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Antioxidant Activity of Bio-extract which Obtained from Hazelnut Shells and Green Leafy Covers

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Abstract: The article presents the findings of an antioxidant activity assay conducted using 70% ethanol and deionized water on extracts from green leafy covering (GLC) and hazelnut hard shells (HS) that are grown in the northwest of Azerbaijan. The kinetics of each extract were examined using a UV-2700 vis spectrophotometer, and the DPPH (2,2-Diphenyl-1-picrylhydrazyl) technique was used to determine the extract's free radical scavenger activity. The results show that the bio-extracts obtained in 70% alcohol have radical scavenging activities of FRSA(hs)=59.24% and FRSA(glc)=35.72%, while the bio-extracts obtained in water have radical scavenging activities of FRSA (hs)=31.15% and FRSA(glc)=22.23%. Waste is significant for treatment, affordable, and an effective preventive measure since it is derived from raw resources.

Keywords: Hazelnut hard shell and green leafy covering, Bio-extract, Free radical scavenger activity.

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1. INTRODUCTION

Recent global pandemic-related issues have underscored the importance of exploring and applying novel herbal natural remedies. This is particularly significant given the development of numerous synthetic pharmaceutical preparations used to treat a variety of infectious diseases in humans. Large-scale trials conducted in the past two years have further supported the necessity for therapeutic medications with antioxidant effects in the treatment of these disorders in the general population. It was found that plant-based antioxidants, in contrast to synthetic antioxidants, are the safest option (1).

The presence of antioxidant-containing microelements and bioactive substances in natural treatment solutions contributes to their effectiveness and benefits. It has a more profound effect on the human body and has better therapeutic quality. Inhibiting the redox process in lipids and triggering the removal of free radicals created in the mitochondria during the metabolic process, antioxidants play a unique function in human life and activity. It has been established that when the concentration of free radicals in the body exceeds 5%, they damage cells at the molecular level and result in the occurrence of various diseases in humans. Currently, plants containing Mn, Zn, Se, Cr, Si, J elements, and the B, C, D, and F group vitamins are employed extensively as natural antioxidants for both medicinal and preventative purposes, with significant advantages (2–5).

Additionally, among the most crucial bioactive compounds are lignans, polyphenols, tannins, and steroidal saponins. They lower the organism's cholesterin content. They have a direct impact on the gut flora and gene expression. Currently, foods like beans, green leafy covering plants, cereal goods, fruit-vegetable combinations, orchards, and tea have many benefits because they are primary sources of antioxidants. Investigations revealed that the extracts from the green leafy covering and the hard shell of hazelnuts were rich in bioactive polyphenols and mineral components with increased antioxidant activity. Italian researchers found that the bio-extract made from hazelnut shells includes tannins and neolignans, two polyphenolic substances with strong antioxidant activity (6–8). Researchers in Turkey have shown that the chemical paclitaxel, which is found in hazelnut shells, has a strong antioxidant impact, helps the body scavenge free radicals, and boosts immunity

(9). The extract taken from the hazelnut shell included 27 phenolic components, according to studies conducted in Singapore (10). Further research has revealed that hazelnut green leafy covering contains 17 phenolic acids, which have been shown to have strong antibacterial and antioxidant properties. As a result, it is advised that these compounds be taken into consideration as possible sources of antioxidants (11). The bio-extract made from green leafy covering and hazelnut shells has radical scavenging properties that are dependent on the extractive materials, extraction technique, and environmental factors (12–14).

After analyzing the chemical composition and biologically active components of the bio-extracts made from the hard shell and green leafy covering of hazelnut plants that grow in Azerbaijan's northwest, it was found that these plants are rich in mineral elements and other organic compounds that are biologically active. Research has indicated that the hazelnut hard shell bio-extract in 70% ethanol includes Cr-8.0 mg/g, Mn-104 mg/g, Zn-12 mg/g, and Si-698 mg/g. Conversely, the green leafy covering bio-extract contains Cr-13.0 mg/g, Mn-17.0 mg/g, Zn-10.0 mg/g, and Si-631.0 mg/g. Eight organic compounds were found in the hazelnut hard shell bio-extract, while five organic compounds were found in the green leafy covering bio-extract. These compounds were found to have antioxidant activity (15,16). The bio-extracts made from the hard shell and the green leafy covering, as can be observed, contain biologically active substances with antioxidant activity as well as essential microelements that are present in the body's daily required amount and work well as a preventative and therapeutic measure.

The investigation on the antioxidant properties of bio-extracts made from the hard shell and green leafy covering of hazelnuts using 70% ethyl alcohol and deionized water is reported in this article.

2. MATERIALS AND METHODS.

2.1. Plant Materials

The hard shell and green leafy covering of the common hazelnut plant in the Shaki region of Azerbaijan are the research objects. The hard shell and green leafy covering were first cleaned with tap water, then dried, ground, and cleaned again with distilled water. The extracts were obtained using 70% ethyl alcohol and deionized water.

2.2. Preparation of Extracts

At room temperature, the hard shell and green leafy covering of samples of typical hazelnut plants were dried and ground into a powder. Fifty grams of the ground sample were added to a 500 ml flask. After that, 300 mL of distilled water was added to the ground samples. At a temperature of 100 °C, the combinations were removed for 30 minutes. After extraction, the solution was filtered. After that, 100 milliliters of distilled water were combined with the leftover ground material, and the mixture was extracted for fifteen minutes. It was necessary to filter the obtained extract before combining it with the original extract. Once more, the flask's residual was combined with 100 milliliters of distilled water and extracted for 15 minutes. Before being mixed with the original extract, the obtained extract was filtered. At a temperature between 75 and 80 °C in a water bath, the alcohol extraction process was accurately followed. Using an SPT-200 Vacuum-Drier, both extracts were crushed into a powder (15).

2.3 DPPH Radical Scavenging Activity of Extracts

A widely used method to evaluate a material's ability to scavenge free radicals is the stable DPPH radical scavenging model. Using a 70 μM DPPH solution in methanol and the UV-2700 spectrophotometer technique, the free radical scavenging activity (RTA%) of the bio-extracts was calculated in a typical room atmosphere using the formula RSA%=(A0-As)/A0 equal (17). First, the absorption of a 70 μM DPPH solution was ascertained. Following kinetic measurements, the absorption of each bioextracts was assigned.

3. RESULTS AND DISCUSSION

The kinetics of free radical scavenger activity were investigated, activity was calculated, and comparative analysis was carried out for each extract (Fig 1).

Initially, a 70 μM DPPH solution was produced in methanol. The absorption was then measured in a 3 ml cuvette using a UV-2700, and the value of absorption was roughly 0.8211 at 516 nm. After extracting 500 μL of DPPH solution from that cuvette and adding 500 μL of bio-extract to another cuvette, the kinetics were observed after 20 minutes.

The graph shows that from 0 to 60 seconds, all kinetics curves have a sharp decline. Still, there is a small decrease from 60 to 260 seconds. Furthermore, kinetics lines nearly continue in later seconds while remaining stable. At first, the control DPPH's absorbance is 0.8211. At the conclusion of each procedure, the absorbance of the combination solution was measured, and radical scavenging activity RSA (%) was computed. Table 1 displays the absorbance and RSA of the bio-extracts made from the hazelnut's green leafy covering and hard shell.

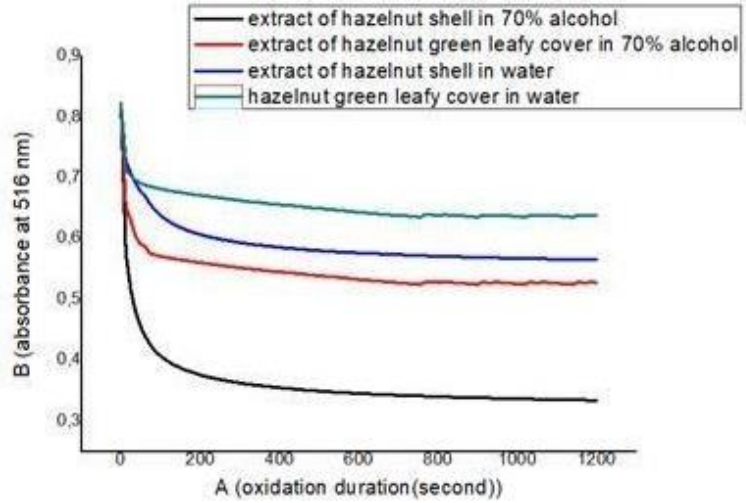

Figure 1: Bio-extracts obtained in 70% ethanol and water: their kinetics.

Table 1: Radical scavenging activities of 70% ethanolic and aqueous bio-extracts from hard shell and green leafy covering of hazelnut.

No	Name of sample	Absorbance		Radical scavenging activity, RSA %	
		In alcohol	In water	In alcohol	In water
1	DPPH	0.8211	0.8210	-	-
2	Bioextract of the hazelnut hard shell	0.3342	0.5653	59.2452	31.1543
3	Bioextract of the hazelnut green leafy covering	0.5278	0.6384	35.7215	22.2366

The results of the analysis of the kinetics of all four bio-extracts indicate that the hard shell bio-extract has a stronger radical scavenging activity than the green leafy covering bio-extract, regardless of the extractants used. The graph shows that while all extracts had 0.8211 absorption features at the beginning, the kinetic lines decreased rapidly between 100 and 150 seconds and then remained stable for the remaining seconds. The bio-extracts derived from the hard shell had a stronger radical scavenging activity than those from the green leafy covering, according to an analysis of the kinetics of each bio-extract. A computation was done regarding the absorption value at the conclusion of the 30 minutes while the kinetics were being recorded. The graph shows that while all extracts had 0.8211 absorption features at the beginning, the kinetic lines decreased rapidly between 100 and 150 seconds and then remained stable for the remaining seconds. The bio-extracts derived from the hard shell had a stronger radical scavenging activity than those from the green leafy covering, according to an analysis of the kinetics of each bio-extract. A computation was done regarding the absorption value at the conclusion of the 30 minutes while the kinetics were being recorded. According to the calculations, the radical scavenging activity of bio-extracts obtained in 70% alcohol is FRSA(hs)=59.24% and FRSA(glc)=35.72%, but the radical scavenging activity of bio-extracts obtained in water is FRSA (hs)=31.15% and FRSA(glc)=22.23%.

Studies by Siriwardhana SS. and Shadi F. found that the bio-extract from the hazelnut's green leafy covering had a hydrogen peroxide radical scavenging activity of 66% at 100 ppm concentration and 90% at 200 ppm concentration and that it cleaned organic free radicals more effectively (18). The presence of polyphenols and other bioactive compounds in hazelnut bio-extracts made from both the hard shell and the green leafy covering are related to their antioxidant activity (19, 20). The hydroxyl groups in polyphenols, the potential for a donor-acceptor pathway, or the metal chelating impact all contribute to their antioxidant potential (21). The fruits, vegetables, and grains that we eat daily have antioxidant activity that is on par alongside and in certain cases even higher than bioextracts derived from hard shells and green leafy covering of hazelnut (22).

4. CONCLUSION

In the northwest of Azerbaijan, where common hazelnut (Corylus avellana L.) grows, the radical scavenging activity of bio-extracts obtained in 70% alcohol is FRSA(hs)=59.24% and FRSA(glc)=35.72%. In contrast, in water, it is FRSA (hs)=31.15% and FRSA(glc)=22.23%. The high concentration of phenolic compounds and other bioactive components with antioxidant activity accounts for the bio-extract's high relative sound attenuation (RSA) that was extracted from the hard shell. A comparison examination of the data reveals that, in terms of antioxidant indicators, the bio-extracts made from the hard shell and green leafy cover of hazelnuts cultivated in Azerbaijan with 70% ethanol are comparable to those made from hazelnuts grown in other nations. Compared to the antioxidant activity of fruits, vegetables, and cereals that we eat on a regular basis, the RSA activity of bio-extracts made from solid and green bark is comparable and, in certain instances, even higher. Another benefit of bio-extracts from the hard shell and green leafy covering is that, in contrast to fruits

and vegetables, they are year-round and can be produced year-round. Additionally, because they are made from less expensive waste raw materials, they are accessible and economical.

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