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Full Length Research Paper

Antioxidant properties of cashew leaves' extracts before and after treatment with activated carbon used in cosmetics

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Natural ingredients such as cashew leaves extract could be an attractive candidate in cosmetic formulation. However, the plant extracts are normally dark brown and greenish color that might spoil the appearance of the products if they are added in cosmetic formulation. In order to solve this problem, use of activated carbon was tested to eliminate the intense color of plant extract without affecting the cosmeceutical properties. Ethanol and water extracts of cashew leaves were compared for the cosmeceutical properties mainly antioxidants. The system was tested with different concentrations of cashew leaves extract (CLE-5, 10, 15, 20, 25 and 30%) for solid and liqufied form of cashew leaves extract (CLE) before treatment with activated carbon and after treatment with (10, 15, 20 and 25 g). The study shows that 15 g activated carbon using 20% CLE (water) produces 0.13 radical scavenging activity (RSC%) antioxidant. Moreover, using a similar system, 25% CL (ethanol) produces 0.10 (RSC%) antioxidants.

Key words: Antioxidant properties, ethanol extract, water extract, cashew leaves, cosmeceutical.

INTRODUCTION

Cosmetics are products that are used to protect and improve the appearance of the skin or deodorate the human body. Today, the basic development of cosmecutical product is not just to cleanse, protect and moisturize, but to incorporate the antioxidants in skin care products. The concept of free radical damage has highlighted the importance of antioxidants and nutritional supplementation in maintaining health. Reactive oxygen species (ROS) are implicated in numerous pathophysio-logical events such as aging, cancer, atherosclerosis and diabetes (Halliwell et al., 1992). Mostly, the previous reserchers conducted their experiments on antioxidants of cashew nut (Singh et al., 2004), cashew nut shell liquid (CNSL) (Amorati et al., 2001). Cosmetics include skin-care creams, lotions, powders, perfumes, and so on. Today, with the growth of knowledge, consumers are moving towards the use of cosmetics from natural resources, more effective and with no chemical ingredients. They are looking for products without any side effects and at the same time more effective in maintaining the health of the skin. For this reason, some consumers use cosmeceutical products with combination of cosmetic and pharmaceu-tical ingredients to reduce or delay the process of skin aging as well as maintenance of healthy skin by addition of photochemicals such as antioxidants.

Antioxidants are components that are needed to protect the cells from aging caused by unstable molecules known as free radicals. These compounds have the ability to whiten (Sánchez-Ferrer et al., 1995) and rejuvenate the skin (Wolf et al., 1998; Pelle et al., 1999) mainly because of vitamin E, beta carotene, and vitamin C. The sources of the natural antioxidants are mostly from natural resources like plants, that are rich in phenolic compounds. As a matter of fact, plant extracts that are rich in antioxidants components will have high potential to

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be developed into cosmetic formulation . One of the challenges of using the plant parts in cosmetics formulation is the dark green colour of their extracts which will spoil the appearance of the final cosmetic products, besides its original odor. There are many methods available for decolorisation process. However, activated carbon is the most commonly used method of dye removal by adsorption (Raghavacharya, 1997). Decolorisation process has to be easy, fast and economical and the extract is usually in liquid form.

Some parameters used to be considered for decolorisation and optimisation included cashew leave extract concentration, amount of granular activated carbon used and selecting a suitable solvent (water or ethanol) for extraction. This study is focused to address antioxidant issues related to herbal extracts for cosmetic application.

MATERIALS AND METHODS

Cashew leaves sources

Cashew is a tree in the flowering plant family of Anacardiaceae. Anacardium occidentale L. (cashew) is a multipurpose tree of the Amazon. Fifteen species of small to very tall trees make up this genus, which occurs in tropical parts of America. Its English name derives from the Portuguese name for the fruit of the cashew tree, caju, which in turn derives from the indigenous Tupi name, acajú. It is now widely grown in tropical climates for its cashew "nuts" and cashew apples (Mishra et al., 2007).

Preparation and extraction of cashew leaves

To avoid any contamination or dust, the leaves were cleaned and spread to dry at room temperature in a clean room for 7 days. The dried leaves were then grounded to powder form and stored in dry places upon extraction process.

Soxhlet extraction of grounded cashew leaves (up to 20 g)

Each powdered samples of cashew leaves (10 g) were extracted using 95% ethanol (200 ml) using soxhlet system. Extraction was carried out for 18 h at 78 to 80°C. The extract was then evaporated on the rotary evaporator to concentrate it. It was then dried overnight in temperature and kept for further use in a cold (4°C) and dry place.

Cashew leaves extraction by soaking method (more than 20 g)

Soxhlet extraction is time consuming and limited by its ability to hold samples (up to 20 g). In order to produce higher volume of extract, the extraction by soaking was carried out. Therefore, different weight (5, 10, 15, 20, 25 and 30) g cashew leaves powder prepared and then 6 beakers with 100 ml ethanol in each of them. Different volumes of cashew leaves powder were added to the beakers to make 6 different concentrations (5, 10, 15, 20, 25 and 30%). They were left in the lab for 24 h, after which they then filtered, evaporated, dried and kept in a cool place for the next processes.

The paste mixed with water and ethanol for decolorisation experiments. Free radicals are highly reactive molecules or chemical species containing unpaired electrons that cause oxidative stress, which is defined as “an imbalance between oxidants and antioxidants in favor of the oxidants, potentially leading to damage” (Sies, 1997). Oxidative stress can damage lipids, proteins, enzymes, carbohydrates and DNA in cells and tissues, resulting in membrane damage, fragmentation or random cross linking of molecules like DNA, enzymes and structural proteins and even lead to cell death induced by DNA fragmentation and lipid peroxidation (Beckman and Ames, 1998). These consequences of oxidative stress construct the molecular basis in the development of cancer, neurodegenerative disorders, cardiovascular diseases, diabetes and autoimmune disorders.

Folin’s reagent is usually used to quantify the total phenolic and polyphenolic compounds which present in plants, food and beverages. The most easy, fast and simple analytical method are by using free radicals. A rapid and inexpensive example of these analytical methods is 2, 2-Diphenyl-1-picrylhydrazyl (DPPH) method. It is now widely used to test the ability of compounds to act as free radical scavengers or hydrogen donors and evaluate antioxidant activity of foods. It has been proved that it is an accurate, convenient and rapid way to determine antioxidant activity of various foods (Soto et al., 2008). The reaction mixture contains 500 of test sample extracts and 500 of DPPH in ethanol. The concentration of DPPH is 0.0027 g in 50 ml ethanol in the reaction mixture. These reaction mixtures were in darkness for 30 min, the absorbance was measured at 570 nm (Liana-pathrianan and Shahidi, 2005).

RESULTS AND DISCUSSION

The concern of this study is not only to reduce the green colour of cashew leaves but also maintain the quality of extract. High amount of antioxidant is the main reason for this purpose because the cashew leaves contain high potential antioxidant to be develop into cosmeceutical formulation ingredient. Although, most of antioxidant activities from plant sources are derived from phenolic-type compounds, these must not indicate that the presence of small quantities of phenolics will result in low antioxidant activities.

Therefore, in this section, DPPH free radical scavenging activity was carried out to investigate if the antioxidant property of extracts was being maintained after the treatment which reduces the colour and quantities of phenolics in the samples. DPPH is one of the commonly used substrate for fast evaluation of antioxidant activity because of its stability (in radical form) and simplicity of the assay. In this assay, the ability of investigated sample extracts to act as donors of hydrogen atoms or electrons in transformation of DPPH radical into its reduced form DPPH-H was investigated (Babji et al., 2005). If the sample is able to turn the stable purple coloured radical solution into yellow colour solution, then it has the ability to scavenge free radical.

Figure 1 indicates that there is a significant reduction in antioxidant value after treatment CLE (water) with granular activated carbon (GAC). It is more obvious in 10,

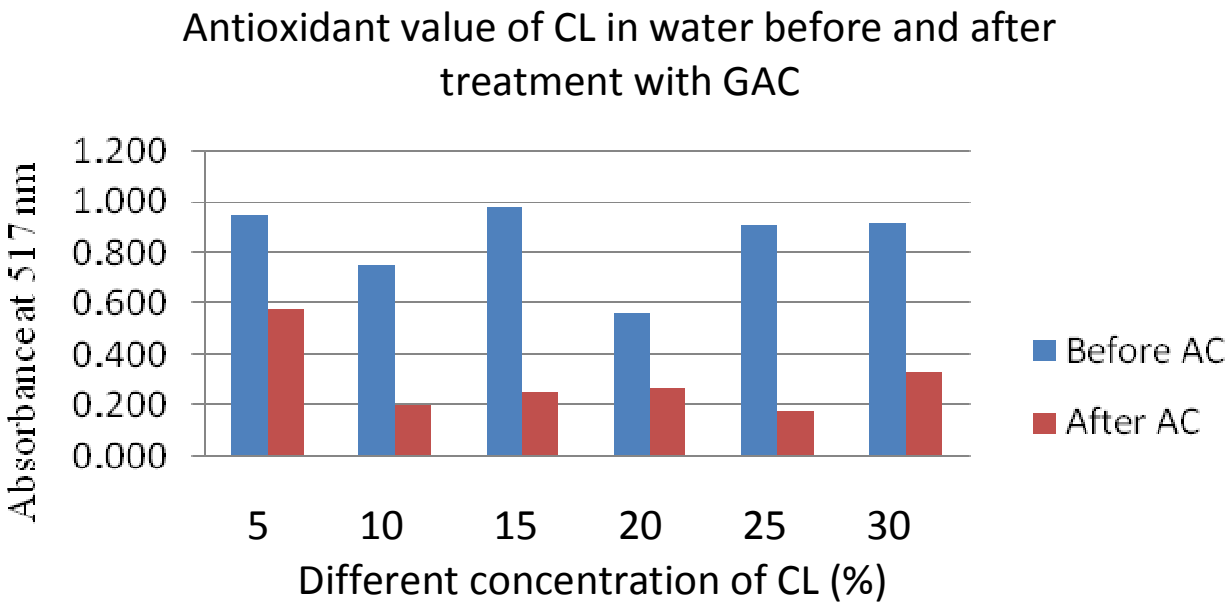

Figure 1. Comparison of antioxidant value before and after treatment of CLE (water).

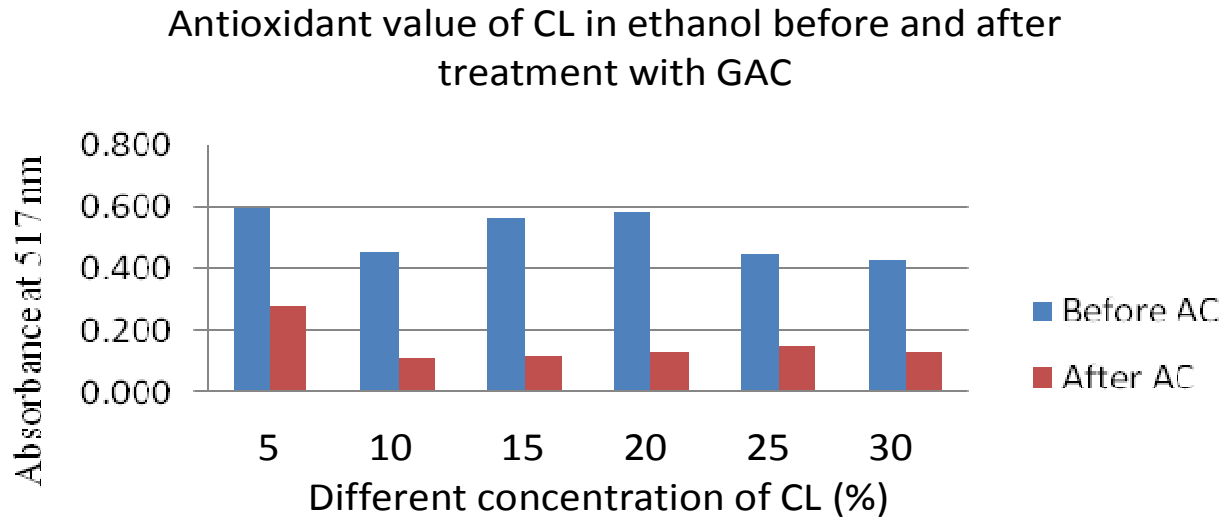

Figure 2. Comparison of antioxidant value before and after treatment of CLE (ethanol).

15, 25 and 30% CLE. Figure 2 shows a sharp decrease in antioxidant value after treating CLE (ethanol) with GAC. It is more obvious in 10, 15, 20, 25 and 30% CLE. The decrease is the highest when using 15 and 20% CLE.

In this comparison, samples from different experiments were collected after 1 h exposure to different amount of GAC. The antioxidant values were compared before and after 1 h treatment for both water extract and ethanol extract. In both samples, it can be concluded that with 1 h treatment with GAC, significantly reduced the antioxidant level of all samples tested.

Figure 3 shows that for 5% CLE (water) reduction in antioxidant value starts after 1 h mostly for 15 g and 20 GAC. However, it is constant until end of experiment (6 h). Figure 4 indicates that there is no significant reduction in antioxidant value after treatment of 10% CLE (water). Figure 5 presents antioxidant value decrease until 2 h treatment of 15% CLE (water) then remain constant. Figure 6 shows there is a significant reduction in

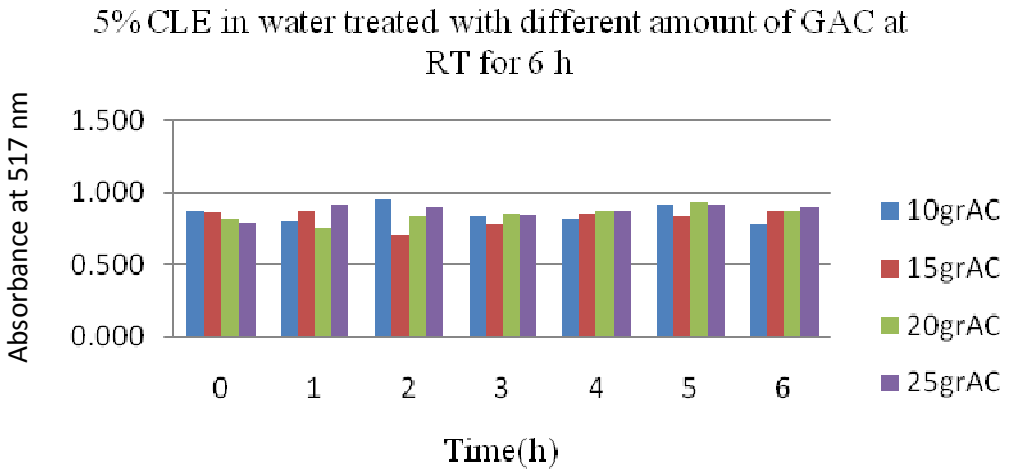

Figure 3. Antioxidant activity at different contact time for treatment of 5% CLE in water.

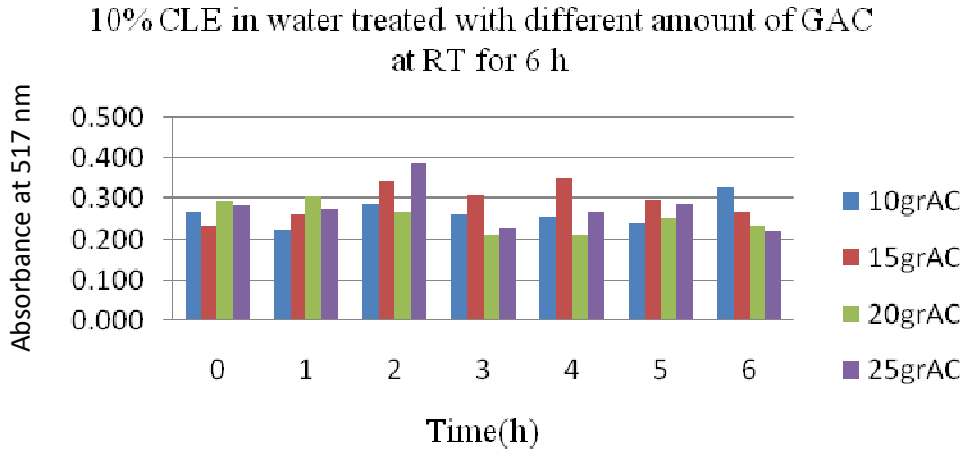

Figure 4. Antioxidant activity at different contact time for treatment of 10% CLE in water.

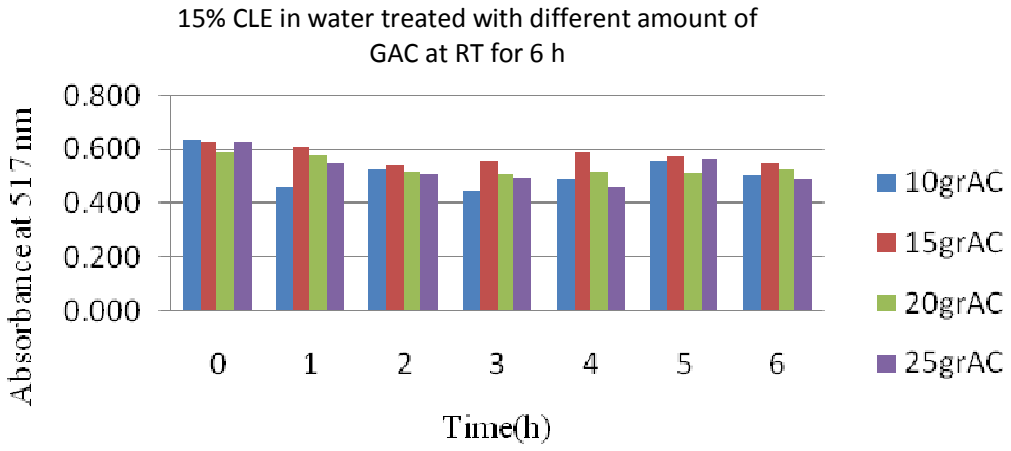

Figure 5. Antioxidant activity at different contact time for treatment of 15% CLE in water.

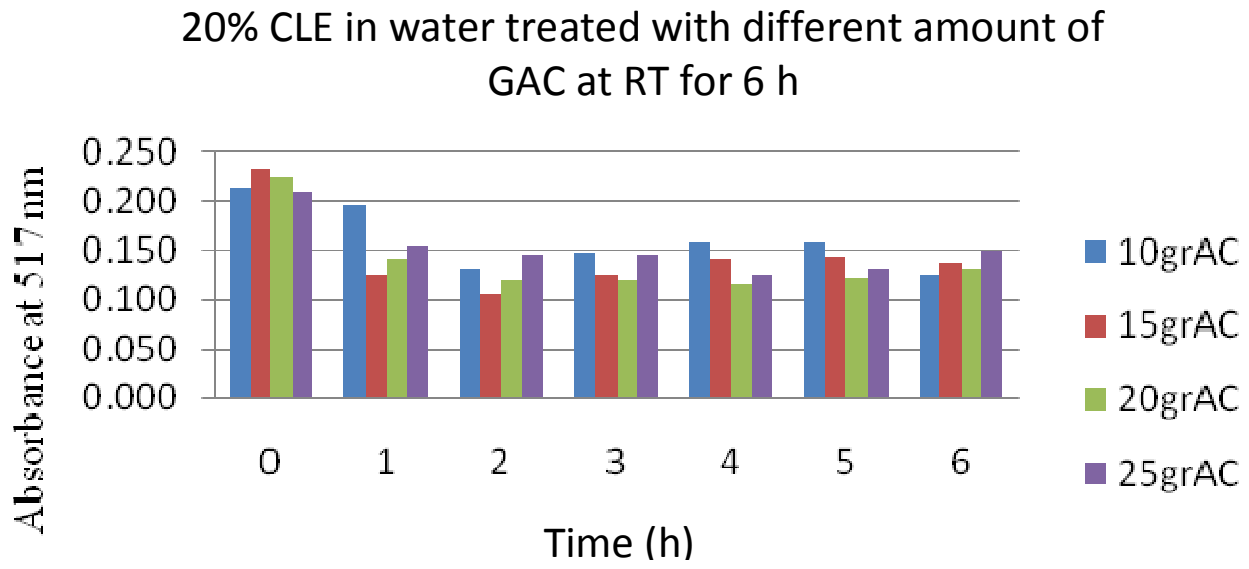

Figure 6. Antioxidant activity at different contact time for treatment of 20% CLE in water.

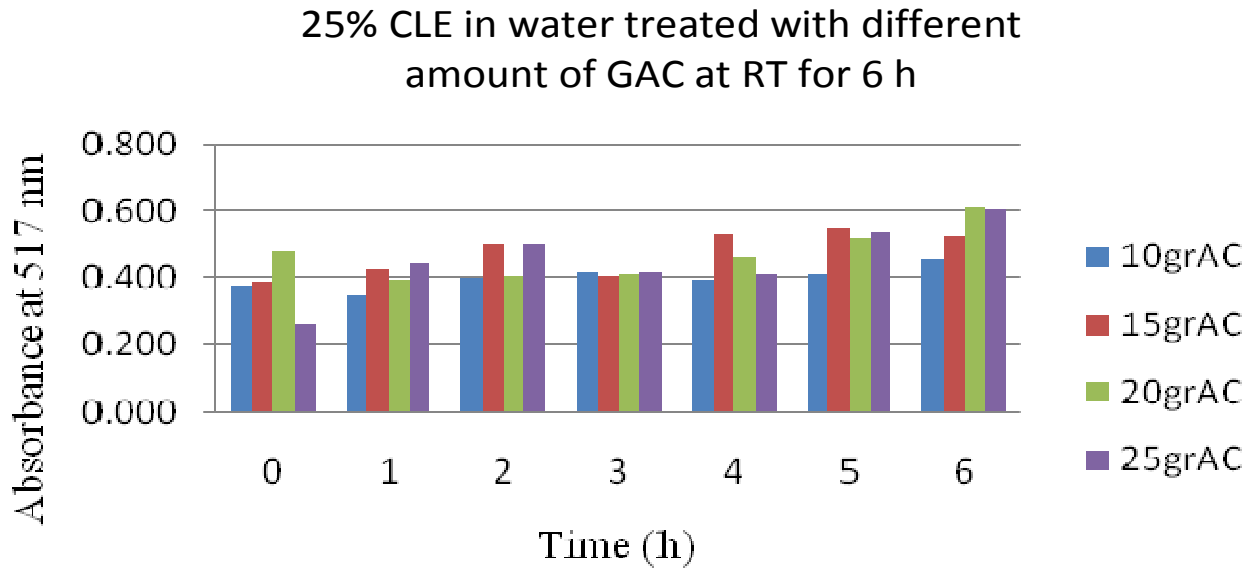

Figure 7. Antioxidant activity at different contact time for treatment of 25% CLE in water.

antioxidant value within first hour treatment of 20% CLE (water) then remain constant until end of experiment (6 h).

In Figure 7, the graph shows that significant reduction in antioxidant occurs after one hour of treatment but exposing extract to GAC for more than 5 h gave false reading (increase in absorbance value) which is illogical. In Figure 8, this graph shows that after 1 h of treatment, antioxidant level seems to increase. The increase in absorbance could be due to the released of powdered GAC to the solvent. Since the CLE concentration is high (30%) and did not produce good colour reduction, this concentration was not selected for further study. In Figure 9, there is a significant reduction in antioxidant value after first hour treatment of 5% CLE (ethanol). After that antioxidant value remain constant. Figure 10 shows that there is a significant decrease in antioxidant value within first hour treatment of 10% CLE (ethanol). Antioxidant value after that remain constant. In Figure 11, there is a significant reduction in antioxidant value mostly for

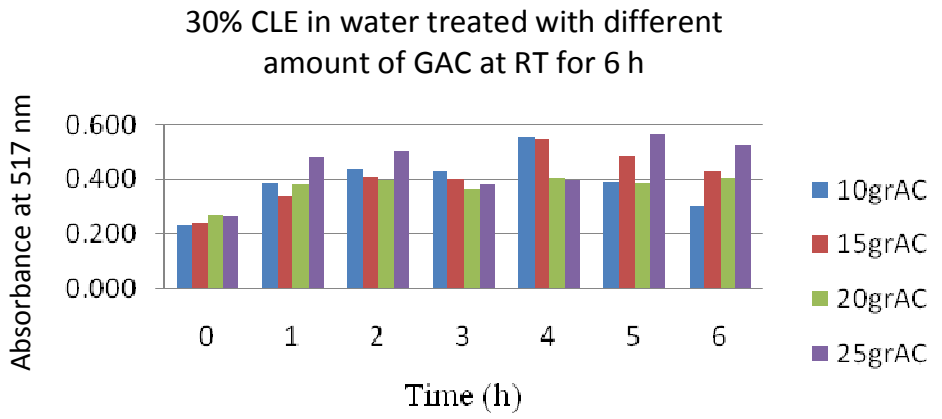

Figure 8. Antioxidant activity at different contact time for treatment of 30% CLE in water.

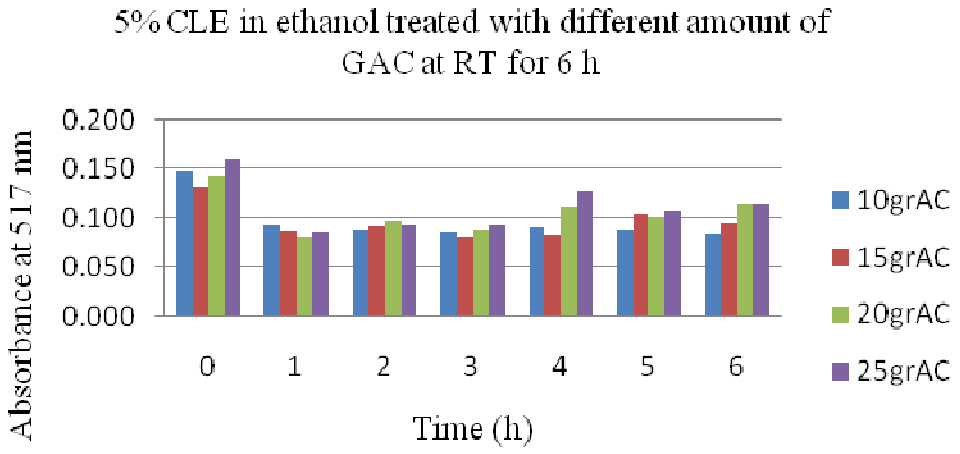

Figure 9. Antioxidant activity at different contact time for treatment of 5% CLE in ethanol.

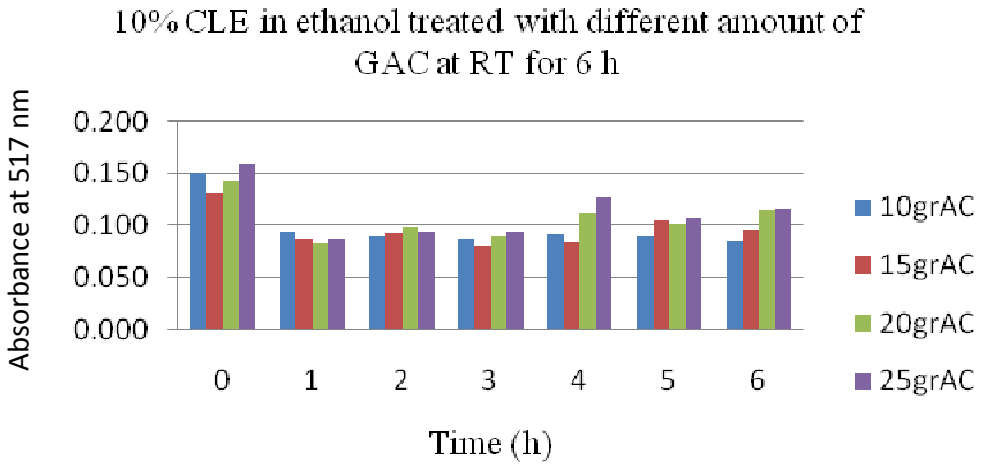

Figure 10. Shows that there is a significant decrease in antioxidant value within first hour treatment of 10% CLE (ethanol). Antioxidant value after that remain constant.

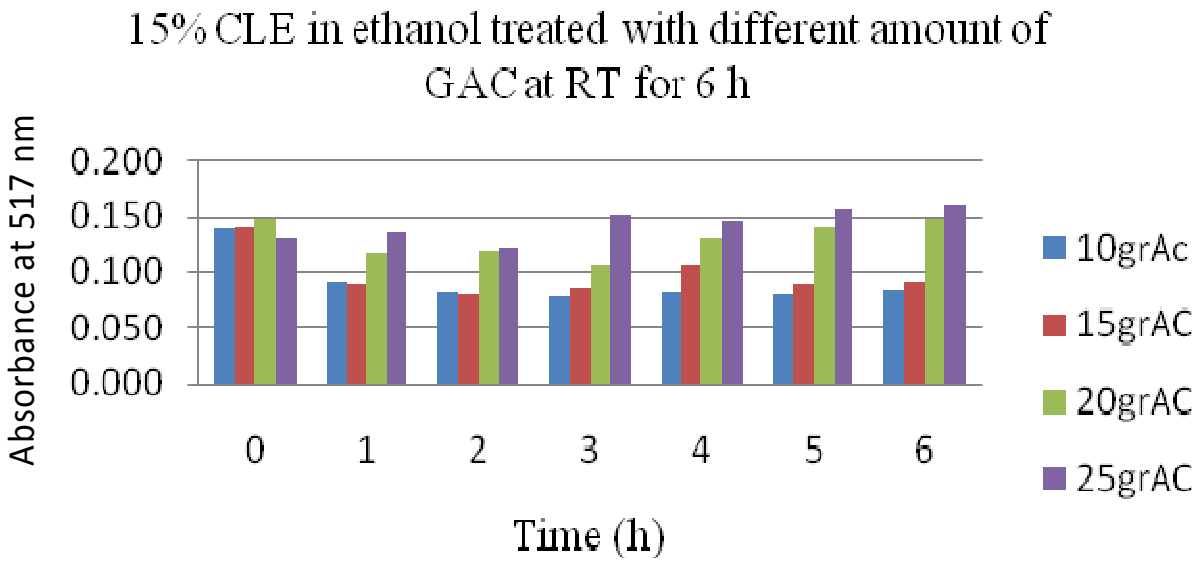

Figure 11. Antioxidant activity at different contact time for treatment of 15% CLE in ethanol.

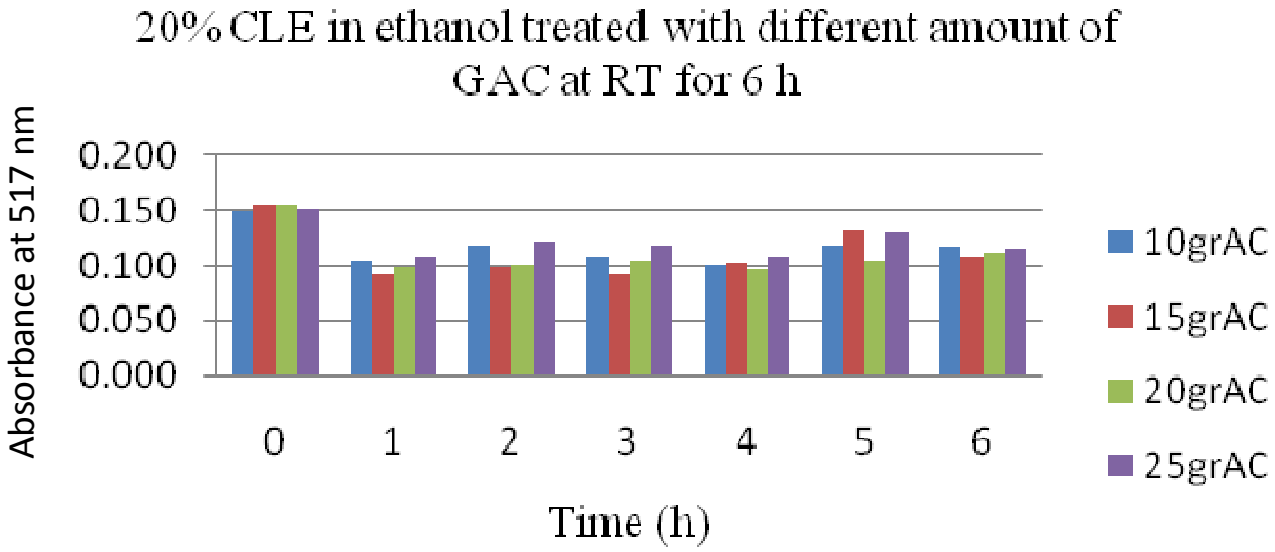

Figure 12. Antioxidant activity at different contact time for treatment of 20% CLE in ethanol.

1 and 15 g GAC then constant until end. For 25 g GAC there is no decrease.

Figure 12 shows that there is a significant reduction in antioxidant value within first hour and then remain almost constant until end of experiment. Figure 13 indicates a sharp decrease in antioxidant value from the first hour treatment of 25% CLE (ethanol). Antioxidant value remain constant after 1 h until end of experiment. Figure 14 presents that there is a significant reduction in antioxidant value within first hour and then until end of experiment, antioxidant value is constant.

Conclusion

There is a significant reduction in antioxidant value after treatment CLE (water) with GAC. Moreover, a sharp decrease in antioxidant value after treating CLE (ethanol) with GAC. The decrease is the highest when using 15 and 20% CLE. In both samples, it can be concluded that

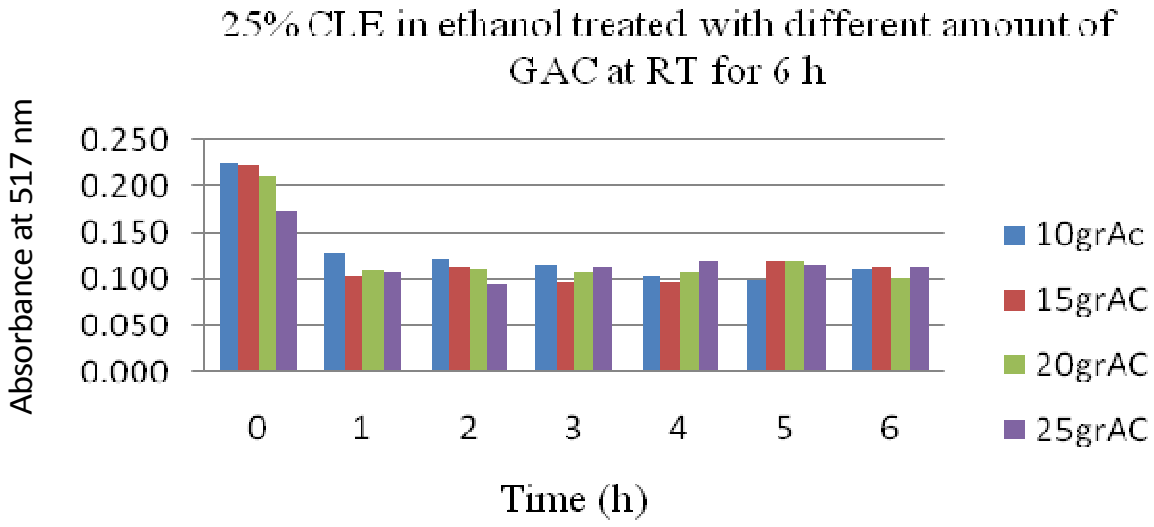

Figure 13. Antioxidant activity at different contact time for treatment of 25% CLE in ethanol.

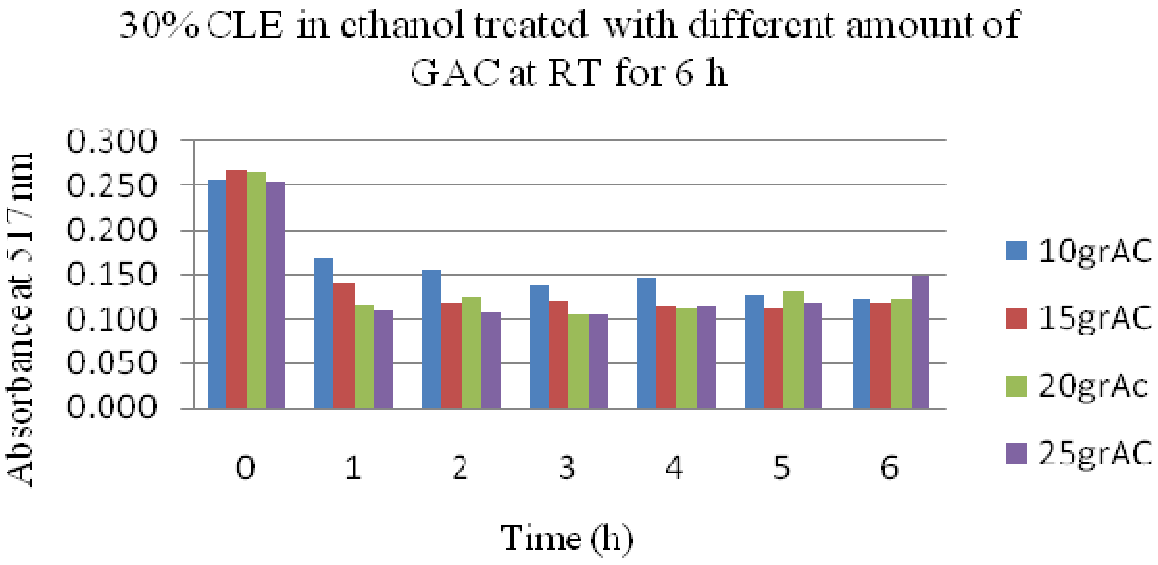

Figure 14. Antioxidant activity at different contact time for treatment of 30% CLE in ethanol.

after 1 h treatment with GAC, significantly reduce the antioxidant level of all samples tested.

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