***The Creation of a Better BB Cream and Conditioning Cleanser***

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Table of Contents:

Introduction…………………………………………………….Page 2

Methods and Materials………………………………………..Page 3

Results…………………………………………………………..Page 5

Discussion………………………………………………………Page 7

Conclusion……………………………………………………....Page 8

Acknowledgements…………………………………………….Page 8

Bibliography…………………………………………………….Page 8

Introduction:

        In the modern day world, appearance is an important aspect in society. It impacts the way that individuals view each other and it can improve an individual’s confidence and self-esteem. This project focused on the development of a better BB Crème and Conditioning Cleanser for hair. BB Crème for hair is a revolutionary product that is supposed to aid hair in ten different ways, including making it softer and more manageable, and give it a flawless, healthy finish. BB Crème is a new product and not many companies have the formula and raw ingredients yet. One major brand (Brand X) has emerged on top, as its product is popular and sells at a fairly low price. Many consumers found that Brand X’s product did soften their hair and improve shine, but did not help to manage the hair and smooth down fly-aways. The BB Crème is an emulsion, therefore emulsifiers and emollients were needed to keep the oil and water phases together. The conditioners were also abundant, as they were needed to add the softness, silkiness, smoothness and manageability of the hair.

Conditioning Cleansers are “two in one” products that both clean and condition the hair in one step. They save time and money and can help soften and cleanse hair. Effective formulas for this product have been difficult to find. A different brand (Brand Y) created a formula that became the most popular and its formula is rare and unique. By creating a formula that could serve as an alternative to this formula, this project would open up new doors for innovation with this product and also provide a way to make this type of product cheaper and more accessible for consumers. For this Conditioning Cleanser, both surfactants and conditioners were abundant. In this system, this is necessary, as the surfactants remove the dirt and sebum from the hair and replace it with conditioners to smooth and soften the hair.

Viscosity, pH and stability are essential aspects in creating these formulas. Viscosity is a measurement of the product’s resistance to deformation by shear or tensile stress. It measures how thick a product is, which becomes very prominent when marketing the product. For example, a shampoo should have a lower viscosity than a cream because a shampoo is expected to be thin, since it is supposed to cleanse hair, while a cream is expected to be thick, since it is supposed to style or condition hair. The pH is significant because in order for the product to be safe, the formula cannot be too acidic or too basic. Stability testing is used to determine if a product will retain its quality over a period of time. If a product is unable to retain its quality, it is unable to be used. Panel testing was also conducted to test the effectiveness of the student created product against the market product.

Materials and Methods:

        The student conducted an ingredient analysis. The student determined which raw materials and chemicals could either match each ingredient exactly or provide the same function as each ingredient. Using a recommended percentage range for each ingredient the student chose a percentage for each ingredient. The student and the mentor created a procedure to make the formulation based on what ingredients needed to be heated and/or pre-mixed with other ingredients. After creating the formulation, the student ran multiple tests to examine its efficiency and safety.

Formulas were created after extensive review. The pH was tested. The student tested the pH of the original formulas (Brand X’s and Brand Y’s) and then determined the acceptable pH range for each product. A pH between 4.5 and 5.0 was optimal for the BB Crème. A pH between 5.5 and 6.0 was ideal for the Conditioning Cleanser. Citric Acid 50% and Sodium Hydroxide 20%, was used to adjust the pH of the student created formulas.

The student tested viscosity. A Brookfield LVT Viscometer was used to test the viscosity of the BB Crème, while a Brookfield RVT Viscometer was used to test the viscosity of the Conditioning Cleanser, as it was thicker than the BB Crème. The student tested the viscosity of the original formulas and determined the appropriate viscosity. For the BB Crème, the viscosity should be around 17,000 cPs (centipoise units), while for the Conditioning Cleanser should be around 19,000 cPs. The student would use either a thickener product to increase the viscosity or use an ingredient to decrease the viscosity, such as water, to adjust the viscosity.

The novel formula and the market product were compared through panel testing. The student used a panel testing that involved hair tresses for the BB Crème. The student prepared two different hair tresses, A and B. Hair tress A was the student created formula and hair tress B was Brand X’s product. Seven trained professionals ranked the two tresses against each other based on combing ability, volume, electrostatic charge, fly-aways, shine, residue, dryness, oiliness, smoothness, softness, silkiness, manageability and acceptance. The panelists rated A against B on a -1 to +1 scale. A -1 indicated that A was significantly worse than B for that specific guideline, a -0.5 indicated that it was slightly worse, a 0 meaning the two tresses were equal in performance, a +0.5 indicated that A was slightly better than B and a +1 showed that A was significantly better than B.

Stability was tested. Two oz. samples of each formula were put in chambers set at a certain temperature. They were placed in chambers that were 5° C, 40° C, 45° C, 50° C and at room temperature. For the 5°C, 40°C, 45°C and room temperature samples, viscosity, pH, odor and appearance was noted initially, at 24 hours, 1 week, 2 weeks, 1 month, 2 months and 3 months to determine if these factors would remain consistent over the product’s lifetime. For the 50°C sample, only the appearance was tested at 1 month, as it was used to indicate if the product would separate into its different components or if it would remain together. Another sample was used for three freeze-thaw cycles. For the freeze-thaw cycle, the sample was placed in a freezer for 24 hours, then left out to thaw for 24 hours. When the sample was room temperature, viscosity, pH, odor and appearance were noted. Then the sample was placed back into the freezer and the process was repeated two more times.

Results:

Data was collected for the panel testing for the BB Crème and stability for both the BB Crème and the Conditioning Cleanser.

        The data for the BB Crème panel testing revealed that the new formula was just as efficient as Brand X’s product for many guidelines. With 90% confidence and a p-value of less than 0.1, the two products were rated a score of 0 for electrostatic charge, shine, residue, stickiness, oiliness, dryness, silkiness and care, showing that for those guidelines, the formulas were equal in their performance on the hair. For volume before combing and frizz/flyaways, with less than 90% confidence and a p-value greater than 0.1, the two products were found to be equal with a score of 0. However, for frizz/flyaways, two panelists gave the formulas a score of 1, stating that the student created formula had done a significantly better job at taming flyaways. For volume before combing, two panelists gave the formulas a score of 0.5, stating that the novel formula added slightly more volume to the hair than Brand X’s formula. With less than 90% confidence and a p-value of less than 0.05, the formulas were given a score of -0.5, showing Brand X’s product was slightly easier to comb, and was slightly softer. With less than 90% confidence and a p-value less than 0.1, the formulas were rated a -0.5 for gliding and volume after combing, indicating that Brand X’s formula performed better than the student created formula on these two guidelines. With less than 90% confidence and a p-value of greater than or equal to 0.1, the formulas were rated a 0.5 for manageability, expressing that the novel formula was better at managing the hair in comparison to Brand X’s formula.

        The data collected for stability differed between the BB Crème and the Conditioning Cleanser. For the BB Crème, after three months in stability and three freeze-thaw cycles, it was found to be stable, keeping a consistent appearance, odor, viscosity and pH for all samples. For the Conditioning Cleanser, it was found to be unstable. The formula separated into two different components after the third freeze-thaw cycle. It also separated in the room temperature sample at the very end of three months.

Discussion:

The student created BB Crème formula improved upon the ability to manage hair and fly aways significantly. The novel formula was rated as equal in performance to Brand X’s product on electrostatic charge, shine, residue, stickiness, oiliness, dryness, silkiness, care, volume before combing and frizz/flyaways. It worked upon the claim of manageability and improved upon the complaints made by consumers. Many panel testers stated that they would prefer the new formulation to Brand X’s product because Brand X’s product made the hair a little too silky, thus making it difficult to manage and style. Further research could be conducted to attempt to make the new formula condition the hair more, but just enough so it does not interfere with the manageability.

        The Conditioning Cleanser provided an alternative formula to Brand Y’s formula, but it did not pass stability. Due to the complexity of the 2-in-1 formula, many different factors could have led to this instability. Possible factors could be the large percentage of conditioners and thickeners. Fragrance may have also been a factor helping to cause the instability. Further research has been conducted to fix this problem. For all of these attempts, the fragrance was removed. The student attempted to use a wider variety of thickeners/conditioners at lower concentrations. This formula failed stability within 2 weeks. The student also attempted to add an ingredient that is known for stabilizing formulas, starting it at a low percentage of 1%. This formula failed just after the 2 week mark in the 5° C sample. The student also attempted increasing the stabilizing ingredient. This failed after the four week mark. Further steps can be taken to improve upon the formula, so that it will pass stability.

Conclusion:

At the end of the project, the new BB Crème was rated as more successful when managing hair and fly aways than Brand X’s product. The Conditioning Cleanser was equal in performance to Brand Y’s product, but was found to be unstable. Multiple attempts were made to fix the stability and although advancements were made over time, it was not successful. Further research can be conducted to improve upon the stability of the formula. The knowledge acquired may also be used to develop new formulas in the future.

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