protein content in hydroacetonic and hydroethanolic extracts. The highest moisture content was indicated in leaf of shrubs with percentage (54.203%), followed by leaves from male (42.242%) and female (28.003%) trees, respectively. In addition, the total sugar content is higher in all crude extracts with different concentrations (107.696-140.945 mg GE/g of DW). However, the result of protein content in this research showed the lower concentration in all studied extracts. These result suggesting that this plant is important source of nutritional value that can be present an interesting benefits for body human, which can be used as spice in cooking or infusion teas with heat water. Further analysis are need also to calculated other parameters including (ash, energy, fiber, fat, and mineral element) for valorize this aromatic plant and to confirm these results.

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