



## Determination of antioxidants in some natural hair cosmetic in Sudan

Abdelazim Ibraheem Elgasim<sup>1</sup>, Bara'ah Ali El-Tahir<sup>2</sup>, Amina Aboubakr Bala<sup>3</sup>

<sup>1</sup>Assistant Professor, Department of Chemistry, Faculty of Education, University of Omdurman Islamic University, Khartoum, Sudan

<sup>2</sup>Assistant Professor, Department of Chemistry, Faculty of Education, University of the Holly Quran and Islamic Sciences, Khartoum, Sudan

<sup>3</sup>Assistant Professor, Department of Biology, Faculty of Education, University of the Holly Quran and Islamic Sciences, Khartoum, Sudan

### Abstract

The objective of this study was to determine useful antioxidants in some herbal plants and animal product, beeswax and Sesame Oil widely applied in Sudan as hair cosmetics. Since some herbal plants are known to have high content of phenolic compounds and polyphenols, they were expected to have strong antioxidant activity. It was found that colves, ginger and hibiscus, cosmetics herbal plants, had higher percentages of antioxidant of 90.4%, 85.7%, 20.5% respectively, than that of Sesame Oil (48.1%). Hair cosmetic of animal product of beeswax and camel hump fats had higher percentages of antioxidant of (26.4%) and (14.3%) respectively, than that of lamb grease (4%) and bone marrow fats (3.1%). The application of Sudanese natural hair cosmetic products, particularly those containing high content of antioxidants, give hair enough support to prevent its damage caused by reactive oxygen species produced in the strong sunny and duty environmental conditions in Sudan.

**Keywords:** antioxidants, herbal plants, animal fats, hair cosmetics, free radicals

### Introduction

Antioxidants are compounds that inhibit oxidation. Oxidation is a chemical reaction that can produce free radicals, thereby leading to chain reactions that may damage the cells of organisms (Dabelstein 2007). Free radicals are highly reactive molecules with unpaired electrons that can directly damage various cellular structural membranes, lipids, proteins, and DNA. The damaging effects of these reactive oxygen species are induced internally during normal metabolism and externally through exposure to various oxidative stresses from the environment. The body possesses endogenous defence mechanisms, such as antioxidant enzymes (superoxide dismutase, catalase, glutathione peroxidase) and non-enzymatic antioxidant molecules (vitamin E, vitamin C, glutathione, ubiquinone), protecting it from free radicals by reducing and neutralizing them (Shindo 1994) [10].

In the case of failure of the antioxidant defence system, antioxidants need to be supplemented from outside sources, like synthetic one. However, studies conducted subsequently have demonstrated that synthetic antioxidants have toxic effects and, consequently, restrictions have been imposed on their use. Therefore, researchers have focused their studies on plant-derived natural antioxidants (Kulisic 2004) [6].

Human hair is exposed to a number of chemical and physical hazards, such as combing, brushing, heating, drying and different chemical treatments which render it brittle and dull. Moreover, UV-light irradiation, causes significant hair damage. The culprits are called ROS (reactive oxygen species). Most of these ROS are generated in the water phase; thus wet hair is particularly susceptible. Attention should be paid to the sulfur-containing amino acid cysteine which is located in the rigid outer layer of the hair

structure, the cuticle. But also the aromatic amino acids tryptophan and tyrosine are easily degraded by light. Damaged hair has a porous surface and is thus more sensitive to free radicals.

Obviously, drying wet hair with a conventional dryer damages the hair structure significantly. This damage is not primarily caused by the heat itself but is induced by reactive oxygen species generated in the water film on wet hair. Thus, the application of antioxidants should offer adequate protection against this particular hazard that hair is subjected to every day (Zulli 2000, Johon 2013) [12].

Fats and oils are water-insoluble substances of plant or animal origin that consist predominantly of triglycerides. Those that are solid or semisolid at room temperature are normally called fats, while those that are liquid under the same conditions are called oils.

Oils are obtained by different techniques from the fruit of some vegetables or some animal organs. They are principally constituted by triglycerides; they also contain other lipophilic substances in low proportions, such as fatty alcohols, fatty acids, vitamins, phytosterols, etc. These last components determine in many cases their cosmetic and pharmaceutical activity.

In the earliest history of hair cosmetics there is naturally occurring waxes, animal fats and vegetable oils. Animal fats were used alongside plant oils in cosmetics to provide grooming effects on head and beard hair (Parichart 2017) [8]. Lamb grease, or so-called scientifically known as lanolin, is a fatty substance taken from lamb fat and wool; after separating from the skin after slaughter. Locally in Sudan known as (Wadak). It treats the problem of dryness, flattening, and destructions. It gives the hair a soft and a natural touch to look as if it has been softened all the time. (Crystal 2014).

The sesame oil contains many benefits for the hair because it contains a lot of amount of nutrients and proteins that nourish the hair and strengthen the roots. The problem of greying as a natural hair colour to make it darker, enhances hair growth, stimulates blood circulation in the scalp, nourishes it and protects hair from the harmful UV rays of the sun as it is a natural protection of the harmful sun rays. The hair eliminates the problem of head lice because it contains a lot of natural antibacterial and antifungal substances. It helps to treat dandruff problem, smoothest hair and protect hair from damage that can be caused by heat (Lily 2018)<sup>[7]</sup>.

Beeswax is considered one of the best types of physiotherapy which contributes to stimulating and strengthening hair growth (Hayel 2016)<sup>[5]</sup>.

The bone marrow is a white and butter like gel, which is found inside the bones of cows, goats, and sheep, known in Sudan as (Dehn Elsag). It makes hair brighter and healthier, restores its vitality and freshness, prevents its fall, nourishes it and increases its length (Wala 2017).

Hump is a fatty mass carried by camel over the back. Locally it is known as (Sanam Elebel) and consists of grease and fat. Studies have shown that the camel hump fats have a lot of benefits, such as, intensifying the hair to give it the super smoothness and removing its wrinkles, increasing its length, giving it the nutrition it needs, preventing dehydration and breakage, strength eningit is follicles and preventing falling (Aatikha 2018).

A majority of antioxidants naturally present in plants occurs in phenolic structures and especially in flavonoids structures. The extracts of ginger, hibiscus and colves herbal plant must contain antioxidants component (Youssef 2015). The objective of the study is determination of antioxidants and in some natural hair cosmetic in Sudan.

## Materials and methods

### Materials

Deionized water from a high purity water system, quality: specific resistance > 18.2 MΩ cm.

Dimethyl sulfoxide (DMSO).

2,2-Di (4-tert-octylphenyl)-1-picryl-hydrazyl (DPPH).

Propyl- gallated standard.

Sampls

### Instrument used

Ultraviolet/Visible (UV) spectrophotometer, (Thermo-scientific multiskan spectrum SN1500-722 Finland).

### Method

Shimada (1992)<sup>[9]</sup> reported that a number of widely used methods and modifications were proposed to determine antioxidant activity including total antioxidant activity. In this study, radical scavenging effect was determined for different samples of Sudanese hair cosmetic products. such as sesame oil, beeswax, bone marrow fats, camel hump fats, lamb grease and ethanolic extracts of ginger, hibiscus and colves.

Antioxidants content was determined according to the method of Shimada *et al.* (1992)<sup>[9]</sup>, with some modification. A 5mg of samples was dissolved in 1cm<sup>3</sup> of dimethyl sulfoxide. In 96-wells plate, the test samples were allowed to react with 2,2-Di (4-tert-octylphenyl)-1-picryl-hydrazyl stable free radical (DPPH) for half an hour at 37°C. DPPH was prepared in methanol. After incubation, decrease in

absorbance was measured at 517nm using multiplane reader spectrophotometer. Percentage of antioxidants was determined in comparison with that of a propyl gal late as standard. All tests and analyses were run in triplicate (Amina 2020)<sup>[11]</sup>.

## Results and discussion

The samples to be examined are: beeswax, lamb grease, sesame oil, bone marrow and ethanoic extracts of ginger, hibiscus and colves. All these samples are used as a hair grooming product to treats many problems of hair and scalp. The percentage of antioxidants in some Sudanese hair cosmetic products are summarized in Table 1.

**Table 1:** The percentage of antioxidants in some Sudanese hair cosmetic products

No.	Sample	Antioxidants content %
1	Sesame Oil	48.1
2	Beeswax	26.4
3	Bone marrow fats	3.1
4	Camel hump fats	14.3
5	Lamb grease	4
6	Animal fats	2.02
7	Colves	90.4
8	Ginger	85.7
9	Hibiscus	20.5

Since the colves, ginger and hibiscus herbal plants had a higher content of phenolic compounds and polyphenols, it had a stronger Antioxidant activities. The antioxidant properties of phenolic compounds originate from their properties of proton loss, chelate formation, and dismutation of radicals. Their structure activity relationships are examined for this purpose. Phenols are compounds that have the ability to destroy radicals because they contain hydroxyl groups. These important plant components give up hydrogen atoms from their hydroxyl groups to radicals and form stable phenoxyl radicals; hence, they play an important role in antioxidant activity. Therefore, determination of the quantity of phenolic compounds is very important in order to determine the antioxidant capacity of plant extracts (De Gaulejac 1999)<sup>[3]</sup>.

In addition, antioxidants are added to cosmetic to prevent deterioration in their taste, smell, and colour (Kulisic 2004)<sup>[6]</sup>. The uses of these herbal plants extracts give agood effects to hair.

## Conclusion

The antioxidant properties of phenolic compounds originate from their properties of proton loss, chelate formation, and dismutation of radicals. Their structure activity relationships are examined for this purpose. Phenols are compounds that have the ability to destroy radicals because they contain hydroxyl groups. These important plant components give up hydrogen atoms from their hydroxyl groups to radicals and form stable phenoxyl radicals; hence, they play an important role in antioxidant activity. Therefore, determination of the quantity of phenolic compounds is very important in order to determine the antioxidant capacity of plant extracts (De Gaulejac 1999)<sup>[3]</sup>.

In addition, antioxidants are added to cosmetic to prevent deterioration in their taste, smell, and colour (Kulisic 2004)<sup>[6]</sup>. The uses of these herbal plants extracts give agood effects to hair.

As a result, owing to its antioxidative properties, sesame oil is thought to be a natural source of antioxidants. It was observed to be the strongest compared with other animal fats and beeswax. It was observed that the radical scavenging effect of Sesame Oil was (48.1%), beeswax was (26.4%), bone marrow fats was (3.1), camel hump fats was (14.3%), lamb grease was (4%). The ethanolic extracts of colves, ginger and hibiscus had a radical scavenging effect were: 90.4%, 85.7% and 20.5% respectively.

## References

1. Amina Aboubakr Bala Mohamed. Determination of Natural and Mineral Ingredients in Sudanese hair Cosmetic Products, 2020.
2. Dabelstein W, Reglitzky A, Schutze A, Reders K. Automotive Fuels, 2007.
3. De Gaulejac NSC, Glories Y, Vivas N. Free radical scavenging effect of anthocyanins in red wines, 1999;32:327-333.
4. Fukumoto LR, Mazza G. Assessing antioxidant and prooxidant activities of phenolic compounds. J. Agric. Food Chem, 2000;48:3597-3604.
5. Hayel El Jazi. The benefits of bee wax for hair, 2016, 14 -23.
6. Kulisic T., Radonic A., Katalinic V., Milosa M. (2004). Use of different methods for testing antioxidative activity of oregano essential oil, analytical, nutritional and clinical methods, 2016;85:633-640.
7. Lily Greene. 12 Wonderful Benefits of Sesame Oil for Your Hair, 2018.
8. Parichart S. Follow Use of animal fats and oils in Cosmetics industry, 2017.
9. Shimada Kfujikawa, Yahara K, Nakamura T. Antioxidants properties of xanthan on the Antioxidation of soybean oil in cyclodextrin emulsion, 1992.
10. Shindo Y, Witt E, Han D, Epstein W, Packer L. Enzymic and non-enzymic antioxidants in epidermis and dermis of human skin. J Invest Dermatol, 1994.
11. Soares JR, Dins TCP, Cunha AP, Almeida LM.. Antioxidant activity of some extracts of *Thymus zygis*. Free Radic. Res, 1997;26:469-478.
12. Zulli F, Liechti Ch, Suter F. Controlled delivery of lipophilic agents to cell cultures for *in vitro* toxicity and biocompatibility assays. Int. J. Cosmetic Science, 2000;22:265-270.