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INVESTIGATION OF THE QUALITY OF SHAMPOOS FOR NORMAL HAIR BY ORGANOLEPTIC, CHEMICAL AND PHYSICO-CHEMICAL METHODS

Abstract: The results of research on the quality of shampoos from different manufacturers were discussed in the article. An objective assessment of shampoos was given on the basis of organoleptic and physicochemical quality indicators.

Key words: surfactants, quality, pH, foaming, mass fraction of chlorides, mass fraction of dry substances.

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Introduction

Shampoo – one of the main and most common hair care products, is a mixture of several substances. Water is present in the greatest quantity in shampoos, followed by surfactants. Preservatives, flavors, inorganic salts are also added to the composition of it. Modern shampoos often contain natural oils, vitamins, or other ingredients which manufacturers declare, strengthen hair or provide some benefit to consumers. However, there is no experimental confirmation of these facts. [1]

1. Water as a base in which other components are mixed makes up about 80% of all components.

2. Surfactants (detergents) - surfactants that actively remove pollution. These include:

- Ammonium Lauryl Sulfate
- Ammonium Laureth Sulfate
- Sodium Laureth Sulfate
- Sodium Lauryl Sulfate

They are poisonous, carcinogenic, mutagenic substances. The safest detergent is sodium laureth sulfate.

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3. Detergents (detergents) of medium foaming, which are added to form a lather, moisturize and thicken the shampoo formula so that it spreads more easily.

- Cocamide DEA (CDEA or 6501)
- Cocamide ME A (CMEA)
- Cocamidopropyl Betaine (CAB-30)

4. Sodium Citrate, or Sodium Citrate
- a buffering agent that maintains the required pH level of the shampoo (weakly acidic environment) during hair washing. Sodium citrate removes dirt and grease from hair and helps to smooth hair cuticles.

5. Ethanol - ethyl alcohol. Used in shampoo as a solubilizer, (a substance that increases the solubility of difficult-to-dissolve ingredients

- fragrances, preservatives, bacteriostatic additives).

6. Glycol Distearate / Stearate - waxes added to shampoo to improve the appearance, consistency of the mass: give the shampoo a pearly shine and allow it to easily flow out of the bottle.

7. Polyquaternium / Quaternium - emollient components that thicken shampoo and condition hair.

8. Dimethicone / Cyclomethicone - silicone oils that smooth the hair cuticles, thickening the hair, reducing static electricity and adding shine to the hair. They add weight to the hair and make it easier to detangle, but they can add oiliness and even itchy scalp.

9. Panthenol (Panthenol) - a form of vitamin B, a moisturizer that penetrates into the hair cuticle and enlarges it and covers it on top to give shine.

10. Cetyl / Oleyl / Stearyl Alcohols are hydrated alcohols that attach to the outside of the hair shaft and act as a lubricant for easy combing.

11. Ascorbic Acid / Citric Acid - Natural acids derived from Vitamin C add shine to hair.

12. Octyl Salicylate / PABA Sunscreens added to protect hair and scalp from UV rays, which also contributes to long-term retention of color of colored hair.

13. Preservatives - substances that prevent the development of microorganisms in cosmetic products. The following are used as preservatives:

• DMDM-hydantoin (a preservative with a broad spectrum of antibacterial activity)

• Benzoic acid (another name for sodium benzoate is a natural preservative found in cranberries and lingonberries)

• Diazolidinylcarbamide
• Methylisothiazolinol
(methylchloroisothiazolinone)

• Parabens
• Phenoxyethanol

14. Dyes - substances that give color to shampoo. An allergic reaction to these substances is possible.

• Pearlescent additives (propylene glycol distearate or glycol distearate)

• Dyes (CI 14700 (red dye), C115510, CI 19140 (yellow dye), CI42090, CI60730, etc. with CI)

15. Fragrances - substances that give the shampoo a pleasant smell. The word parfum or fragrance means that a fragrance or perfume is used in a cosmetic product. As a rule, each company has its own unique name for a flavoring agent. Fragrances can cause headaches, dizziness, allergic rashes, severe cough, vomiting, and skin irritation. [2]

MATERIAL AND METHODS

Despite the wide range of shampoos of different effects, their quality does not always meet consumer's requirements, so quality issues are relevant.

In view of the importance of this issue, the purpose of the work was to study the quality of shampoos for normal hair from different manufacturers, sold in the market of the city of Tashkent.

To assess the quality of the selected samples, organoleptic, physicochemical indicators were examined.

The shampoo quality was assessed in the laboratory of the Agro-Kimyoo Standart LLC testing center.

Study and analysis of packages and markings of the tested shampoos

Sample 1. AVON naturals Hair care "Moisture and color. Pomegranate and camellia oil" is intended for colored hair. Moisturizes hair leaving it soft, smooth and shiny.

Manufacturer / seller Avon Beauty Products Company LLC Russia, 119048, Moscow, st.Usacheva, 2

The date of expire: 3 years from the date of production (08/20/2020) The volume of the bottle is 700 ml.

Sample 2. Nivea Men "Firming, Anti-dandruff" men's shampoo. Eliminates up to 100% of visible dandruff and prevents its reappearance (with regular use). Formula with bamboo extract strengthens hair.

Manufacturer: Beiersdorf Manufacturing Berlin GmbH, Franklinstrasse 1 D-10587 Berlin, Germany.

The date of expire: 2 years from the date of production (05/20). The volume of the bottle is 250 ml.

Sample 3. Children's shampoo "Tik-Tuk". Gently cleans and rinses off easily. Herbal complex and panthenol.

Manufacturer: JSC "Svoboda", Russia 127015, Moscow, st. Vyatskaya, 47.

The date of expire: until 04.23. The volume of the bottle is 350 ml.

Sample 4. "HAYAT" shampoo balsam 2in1. For all hair types. The coke oil and glycerin that are part of the shampoo moisturize and add shine to the hair.

Manufacturer: LLC "HAYAT COSMETICS" Republic of Uzbekistan, Tashkent, Yashnabad district, Parkentskaya street 327A.

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The date of expire: 2 years from the date of production (13.10.2020). Volume of the bottle 400ml

Sample 5. "GUGU" shampoo conditioner. Nutrition and volume for all hair types. Revitalizes and gently nourishes dry and damaged hair.

Manufacturer: OOO "Fabienne inter group" Republic of Uzbekistan, Tashkent region, Yangiyul district, Kholniyozova street, house 54.

The date of expire: 2 years from the production date (11/23/2019). The volume of the bottle is 350 ml.

Sample 6. "FABI lux" anti-dandruff shampoo. Moisturize scalp and free from dandruff. Gently cleanses, deeply nourishes and strengthens hair from roots to ends.

Manufacturer: OOO "Fabienne inter group" Republic of Uzbekistan, Tashkent region, Yangiyul district, Kholniyozova street, house 54.

The date of expire: 2 years from the date of production (06/27/2020). The volume of the bottle is 400 ml.

RESULTS ACHIEVED

Analysis of organoleptic characteristics of shampoos

The study of shampoo packages showed that the labels of all samples have a high informative value. Determination of the smell of shampoos showed that the first four samples have a slight pleasant smell characteristic of the name of the sample. Sample 5 and Sample 6 had a very pungent odor. The color of the first sample is light pink and the consistency is thick, gel-like. The color of the second sample is pearlescent and the consistency is very thick and creamy. The color of the third sample is transparent and the consistency is gel-like. The color of the fourth sample is white and the consistency is jelly-like. The color of the fifth sample is transparent and the consistency is liquid. The color of the sixth sample is transparent and the consistency is jelly-like.

Study of the foaming ability of shampoos

To ensure a high detergency, high-quality shampoos should produce a finely dispersed, creamy foam that is easily washed off, has structural strength and does not slip on the face. Foaming ability characterizes the main functional features of shampoos

and affects the effectiveness of removing dirt from hair [4].

Reagents and devices: Ross-Miles device, stopwatch, prepared solutions of shampoos, water with a hardness of 3.57 mg-eq / dm³.

Work progress: Foaming ability is determined on a Ross-Miles device at (37 ± 2) °C - for foam detergents and shampoos.

The water jacket is connected to the thermostat, the thermostat is turned on, and the temperature of the liquid in the jacket is brought to the specified one. At the same time, 300 ml of the test product or shampoo solution is brought to the tested temperature. From this amount, 50 cm³ of the solution is taken, poured it into a measuring cylinder along the wall so that foam does not form. In 10 minutes, with the help of a rubber bulb or a pump, is introduced into the pipette 5 tested solution in a volume of 200 cm³ into, so that doesn't form a foam. The pipette with the solution is fixed in a tripod so that its outlet is at a distance of 900 mm from the liquid level in the cylinder and ensures that the jet hits the center of the liquid. Then open the pipette valve. After the solution has flown out from the pipette, a stopwatch is turned on and the height of the formed column of foam is measured in millimeters (HOOm) (for foam detergents and shampoos, the measurement is made after 30 s). Then, after 5 minutes, measure the height of the formed column of foam in millimeters (H5ism).

If the level of the foam column has an uneven surface, then the arithmetic mean of the measurements of the maximum and minimum foam heights is taken as the height 'of the foam column.

Before each new determination, the tube is flushed with distilled water.

The difference between the diameters of the tubes of individual devices influences the height of the formed foam column. Therefore, for each device it is necessary to set a correction factor, with which all the values obtained during measurements are recalculated to values corresponding to the height of a column of foam, accurately measured by a device with an inner diameter of a tube of 50 mm. [3]

Table 1.

The title of the shampoo	Foam number (not less 100)	Foam sustainability: (not less 0,8)
Avon naturals Hair care	205	3,55
Nivea Men	200	2,75
Тик-Тук	180	3
HAYAT	205	2,61
GUGU	210	2,55
FABI	250	3,16

product should maintain an optimal skin pH of 5.5. For shampoos, the pH range is allowed - from 5.0 to 8.5

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according to GOST, but strong deviations from the optimal pH level can cause drying, tightening and skin irritation [3].

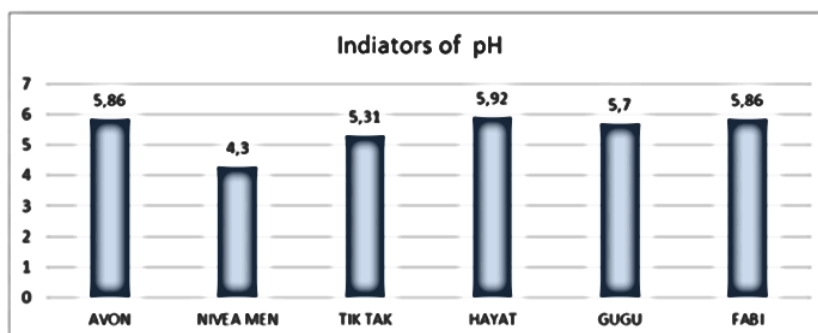
Reagents and devices: prepared shampoo solutions, pH meter, beaker.

Work progress: 10.00 g of the product is placed in a glass, 90 cm³ of distilled water is added and stirred using a glass rod or a magnetic stirrer. Subject the resulting solution to research.

Progress: The pH meter is calibrated according to the manufacturer's instructions. After calibrating the device, rinse the electrodes with water and wipe with filter paper. The test solution is stirred, a sufficient

amount is poured into a measuring vessel and the electrodes are lowered into it. After the results of the pH meter are stable for 1 minute, the indicators are taken. The measurement is repeated on a new portion of the test solution. If the result of the second measurement differs from the first by 0.1 units. pH or more, a third measurement is made. If the result of the third measurement also does not allow a conclusion on the pH value, repeat the entire analysis, including calibration. [3]

The pH test results for shampoo samples are shown in the chart below



Picture 1. Determination of the chloride content in the test samples of shampoos

The chloride content is standardized in accordance with GOST 26878 and is equal to 6.0, since its excess creates an additional load on the hair, and can also irritate the skin and mucous membranes of the eyes. They are added to shampoos to give the desired consistency – usually to increase the viscosity [5].

Reagents and devices: prepared solutions of shampoos, conical flask for titration, silver nitrate, potassium chromate, methyl red, solution; prepared as follows: 0.1 g of methyl red is dissolved in 300 cm³ of ethyl alcohol and 200 cm³ of water, a solution of nitric acid (diluted 1: 4).

Progress of the work: In a flat-bottomed flask, weigh from 2 to 5 g of the tested shampoo with an error of not more than 0.005 g, dissolve it in 50 cm³ of water, add 2 drops of methyl red solution. If the solution has

a yellow color, then it is neutralized with dilute nitric acid until a pink color appears. Then add 2.5 cm³ of a solution of potassium chromate and titrate with solutions of silver nitrate until a brown color appears.

The mass fraction of chlorides in the sample of the tested shampoo calculated on the molecular weight of sodium chloride (X) in percent is calculated by the formula

$$X = V * 0.584 / m$$

where V is the volume of a solution of silver nitrate with a concentration of 0.1 mol / dm³, consumed for titration of the sample, cm³; t is the mass of the test shampoo sample, g;

0.584 - conversion factor for sodium chloride. [3]

Table 2. Estimation of the mass fraction of chlorides in shampoos.

The title of the shampoo	Requirements of ND (not less)	The mass fraction of chlorides, in fact %
Avon naturals Hair care	6.0	1.2
Nivea Men	6.0	1.2
Tik- Tak	6.0	2.4
HAYAT	6.0	0.95
GUGU	6.0	0.34
FABI	6.0	1.1

Determination of the mass fraction of dry substances

The mass fraction of dry substances shows the degree of concentration of the detergent components of

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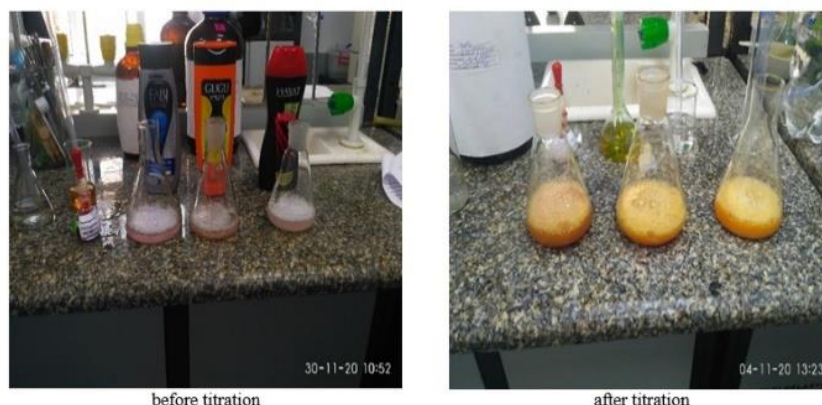
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the shampoo and largely determines their detergent action. To determine the mass fraction of dry

substances, the Moisture Meter MV 45 from OHAUS was used. [6]



Picture 2.

Table 3. Indicators of the mass fraction of dry substances

The title of the shampoo	Parameters' according to the GOST %	The mass fraction of dry substances, %
Avon naturals Hair care	10-27	13,5
Nivea Men	10-27	19.17
Tik-Tuk	10-27	11,44
HAYAT	10-27	9,52
GUGU	10-27	6,75
FABI	10-27	8,17

Based on the results of studies of organoleptic, chemical and physicochemical parameters of shampoos for normal hair, a comparative assessment was carried out and the following conclusions we made: [7]

Determination of the smell of shampoos showed that shampoos Avon naturals Hair care, Nivea Men, Tik-Tuk, HAYAT had an unsharp and very pleasant odor, and shampoos GUGU, FABI had a very pungent and unpleasant odor. [8]

DISCUSSION

The results of the study (Table 1) showed that the most foam is formed by FABI shampoo (250 mm), and least of all – Tik-Tuk shampoo (180 mm). The foaming ability of shampoos is also characterized by the stability of the foam, which determines its structural strength [9]. In the course of the study, it was found that the best foam stability was in the Avon naturals Hair care sample (3.55) and the lowest resistance in the GUGU sample (2.55). But all samples meet the

requirements of GOST in terms of foaming ability and give good and abundant foam. [10] [11]

CONCLUSIONS

As you can see from the diagram, all shampoo samples, except for NIVEA MEN, meet the requirements of the standard for hydrogen index. The pH level of NIVEA MEN shampoo is 4.3 which is below the acceptable pH limit.

The study of the mass fraction of chlorides (Table 2) showed the compliance of all shampoo samples with the requirements of GOST 26878.

The results of the study (Table 3) showed that samples 1, 2, 3 meet the requirements of ND for the content of the mass fraction of dry substances, but for samples 4,5,6, the content of the mass fraction of dry substances is below the norm, which shows non-compliance with the requirement of ND and directly affects the quality shampoos.

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