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Research Article

DEVELOPMENT AND SENSORY ANALYSIS OF SHAMPOO FOR CURLY HAIR

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ABSTRACT

Objective: This study aimed to compare the sensory performance of a shampoo formulation with *Polyurethane-14, AMP-acrylates copolymer* (PAAC) in relation to control formulation in curly and natural hair tresses.

Methods: Curly and natural hair tresses (n = 8) of equal size and weight were pre-treated by washing with a standard shampoo. After the hair tresses were treated with a formulation containing polymer (formulation A) and compared to hair tresses treated with control formulation (Formulation B). Each panelist (n=2) is asked to indicate which tress performs better for each of seven sensory attributes evaluated (quantity and creamy foam, combing, wet touch, frizz formation, curl definition and volume). It was collected images of hair tresses at 0, 1, 2, 4 and 24 hours of washing, comparing the attributes: volume, frizz formation and curl definition. The results were analyzed using table to test of paired assessment, being: SUPERIOR results – 8 and 7 positive evaluations; SIMILAR results – 2 to 6 positive evaluations; INFERIOR results – 1 and 0 positive evaluations.

Results: The addition of the PAAC on the shampoo formulation provided definition and modeling of curls, reducing volume and frizz in 24 hours. There was also lower foam formation in the formulation with polymer PAAC. However, it is important to note that this attribute has inversely proportional effect to the creamy foam, since more creamy foam, smaller quantity.

Conclusions: It was concluded that the shampoo developed was effective in defining and modeling curl in natural and curly hair.

Keywords: Sensory analysis; Shampoo; *Polyurethane-14, AMP-acrylates copolymer*; Curly hair.

INTRODUCTION

The cosmetic market for hair care has grown rapidly and competitively in recent years, because hair plays an important role in the individual appearance and sexual attractiveness and, therefore, is almost daily subjected to various procedures of hair care [1]. The advancement of science shows that hair care products are concerned not only with the cleaning and conditioning, but also are developed using new trends in fashion and high technology, looking for care, protection and good looks of the wires [2].

The hairs type and shape are genetically controlled and change with the races. It was observed that there are some differences between hair types and some aspects that are similar between them [3].

Human hair contains basically 3 functional chemical groups: acidic, basic and peptide bonds, which have the potential of binding small molecules. The hair is constituted of approximately 65-95% protein, 15-35% water, and 1-9% lipids. Furthermore, amino acids like glycine, threonine, aspartic and glutamic acid, lysine, cysteine and tyrosine are the major constituents of human hair [4].

In a study publish in American Journal of Physical Anthropology (1973) the researchers investigate the human hair from various racial groups using a lot of techniques, including: amino acid analysis, acrylamide gel electrophoresis, x-ray diffraction studies and stress-strain analysis. In each of these techniques yielded identical results for all samples, indicating that the variables producing phenotypic differences in human hair form are probably not on the level of primary or secondary biochemical structure [5].

In a comparative study of different racial and ethnic groups, there was no significant difference in the thickness of the cuticle, scale size, shape, and cortical cells of blondes compared with blacks. Black hair has an elliptical shape, whereas Asians have round shaped and straight hair and the blond hair is intermediate. The length and degree of curliness is determined genetically. The curly nature of black hair is believed to be caused by the shape of the hair follicle [3].

It was described in the literature there is no difference in keratin types and amino acids compositions between hairs from different races, although in a study developed in New York showed variation in the levels of some amino acids between black and blond hairs. The results indicated that black hair had significantly greater levels of tyrosinase, phenylalanine, and ammonia, but it were deficient in serine and threonine [3,6].

In a French study, the researchers observed that the number of reducible cross-links is the difference between dark and blond hair, which indicates that the formation of cross-links may be either under genetic control or in conjugation with pigment production [7].

Hair is a very important for our self-confidence as well as for our appearance and self-concept. It reflects our personality, and hair loss or hair damages are considered aesthetic imperfections and social handicap. External part of hair is a shaft keratin fiber structure that is sensible to environmental effects whether they are mechanical, physical or chemical [8].

The hair can be exposed to various conditions that can cause damage to its structure. Examples of this are sun exposure; chemical treatments (bleaching and permanent waving) and normal grooming of hair, including combing, brushing, and shampooing [9].

This damage leads to progressive decrease of the moisture in the hair, capillary leak, which limits the ability of hair to distribute the natural oils and a feeling of dryness in the wires. Thus, the hair is with a rigid, rough and fragile structure, with the damaged appearance and hard combing, besides the frizz and waves inflexible formation [10].

Excessive sun exposition is the most frequent cause of hair shaft's structural impairment. Photochemical impairment of the hair includes degradation and loss of hair proteins as well as degradation of hair pigment. Furthermore, sun radiation causes dryness, reduced strength, rough surface texture, decreased luster, stiffness, brittleness and an overall dull, unhealthy appearance of the hair [8].

In a Japanese study, the results showed that labile protein levels in hair drastically increased upon permanent waving or bleaching treatments. The amount of labile protein is a useful index for hair damage. This index has several superior characteristics compared to other indexes mentioned above [11].

The *Polyurethane-14, AMP-acrylates copolymer* (PAAC) is a polymer that provides excellent curls modulation and frizz control while maintaining the natural appearance and flexible wires.

A research produced by Martino, Vitale and Venemon (2003) showed that polyurethane and acrylates are a hair styling polymer that maintain flexibility and shape memory in the hair. These results were observed in tests of viscosity, drying time, tack, film toughness and spot weld bond strength [12].

This study aimed to develop and to compare the sensory performance of a shampoo formulation with *Polyurethane-14, AMP-acrylates copolymer* (PAAC) in relation to control formulation in curly and natural hair tresses.

MATERIALS AND METHODS

Development of the Formulations

To carry out the subjective comparative test of sensory evaluation of shampoo, it was used a formulation containing deionized water; cocamidopropyl betaine; sodium laureth sulfate; cocamide diethanolamine; sodium chloride; mixture of isothiazolinone, with the addition of: (A) 0.5% Polyurethane-14, AMP-acrylates copolymer or (B) without the addition of *Polyurethane-14, AMP-acrylates copolymer*. The formulations were prepared add the components one by one.

Sensory Evaluation

Equal size and weight curly and natural hair tresses (n = 8) were pre-treated by washing with a standard shampoo. After, hair tresses were treated with a formulation containing the polymer (formulation A) and compared to the hair tresses treated with the control formulation (Formulation B). Each panelist (n=2) is asked to indicate which tress performs better for each of seven sensory attributes evaluated (quantity and creamy foam, combing, wet touch, frizz formation, curl definition and volume) in comparing the two test formulations on the treated hair tresses. It was collected images of the hair tresses at 0, 1, 2, 4 and 24 hours of washing, comparing the attributes: volume, frizz formation and curl definition.

Analysis of Results

The results were analyzed using the table to test of paired assessment. The minimum number of correct judgments to establish significance at various levels of probability for unilateral paired comparison test (p = 0.5) [13]. Thus, the results possibilities are: SUPERIOR results – 8 and 7 positive evaluations; SIMILAR results – 2 to 6 positive evaluations; INFERIOR results – 1 and 0 positive evaluations. After analysis of the results is possible to tell whether the shampoo with polymer is statistically superior, similar or inferior than control shampoo (without the polymer), with 96% reliability of the results [14].

RESULTS AND DISCUSSION

After the hair tresses were treated with a formulation containing the polymer (formulation A) and compared to the hair tresses treated with the control formulation (Formulation B), it was analyzed the tress performs better for each of seven sensory attributes evaluated (quantity and creamy foam, combing, wet touch, frizz formation, curl definition and volume).

The results of sensory analyses indicates the formulation with polymer (Formulation A) there was lower foam formation compared with the formulation without a polymer (Formulation B) (Figure 1). This is because the smaller the bubbles are, the smaller the amount of foam, indicating that it will be thicker. However, it is important to note that this attribute has inversely proportional effect to the creamy foam, since the more creamy foam, the smaller quantity.

In the test which analyses frizzy hair, the results indicated that the addition of the PAAC on the shampoo formulation provides reducing in the formation of the frizz throughout the day. This result was expected since the polymer has action of clamping on the hair (Figure 2). The same was observed in the test that analyses the hair volume, it was observed that the addition of the polymer control the hair volume in 24 hours (Figure 3).

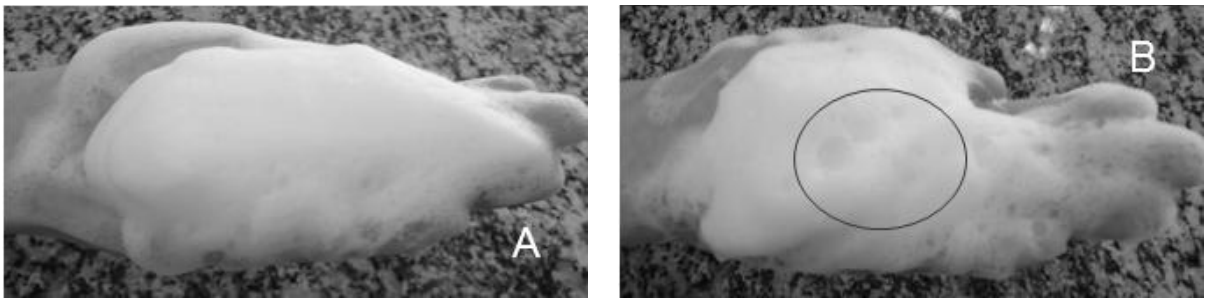

Fig. 1: Foam formation by: A. Formulation with polymer (Formulation A) and B. Formulation without the polymer (Formulation B).

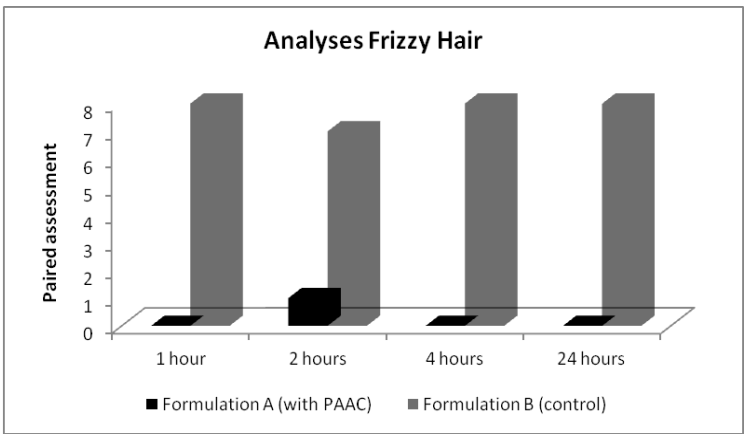

Fig. 2: Results of analyses frizzy hair after hair tresses were treated with a formulation containing PAAC (formulation A) and compared to the hair tresses treated with the control formulation (Formulation B).

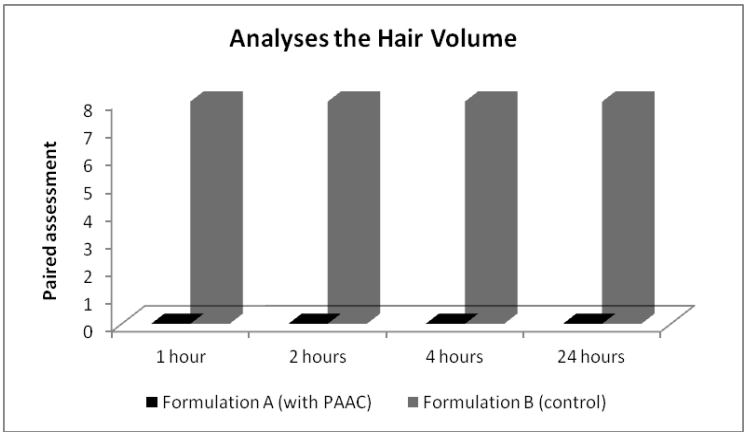

Fig. 3: Results of analyses the hair volume after hair tresses were treated with a formulation containing PAAC (formulation A) and compared to the hair tresses treated with the control formulation (Formulation B).

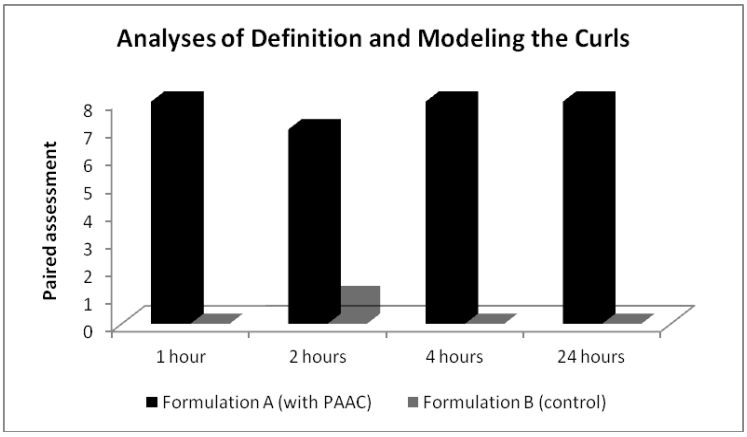

Fig. 4: Results of definition and modeling the curls after hair tresses were treated with a formulation containing PAAC (formulation A) and compared to the hair tresses treated with the control formulation (Formulation B).

In the analyses of definition and modeling the curls, the formulation A is statistically superior in compare with formulation B proving a difference in hair appearance throughout the study period. The formation of curls and their maintenance during the day is the main feature provided by the polymer PAAC, because it has the function of modeling and setting the curls and gives a durable modeling for curls throughout the day (Figure 4).

Through the tests realized we can conclude that the shampoo developed was satisfactory, because it corresponds to the main objective that is the definition and modeling the curls of natural and curly hair.

Volume control of curly hair and reduced in the frizzy hair over a period of 24 hours were observed after addition of polymer in shampoo formulation.

The analyses of foam formation are important observe that the foam formation is inversely proportional effect to the creamy foam, since the more creamy foam, the smaller quantity. This fact is not related to cleaning of the hair, so does not impair the purpose of the shampoo, which is cleanse the hair.

So, it is concluded that the shampoo developed was effective in defining and modeling curl in natural and curly hair.

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