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Decolorisation of Cashew Leaves Extract by Activated Carbon in Tea Bag System for Using in Cosmetics

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Abstract: With the concern of using herbal extract, some undesirable issues like greenish color is a very critical item in producing cosmetic. The plant extracts which are normally dark green might spoil the appearance of the products if they are added in cosmetic formulation. In order to solve this problem, an activated carbon granule tea bag system was assembled and batch experiments were conducted as a mechanism to eliminate the intense colour of plant extract without affecting activities. The system was tested with different concentration of cashew leaves extract (5%, 10%, 15%, 20%, 25% and 30%) in contact with (10 g, 15 g, 20 g and 25 g) granular activated carbon (GAC) from 0 to 6 hours. The study shows that the best condition for decolorisation is 15 g GAC using 20% cashew leaves extract (CLE). Therefore, this study suggests that the tea bag system is suitable to be used for decolorisation of CLE for cosmetic application.

Keywords: Cashew Leaves Extract, Decolorisation, Activated Carbon, Tea Bag System.

1. Introduction

Cosmetics are products that are used to protect and improve the appearance of the skin. 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. Herbs and food plants are heavily consumed because of their good taste as well as health benefits. Natural ingredients such as cashew leaves extract could be an attractive candidate in cosmetic formulation (Mary and Lupo, 2001).

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. Decolorisation is one of the approaches that can be applied to removed unwanted colours in the plant extracts. There are many methods available for decolorisation process such as application of filtration system powdered activated carbon has a reasonably good colour removing capacity when introduced in a separate filtration step (Raghavacharya, 1997).

However, activated carbon is the most commonly used method of dye and odor removal by adsorption (Nassar and El-geundi, 1991). The adsorptive capacities of dyes onto non-biological waste materials, such as activated carbon, will also depend on the surface charge of the adsorbent in contact with water. For carbon, the surface charge will be neutral thus physical adsorption will predominate (Robinson, Chandran and Nigam, 2001).

There are two kinds of activated carbon that contains powder activated carbon and granular activated carbon (PAC and GAC). The use of two layers system PAC and GAC together might not be an effective approach. Decolorisation process has to be easy, fast and economical. The extract is usually in liquid form. There are two ways in which the decolorisation can be proposed:

a) A method in which the granular activated carbon is directly added to liquid extract over a period of time and the resulting mixture was then filtered or

b) A method in which the granular activated carbon covered in a tea bag and soak in liquid extract for a period of time and taken out once decolorisation completed. The latest one has been used in this research.

Some parameters used to be considered for decolorisation optimisation including cashew leave extract concentration, amount of granular activated carbon and so on.

2. Material and Methods

The tea bag dimensions used in this study are from equal size for all volume of GAC. The tea bag was

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soaked in extracts with different concentrations. By this method, it is possible to obtain an activated carbon configuration which is less likely to generate powder dust during handling and which is superior to conventional powdered activated carbon in settling properties and filterability and time.

The GAC configuration of the present method is particularly suitable for use in decolorising extract. The method for decolorising extract of the present system, comprises the step of bringing the granular activated carbon configuration into contact with a liquid like ethanol to decolorise

In the present method, the amount of cashew leaves powder to be used per 1 L ethanol, were 50 g, 100 g, 150 g, 200 g, 250 g, 300 g, 400 g, and 500 g that in fact 400 g and 500 g are saturated and they are not involved in this experiment but are considered as limitation point. In 40% and 50% that are saturated, there is no liquid in combination to separate and then to remove its color. The type and particle size of granular activated carbon to be used in the present method is standard. The concentration of ethanol is preferably in the range of 95% (v/v) to 98% (v/v). The amounts of the granular activated carbon used are 10 g, 15 g, 20 g, and 25 g.

As described above, GAC as tea bag in the present method was contacted with solvent. Stirrer was used to increase contact between solvent and activated carbon surface.

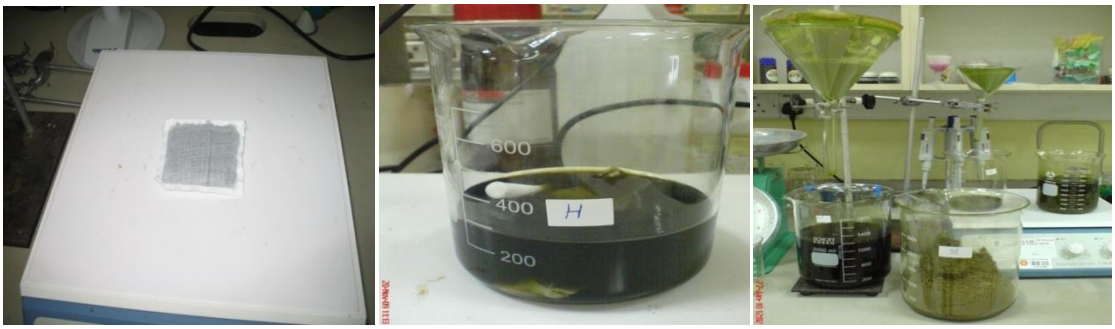


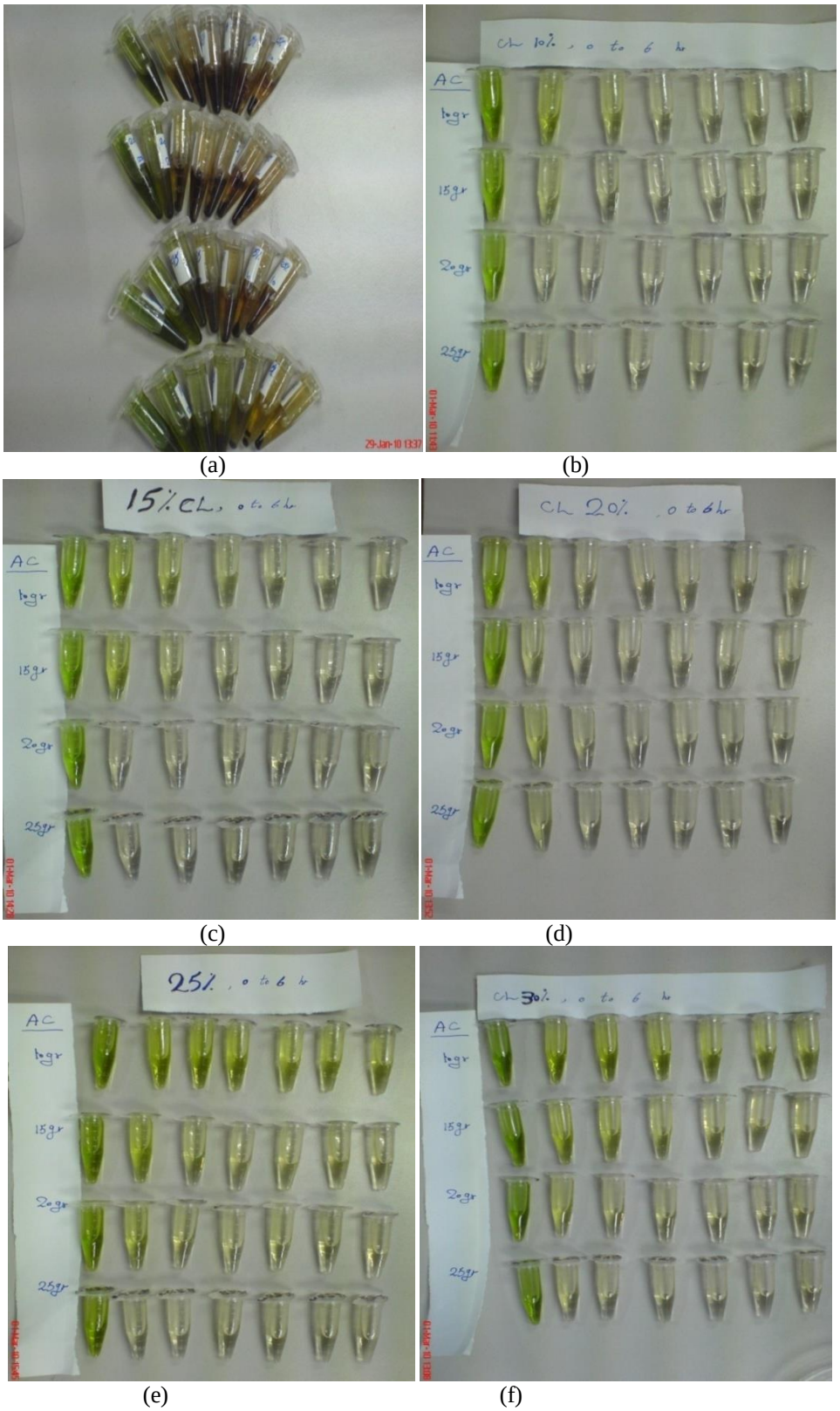
Figure 1. GAC in tea bag (left) new decolorisation method (middle) filtration (right)

The main objective of this section is to reduce the colour of the cashew leaves extract while maintaining its quality. Therefore, following items were done to achieve the objectives.

1. The ethanolic extract of cashew leaves was used in this section.
2. The concentrations of 5%, 10%, 15%, 20%, 25%, 30%, 40% and 50% CLE were in contact with GAC.
3. The experiments carried out at the natural pH of extract and at room temperature (25°C).
4. The weight of GAC was 10, 15, 20, 25 g.
5. The colour intensity of all samples was measured by spectrophotometer.

3. Result and Discussion

The purpose of this study was to find the best operation conditions for decolorisation of cashew leaves extract while maintaining the highest possible properties by adsorption on GAC. To achieve this aim, it was necessary to: (i) determine a simple and practical decolorisation method of activated carbon to be used in the tea bag form, (ii) evaluate volume of GAC, (iii) determine concentration of cashew leaves (v) evaluate decolorisation process that retain properties.

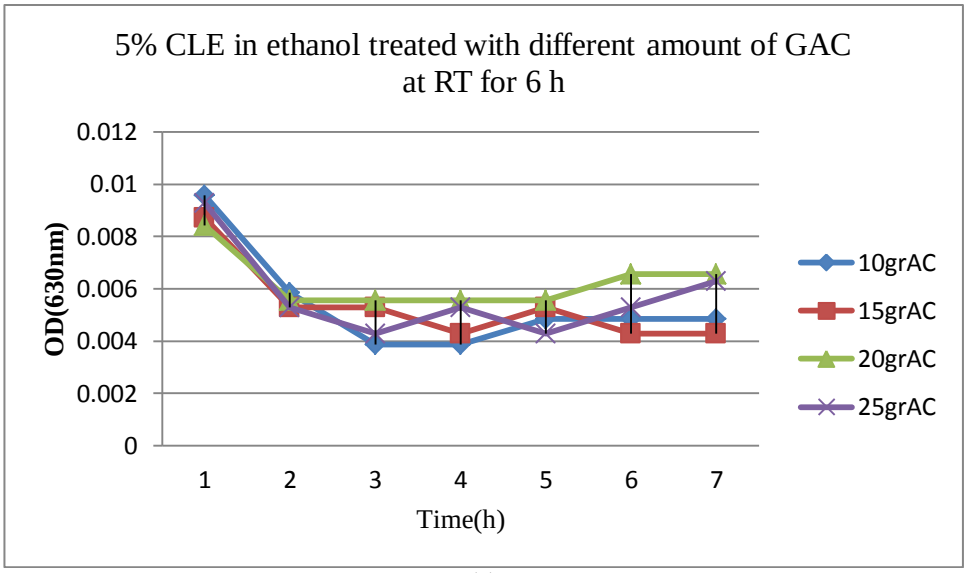


(a) (b)

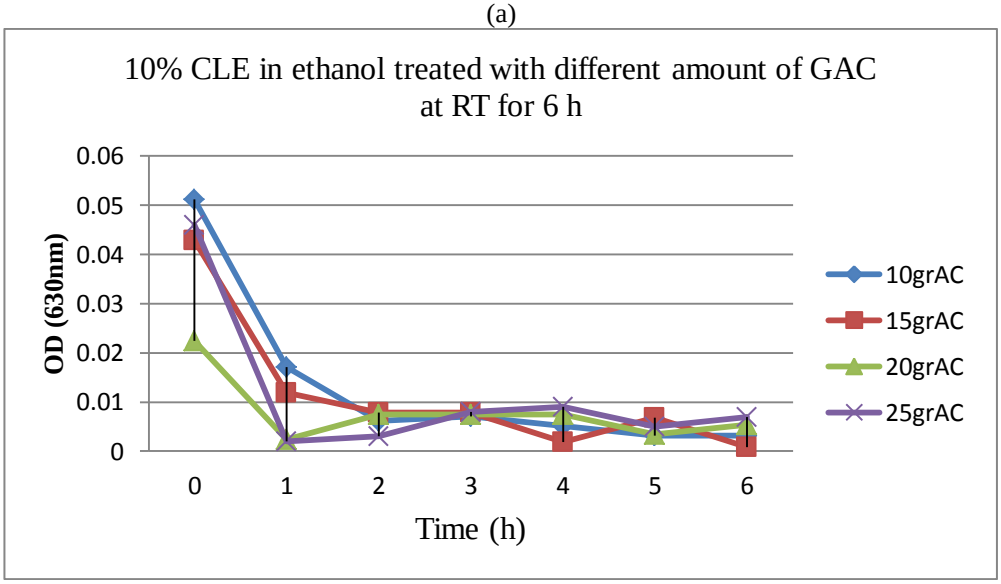
(c) (d)

(e) (f)

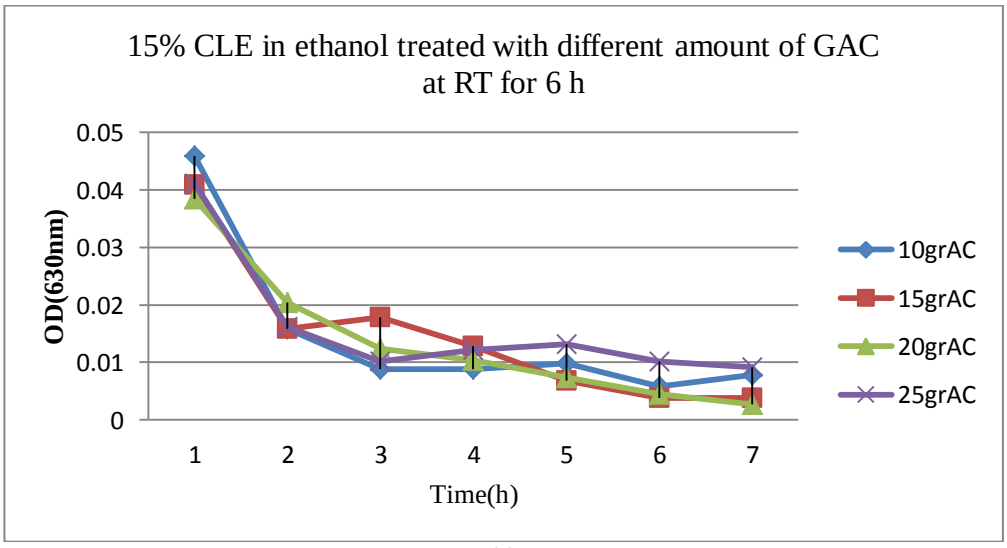
Figure 2. Color intensity (a=5% , b=10% , c=15% , d=20% , e=25% , f=30% CLE)


5% CLE in ethanol treated with different amount of GAC at RT for 6 h
OD(630nm)
0.012
0.01
0.008
0.006
0.004
0.002
0
1
2
3
4
5
6
7
Time(h)
10grAC
15grAC
20grAC
25grAC

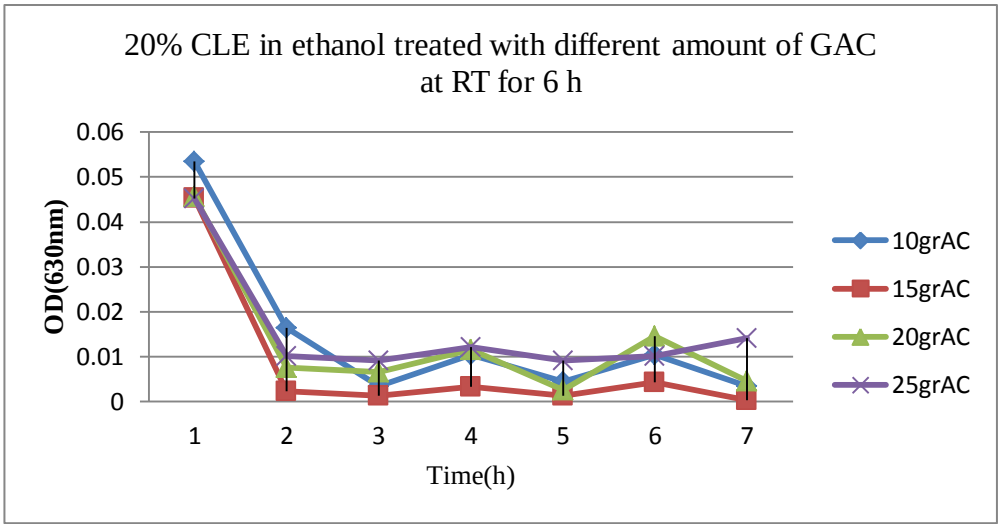
(a)


10% CLE in ethanol treated with different amount of GAC at RT for 6 h
OD (630nm)
0.06
0.05
0.04
0.03
0.02
0.01
0
0
1
2
3
4
5
6
Time (h)
10grAC
15grAC
20grAC
25grAC

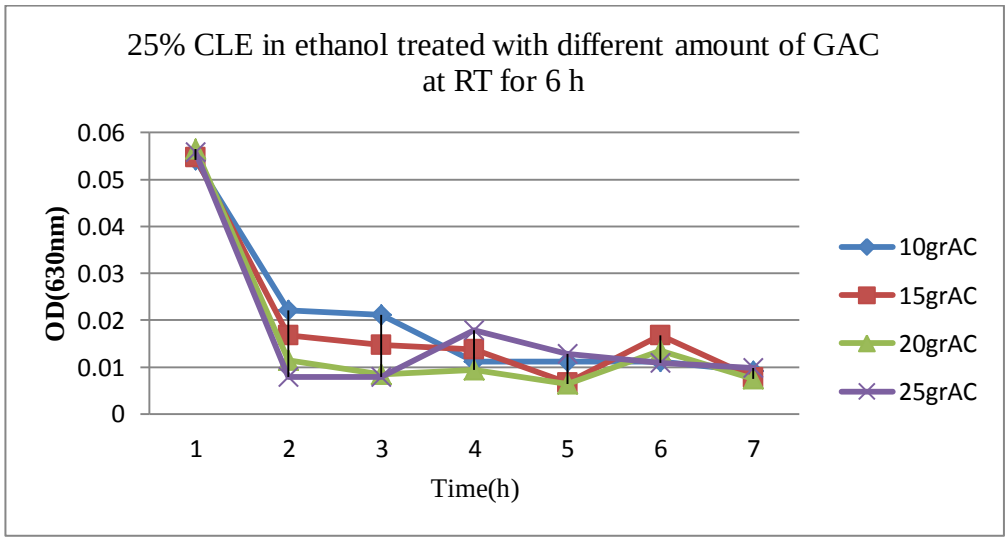
(b)


15% CLE in ethanol treated with different amount of GAC at RT for 6 h
OD(630nm)
0.05
0.04
0.03
0.02
0.01
0
1
2
3
4
5
6
7
Time(h)
10grAC
15grAC
20grAC
25grAC

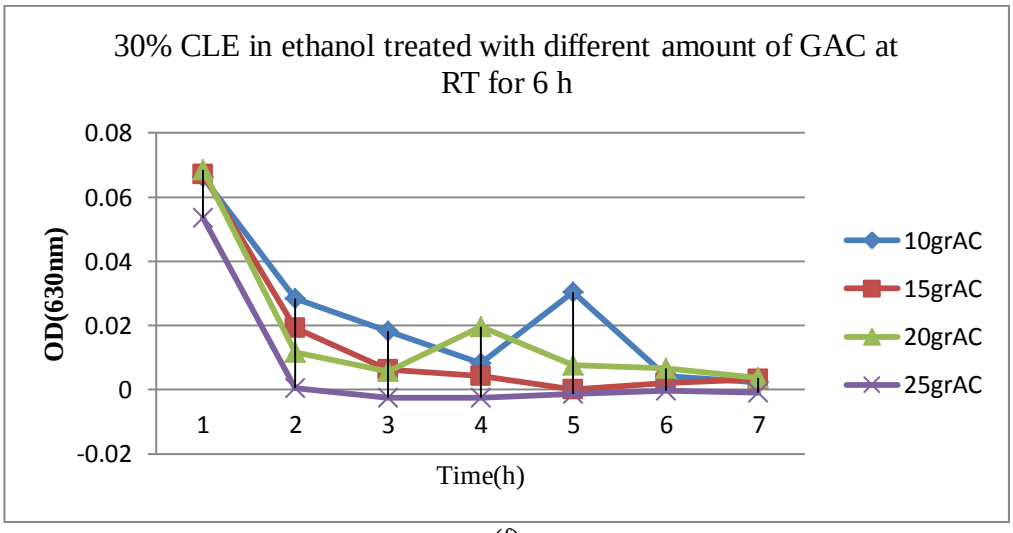
(c)



(d)



(e)



(f)

Figure 3. Graph of OD (630nm) versus contact time
(a=5% , b=10% , c=15% , d=20% , e=25% , f=30% CLE)

From the Figure 2 and 3 above, we can clearly see the effect of decolorisation by using activated carbon. The colour reduction was gradually increased with time. The reduction of colour is based on the values of OD (Optical Density). The larger the different between initial and final value of OD, the more effective the colour of sample is reduced, this means the higher adsorption efficiency.

Different concentration of cashew leaves extract (5%, 10%, 15%, 20%, 25%, 30%) in ethanol were treated by different amount of granular activated carbon. Duration of treatment was 6 hours and sampling time was for every 1 hour. The amount of granular activated carbon was 10 g, 15 g, 20 g, and 25 g. Mode of measurement was OD 630 nm for ethanol. Observation was made based on changing in colour with time intensity.

4. Conclusion

The evidence from this research suggests that, 15 g of granular activated carbon was chosen as the best amount of activated carbon to be used as Tea bag to treat 20% of cashew leaves extract. The suitable operation condition for the tea bag is contact time after 1 hour for ethanol. Under the stated conditions, the designed tea bag was able to function efficiently for all concentration of cashew leaves with different amount of GACs. The treatment carried out by using the designed tea bag was able to improve the colour and appearance of extract with minimal side-effect.

5. Acknowledgment

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