

EVALUATION OF SUGAR ALCOHOL: HUMECTANT IN SKIN CARE COSMETIC

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ABSTRACT

Cosmetics are more important in daily life and are used regularly by everyone. It is also use for protection from atmospheric changes, pollution etc. Everyone experiences dry skin and many people experience occasional episodes but some have chronic dryness which leads to problems like eczema etc.^[1] The use of moisturizers is the mainstay of treatment for dry skin and also for daily maintenance of normal skin. All moisturizer products will contain a careful balance of humectant ingredients to restore just the right amount of hydration back to the body.^[2]

KEYWORDS: Skin Care Cosmetic, Sugar Alcohol, Humectant, Xylitol, Moisturizer, Polyacrylic acid polymer.**INTRODUCTION**

Humectants are important cosmetic ingredients preventing loss of moisture thereby retaining the skin's natural moisture. Some compounds also have the ability to actively attract moisture. Humectants are key ingredients in most skin care products but are also often used in hair care products to volumize the hair by attracting moisture which expands the hair shaft.^[3]

Humectant is defined as a substance that absorbs or helps other substances to retain moisture. Humectant attracts water when applied to the skin and theoretically improve hydration of the stratum corneum. However the water that is drawn to the skin is transepidermal water not the atmospheric water continued evaporation from the skin can actually exacerbate dryness.^[4] Humectants are wonderful for a dry skin type.^[5]

Hydrating substances are used in cosmetic products to retard moisture loss from the product during use and to increase the moisture content in material that is in contact with the product. This function is generally performed by hygroscopic substances or humectants, which are able to absorb water from the surroundings.^[6] Dry hair and dry skin are the target areas in the body for use of humectants.^[7]

Humectant is a substance that is used in cosmetic products to help in retention of moisture these substances are known as hygroscopic.^[8] Some humectants are even capable for holding upto thousand times their own weight of water. They lock moisture onto the surface of the skin making it moist and healthy.^[9]

Chemically all humectants have something in common that is hydroxyl groups. These groups allow them to make hydrogen binding in other words they attract water.^[10] In latin humectare means 'Moisten'^[11] Humectants are water loving agents often referred as hydrophilic ingredient in cosmetics.

Humectants are usually molecules with one or more hydrophilic groups attached to them. These hydrophilic groups can be –

Amines (-NH₂) like urea or amino acids

Carboxyl groups (-COOH) like fatty acids or AHA

Hydroxyl groups (-OH) like glycerin, sorbitol, etc.^[12]

The humectant plays such an important role that it serves as a moisture retaining agent of the products and the skin.

Sugar alcohols are defined as the sum of saccharide derivative in which a hydroxyl group replaces a ketone or aldehyde group.^[13]

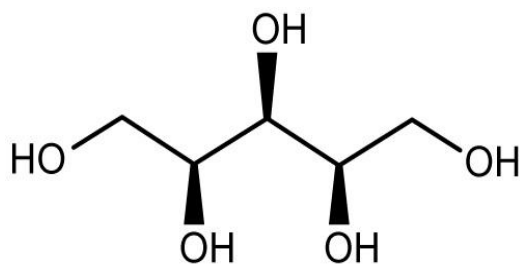
The main objective of this study is to use sugar alcohol for skin care preparation. This study emphasizes use and suitability of sugar alcohol as a humectant for skin care preparation. Sugar alcohols are the versatile ingredient in personal care products and show their impact on modern cosmetic formulations.^[14]

MATERIALS AND METHODS

Xylitol is a sugar alcohol and it is naturally found in low concentrations in the fibers of many fruits and vegetables and can be extracted from various berries, oats, mushrooms etc as well as fibrous material such as corn husks, sugar cane^[15,16] However, industrial production

starts from xylan (a hemicellulose) extracted from hardwoods or corncobs, which is hydrolyzed into xylose and catalytically hydrogenated into xylitol.^[17]

Xylitol, a five carbon sugar alcohol, occurs widely in nature but it is also a normal intermediate in human metabolism. As an alternative sweetener, it is recommended for diabetics and for the prevention of dental caries^[18] Xylitol has water solubility of about 0.64 g per ml.



Chemical Structure of Xylitol

Xylitol is categorized by the U.S. Food and Drug Administration as a food additive. Like other sugar alcohol-sweetened products.^[19]

FORMULATION

Gel is composed of polyacrylic acid polymer dispersed in water along with neutralizer, preservative and active ingredient. The percentage of the chemicals was adjusted to get the required formulation of the gel. The raw materials which were used in formulation are carbomer, TEA, sodium bicarbonate, xylitol etc.

Considering all above properties and uses of active, formulation of gel was selected. After various trial and errors methods formulation as per Table 1 was selected as final formulation.

Table 1

Sr. No.	Ingredients	X1	X2
1	Ultrez 21	1	1
2	Sodium Benzoate	0.5	0.5
3	TEA	0.6	0.6
4	Xylitol	5	7
5	Water	92.9	90.9
		100	100

EVALUATION OF STABILITY PARAMETERS OF ACTIVE IN GEL FORMULATION

The stability of final formulation was observed at two different temperatures that is $45 \pm 2^\circ\text{C}$ and $25 \pm 2^\circ\text{C}$. Various parameters such as viscosity, pH was observed for 3 months.

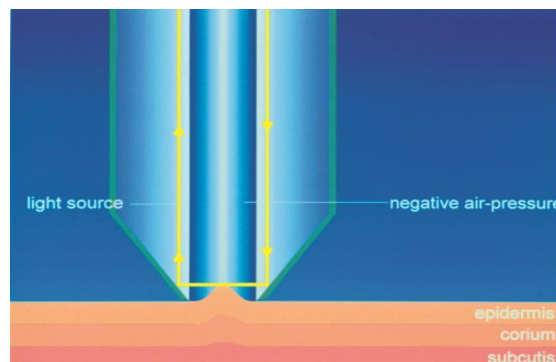
There was no significant change observed in above mentioned parameters of the product at $45 \pm 2^\circ\text{C}$ and $25 \pm 2^\circ\text{C}$ temperatures. Accelerated stability studies showed that formulation with active was stable during the period of study.

SUBJECTIVE EVALUATION

Moisturizers have been used to alleviate dry skin they reduced trans epidermal water loss (TEWL) by promoting barrier repair, smooth exposed dermal nerve ending by creating temporary barrier and restore skin smoothness.^[20] Moisturizers are designed to make stratum corneum soft and more pliant by increasing its hydration.

Moisturizer has multifunctional effect and also contain required amount of humectant in it. It includes reduction of dryness, roughness, scaling, decrease in perceived feeling of tightness and itching.^[21] During the high exposure of sun radiation or sun burn the skin become red and eventually shed or peel. Humectant help in reducing the inflammation, repair sun damage and prevent wrinkle formation by balancing the water content of the skin. The moisturizing efficiency was measured in vitro by the Trans epidermal water loss measurement. Loss of water in the skin to the outside that is TEWL is measured using a device cutometer.

The Cutometer is designed to measure elasticity of the upper skin layer using negative pressure which deforms the skin mechanically.



The measuring principle is based on the suction method. Negative pressure is created in the device and the skin is drawn into the aperture of the probe and after a defined time released again. Inside the probe, the penetration depth is determined by a non-contact optical measuring system. This optical measuring system consists of a light source and a light receptor, as well as two prisms facing each other, which project the light from transmitter to receptor. The light intensity varies due to the penetration depth of the skin. The resistance of the skin to the negative pressure (firmness) and its ability to return into its original position (elasticity) are displayed as curves (penetration depth in mm/time) in real time during the measurement. This measurement principle allows getting information about the elastic and mechanical properties of skin surface.^[22]

Procedure

Eight volunteers in the age group of 20-25 years were selected for the study. The volunteers were allowed to rest for at least 10-20 minutes before study, so that their blood circulation can regain a normal level. The

volunteers were asked not to wash the forearm at least four hours prior to the study and not to apply any cosmetic or soap to the inner forearm during protocol.

Prior to the trials, the baseline values of the volunteers were taken using 2 x 2 cm test areas (2 cm apart) on the inner forearm. Each designated areas were then treated with standard and test formulation (dose 2 mg/ cm²) along with blank that is nothing was applied. The TEWL values were measured immediately at 0 minutes and then after every 30 minutes using cutometer.

The subjective evaluation was carrying out for a week at the same time of the day. All the values of TEWL during 7 days study were noted down. Mean of these values was calculated and plotted against time.

RESULTS

Accelerated stability studies showed that formulation with active was stable in respect to appearance, pH and viscosity.

Change in pH of Gel at two different temperatures as shown in Table 2.

Table 2

Sr. No.	Temperature	No Of Days	X1	X2
1	Oven	0 Day	6.7	6.7
	RT		6.7	6.7
2	Oven	15 Day	6.7	6.7
	RT		6.7	6.7
3	Oven	30 Day	6.7	6.7
	RT		6.7	6.7
4	Oven	45 Day	6.8	6.8
	RT		6.7	6.7
5	Oven	60 Day	6.8	6.5
	RT		6.7	6.7
6	Oven	75 Day	6.6	6.6
	RT		6.7	6.7
7	Oven	90 Day	6.8	6.8
	RT		6.8	6.8

Determination of viscosity was done by Brookfield viscometer with spindle no 5 at 20 rpm in cps as shown in Table no 3.

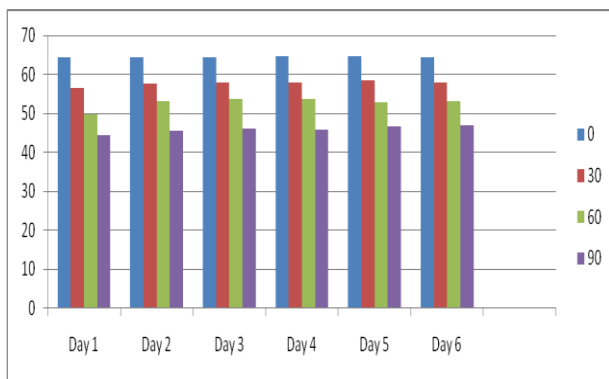
Table 3

Sr. No.	Temperature	No Of Days	X1	X2
1	Oven	0 Day	2800	2700
	RT		2800	2700
2	Oven	15 Day	2750	2650
	RT		2750	2650
3	Oven	30 Day	2786	2606
	RT		2786	2606
4	Oven	45 Day	2695	2595
	RT		2778	2678
5	Oven	60 Day	2680	2580
	RT		2798	2698
6	Oven	75 Day	2600	2500
	RT		2789	2689
7	Oven	90 Day	2600	2500
	RT		2781	2681

SUBJECTIVE EVALUATION

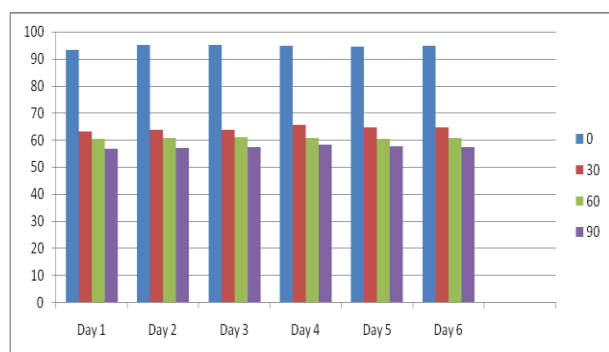
From the subjective evaluation the result obtained are represented in graph 1 and graph 2.

Exhibit graph of TEWL values at lowest standard deviation plotted number of days against time of Xylitol (X1) (5%).



Graph 1

Exhibit graph of TEWL values at lowest standard deviation plotted number of days against time of Xylitol (X2) (7%)



Graph 2

During the evaluation of this product viscosity observed is stable which shows that the product retains the consistency properly. The pH value indicates that it is stable also. Moreover the appearance colour and odour the product is not changed.

At last but not the least the accelerated stability study confirmed the stability of the product over a period of use i.e. minimum three months.

The subjective evaluation was done on the group of 6 subjects. It was found that 95% of volunteers were showing that they were satisfied with the trans epidermal property of the product. The volunteers were comfortable during the application and study.

CONCLUSION

Finally it can be concluded that-

- The product is stable.
- It shows a satisfactory humectant property after application.
- The sugar alcohol i.e xylitol can be satisfactorily used in skin care preparation as a humectant.

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