Nigerian Journal of Pharmaceutical Research
Vol. 9 No 2 pp. 110 - 114 (September 2011)

FORMULATION AND EVALUATION OF CREAM FORMULATED WITH LEAF EXTRACT OF *ANOGEISSUS LEIOCARPUS* D.C. GUILL AND PERR (COMBRETACEAE).

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Abstract
The dry powdered leaves of *Anogeissus leiocarpus* were extracted by maceration in cold aqueous ethanol (50:50) with a yield of 27.92 % on dry weight basis. The extract was formulated into a water-in-oil cream using a base containing suitable surface active agents. The pH, consistency, globule size and colour of the cream were determined 24 h after formulation. The effect of temperature and electrolytes on the cream were evaluated. Results show that exposure to 55 ^{o}C for 24 h caused a reduction in the consistency with change in colour and increase in the globule size. The inclusion of small quantity of electrolytes generally caused a decrease in the consistency and an increase in the mean globule size of the cream. The decrease or increase in these parameters depended on the nature of the electrolyte. The pH increased or decreased in the presence of alkaline or acidic electrolyte. These changes are moderate and did not confer on the cream any deleterious effect.

Keywords: Anogeissus; cream; evaluation.

INTRODUCTION

Herbal Medicine is a form of traditional medicine which involves the use of herbs from medicinal plant parts such as roots, stems, leaves, stem barks, flowers, fruits and seeds for the treatment and management of diseases (Adesina, 2010). Antibiotics is a substance produced by an organism (usually a microbe) or a similar substance produced by other means, used for the treatment of disease in man, animals or plants (Denyer, 2004; Carter, 2005). The World Health Organization defines traditional medicine as the sum total of all the knowledge and practices, whether explicable or not, used in diagnosis, prevention and elimination of physical, mental or social imbalance which relies exclusively on practical experience and observation handed down from generation to generation whether verbally or in writing (WHO, 1976).

Traditional medicine has developed in various communities in Nigeria in response to the health needs of the people (Adesina, 2010). In Nigeria, plants such as *Mitracarpus saper, Picratima nitida, Anogeissus Schimperi and Anacardium occidentale* possess antimicrobial properties (Okujagu *et al*., 2005).

The plant *Anogeissus leiocarpus* is found in some areas in Africa including Nigeria. It is a wild plant that has proven antibacterial and antifungal properties (Mann, 2008). It has also been found to possess gum (Builders et al, 2005). In North Central Nigeria, it is used in the

treatment of skin, intestinal and systemic infections by herbalists using the extract from leaves, the stem bark and the roots.The extract from the leaves has antibacterial properties but has less spectrum of activities against fungal pathogens than the bark (Mangai 1999;Obiabo, 2000; Mann, 2008). The aim of this work is to formulate the extract into a water-in-oil cream and evaluate the stability in the presence of some factors.

MATERIALS AND METHODS

Materials

Chemicals and Organic Solvents

Sorbitan monooleate (Sigma Aldrich,Germany), ethanol (BDH Chemical Ltd,England), lanolin (BDH Chemical Ltd, England), soft paraffin (Merck, Germany) , liquid paraffin (Merck, Germany), emulsifying wax (High Wycombe Bucks, England) ,benzoic acid (BDH Chemicals Ltd, England), sodium hydroxide (Avondale Lab, England), hydrochloric acid (Sigma Aldrich,Germany), sodium chloride (BDH Chemicals Ltd, England), magnesium chloride (BDG Chemicals Ltd, England), aluminium chloride (M&B Chemicals, England).

Methods

Collection and authentication of the plant

The leaves of A *leiocarpus* were collected locally in the month of June in Buhit village of Bassa Local Government, Plateau State, Nigeria. The plant was identified in the Herbarium of Federal College of Forestry, Jos, Nigeria and a voucher specimen (number 14) was deposited there. The *leaves* were air dried, pulverized and bottled.

Extraction of the leaves of A. *leiocarpus*

The dried powdered leaves of *A. leiocarpus* (500 g) was extracted with 50% aqueous ethanol by cold maceration for seven days. The marc was removed and the extract filtered through Whatman filter paper No. 1. The filtrate was dried using a freeze dryer (Edward Freeze drier, USA). The powdered extract was kept in airtight container at room temperature until used.

Preparation of cream.

The cream was formulated using the Hydrophile Lipophile Balance (HBL) method. Table 1 shows the formula used.

Table 1: Formula for cream preparation.

Ingredient	Quantity
Liquid paraffin	20 g
Soft paraffin	10 g
Anhydrous Lanolin (Wool fat)	10 g
Emulsifying Wax	10 g
Anogeissus Leiocarpus (leaf extract)	400 mg
Sorbitan monooleate (Span 80)	3 g
Benzoic acid	0.08 g
Distilled water to	80 g

The oil phase (liquid paraffin, soft paraffin), lanolin anhydrous and emulsifying wax were weighed into an evaporating dish using a weighing balance (Ohaus, Florha Park , USA) and heated over a water bath to 72 ^{0}C. The aqueous phase (distilled water,benzoic acid and herbal extract) were heated over a water bath to the same temperature and added to the oil phase and stirred with a stirring rod continuously until cold. The cream was evaluated 24 h after preparation.

Evaluation of the cream

The colour and odour of the cream was

observed and perceived respectively, while the pH, consistency and globule size were determined using a pH meter (Jenway, USA), a rotational viscometer (Brookfield, USA), and a microscope (Olympus, Germany) respectively.

pH effect

A 2 ml of 1% w/v NaOH was added to 20 g of the cream and allowed to stand for 24 h. The viscosity and the globule size were determined using a rotational viscometer (Brookfield, USA) and a microscope (Olympus, Germany) by placing a drop of the diluted cream (with liquid paraffin) on a glass slide and covering with a cover slip and viewed under the microscope. The various size ranges were determined by matching them against a calibrated gratitcule held in the eyepiece of microscope using x10 magnification. The above procedure was repeated using 2 ml 1% HCl and the values recorded.

Electrolytes effect

A 2 ml of 1% $^{w}/_{v}$ $AlCl_3$ was added to 20 g of the cream and left for 24h and the viscosity and globule size determined as described earlier. The procedure was repeated for 1% w/v $MgCl_2$ and NaCl and the values recorded.

Temperature effect

A 20 g of the cream was weighed out and kept in a thermo-regulator (Controller OV/75/F/DIGs Genlab Ltd, UK) at 55 ^{0}C for 24 h. The viscosity and globule size of the cream were determined and recorded as described earlier and the values plotted.

RESULTS

A yield of 27.92% of the crude extract was obtained from the extraction carried out with 500 g of the leaves. From the various tests carried out on the water-in- oil cream formed with the crude extracts of *A. leiocarpus* leaves, the following results were obtained.

DISCUSSION

The cream formed is a coarse dispersion as the diameter of the dispersed globules in the control sample ranged from 14.3 – 143 µm. The globules of the dispersed phase uniformly dispersed throughout the continuous phase – oils and waxes with a resultant viscosity of 11000mPas. All the samples of which tests were carried out had less dispersion with lower viscosities than the control sample. The large globule size indicates the inherent instability of cream (Martin, 2008).

Change in pH produced by addition of 1% NaOH altered the pH of the control sample (5.90) to 5.20 and 6.49 respectively (TABLE 2). The diameters of the dispersed globules were observed to increase above that of the control and the number of dispersed particles decreased indicating that pH changes cause instability (Coalescence) in the formulation (Carter, 2005;Martin, 2008). The decrease in the number of dispersed globules was higher in the sample to which NaOH was added. These effects were observed although the sorbitan monooleate, the emulsifying agent used in the formulation is relatively unaffected by the pH range produced by the addition of the acid and base (Carter, 1987). Other ingredients in the formulation might be responsible. The viscosity decreased to 8000 and 9000mPas for the samples to which the base and acid were added respectively.

The addition of the electrolytes 1% $AlCl_3$, 1%$MgCl_2$, and 1%NaCl to the cream reduced the uniform dispersion of the aqueous globules with the mean globule size of the

Table 2: Some physicochemical properties of *A. leiocarpus* cream

Sample	Qty	pH	Viscosity in mPa.s at 29 ^{0}C (x 10.00)	Colour	Mean globule diameter x 14.3
Cream	20g	5.90	1.10	Yellow green	3.26±0.68
Cream 1% NaOH	20g	6.49	0.80	Yellow green	4.59±0.36
Cream + 1% HCl	20g	5.20	0.92	Yellow green	4.39±0.56

TABLE 3: Effect of electrolytes and temperature on the viscosity and mean globule diameter of *A. leiocarpus* cream

Sample	Quantity	Colour	Viscosity in mPas at 29^{o}C (×10,000)	Mean globule diameter (µm)
Cream	20 g	Yellow green	1.10	47±0.67
Cream + 1% w/v (2 ml) NaCl	20 g	Yellow green	0.80	57.5±0.02
Cream + 1% w/v (2 ml) $MgCl_2$	20 g	Yellow green	0.70	66.2±0.39
Cream + 1% w/v (2 ml) $AlCl_3$	20 g	Brownish yellow	0.55	85.3±0.72
Cream at 55 ^{o}C	20 g	Yellow green	0.50	117.6±0.23

cream generally increasing in the samples to which $MgCl_2$ and NaCl were added while addition to $AlCl_3$ caused a marked increase in globule diameter above the control with discolouration of the cream occurring (TABLE 3). The increase in globule size produced a corresponding decrease in the viscosity of the cream. The trivalent aluminium ions which produced the largest increase in mean globule diameter among the electrolytes was the least viscous of them all. The divalent magnesium ions however produced a mean globule diameter slightly below that of the monovalent sodium ions and a viscosity almost equal to it. This agrees with Schulze-Hardy rule which states that the degree of compression of a double layer depend not only on the concentration of added electrolyte but also on the valency of the ion of opposite change to the dispersed particle (Carter, 2005; Gennaro, 2007; Martin, 2008).

Exposure of the cream to 55 ^{0}C for 24 h caused the highest increase in mean globule diameter of 118 µm, and the highest decrease in viscosity of 5000mPas. The broadening of the globule size indicates the thermodynamic instability of creams. A decrease in the viscosity of the continuous phase and an increase in the kinetic motion of the dispersed phase with an increased frequency of collision in addition to the distorted effects temperature has on the emulsifying agent used is an explanation for this(Kadiri, 2009; Martin, 2008; Carter, 2005).

CONCLUSION

The water-in-oil cream formed using the aqueous Ethanolic extract of the leaves of *Anogeissus leiocarpus* on exposure to electrolytes, pH change and high temperature, was observed to deviate from the initial character (viscosity, mean size and distribution) of the cream causing instability.

Work is yet to be done on the effect of storage on the formulated cream, its comparison with standard cream and its shelf-life determination.

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