



EFFECT OF FERMENTED RICE WATER ON HAIR

¹ Koli Y., ²Mengade V., ³Ondia L., ⁴Revar B., ⁵Welaratne C., ⁶Dalvi R.

Department of Biotechnology, Chikitsak Samuha's Sir Sitaram and Lady Shantabai Patkar College of Arts & Science and V.

P. Varde College of Commerce & Economics, Goregaon (W), Mumbai, Maharashtra.

Abstract : In the modern era, use of toxic chemical hair care products is becoming a conventional practice. Some of these products can be detrimental to the hair and scalp health and can even induce allergic reactions in some people. Hence, formulating a natural and effective hair care product is a need of the moment. This research gives an insight into the effects of fermented rice water treatment, which can be a natural alternative to chemical products, on hair. The fermented rice water prepared was tested for its chemical and bacteriological properties, its effect on human subjects and statistical analysis of the data obtained about the rate of hair growth was performed. This research was carried out for a duration of 30 days. Statistical analysis was done using t - test with the null hypothesis being that hair growth was not observed after 30 days of using fermented rice water. In this research formulations of four different types of rice water, which were ambemohar rice, kolam rice, basmati rice and a mixture of all three rice, were studied on 30 different human subjects. t test values of these rice were 8.21, 4.03, 41.09 and 5.4 respectively, which means rejection of null hypothesis. This indicates that hair growth was observed in test subjects. The bacteriological studies showed presence of few microorganisms in fermented rice water. The chemical analysis showed presence of alkaloids, tannins, flavonoids, glycosides, steroids and proteins in all the rice water samples. Proteins which are mainly responsible for hair growth were found in highest concentration in mixture of rice. The subjects also reported an improvement in hair quality. The main objective of this research was to investigate the effects of fermented rice water as a haircare product. The research showed an increase in hair growth rate of test subjects more than average growth rate and an improvement in hair quality. This rice water formulation can be used as an alternative to chemical products available in market. This is highly beneficial to maintain good quality of hair and reduce hair fall significantly. It can also help people who develop allergic reactions to chemical haircare products.

I. INTRODUCTION

Hair is the crown of the human body. This is the beauty of a person's personality. Hair care is very important as the issues of hair fall, dandruff, dry and dull hair is very disturbing to an individual and is harmful for the conditions of one's hair. In the modern era where everyone is under hustle and bustle of daily routine and has no time to have completely nutritious food and follow long hair care routines it is becoming more difficult to maintain healthy hair without the use of chemical products. However, use of too many chemical products on hair can be toxic for hair and can even elicit allergic responses in many people. Having a natural, simple and effective hair care product which can be easily homemade is the need of an hour. The age-old technique of fermented rice water is something that claims to be helpful of in curing problems of hair loss and hair thinning.

The Yao ethnic women from the village of Huang Luo in China are a testament to the tradition of using Rice Water. The water used for cleaning the rice was used for bathing by the women of China, Japan and other Southeast Asian countries. These women made it to the Guinness Book of World Records as the

“world’s longest hair village” with an average hair length of about 6 ft. These women are known to have black shiny hair even in their 80s. These women use the fermented rice water and believe it to be the reason for their long and dark hair. (Khadge S., *et al.*) As the hair grows from beneath the skin, hair care and scalp care are intertwined. The hair follicle, hair root, root sheath and sebaceous gland (which are the living parts of hair) are beneath the skin, while the actual hair shaft does not have any living processes. Biological processes are not useful to repair the damage caused to the hair shaft. However, changes can be made to ensure that the cuticle remains intact.

Healthy hair can be attributed to healthy scalp. Not all scalp disorders lead from bacterial infections. Microbes which are part of the normal flora of hair are actually useful for maintenance of hair health. Natural and effective hair care products can help in hair growth. Various biochemical compounds like, proteins, vitamins, tannins etc. have been proven to be helpful in maintenance of strong and healthy hair.

Use of herbal products on hair can work as cleanser as well as a source of nourishment. Use of fermented products for hair nourishment is an age old technique, use of fermented rice water is another such product that can act as hair tonic.

I. RESEARCH METHODOLOGY

3.1 Population and Sample

The fermented rice water was prepared by rubbing 100 gm rice in 1 L of water. The water was then drained and boiled for 10 minutes. It was allowed to cool, orange peels were added and the water was allowed to ferment at room temperature for 24 to 48 hours. Following fermentation, chemical analysis was done by ferric chloride test for tannins, alkaline reagent test for flavonoids, Salkowski test for steroids, Mayer’s test for alkaloids and Keller Killiani test for glycoside. Bacteriological analysis was done by isolation of organisms from rice water on LB, MacConkey’s, CLED and Sabraud’s agar.

Biostatistical analysis was carried out by testing the rice water on human subjects and measurement of their increase in hair length. Four groups of 30 subjects were created on which following rice waters were tested : Ambemohar rice, Basmati rice, Kolam rice and a Mixture of all three rices. All the participants were subjected to rice water treatment for 30 days. A survey of hair length, hair quality and hair problems was conducted before and after the rice water treatment. Students t test was performed on the basis of the data obtained regarding the increase in hair length

3.2 Data and Sources of Data

For this study primary data has been collected from the survey conducted on subjects who used the fermented rice water for 30 days. The hair quality has been rated based on range from very rough to very smooth and hair growth has been measured in centimeters

3.3 Theoretical framework

The hair quality and hair length of the subjects were measured before and after the use of fermented rice water. The average length of hair growth is 1.5 cm/month. This study tests whether the use of fermented rice water results in hair growth of more than average length and use of which type of rice water results in higher hair growth and better quality of hair.

The use of Kolam, Ambemohar and Basmati rice individually and in a mixture was done because: -

- It helped to analyse the effect of various rice types on hair growth
- It helped to find the best option to be used for maximum results
- The rice variety used in Yao village of China is Longii rice
- Use of various types of Indian variety helps to ensure if Indian variety of rice was useful of the same

3.4 Statistical tools and econometric models

3.4.1 Descriptive Statistics

Descriptive Statics has been used to find the maximum, minimum, standard deviation, mean and t test values of the data obtained of length of hair growth. The hypothesis of the t test was that the hair growth after using fermented rice water is not more than average hair growth per month. t test is used to make comparison between two samples. It gives the significant difference between means of two groups. Larger the difference more is the difference between two groups

IV. RESULTS AND DISCUSSION



Fig. 1: Fermented rice water



Fig 2: Ferric chloride test



Fig 3: Alkaline reagent test



Fig 4: Salkowski test



Fig 6 : Keller Killiani test

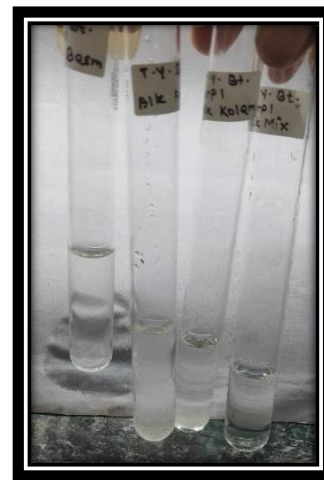


Fig 5: Mayer's test

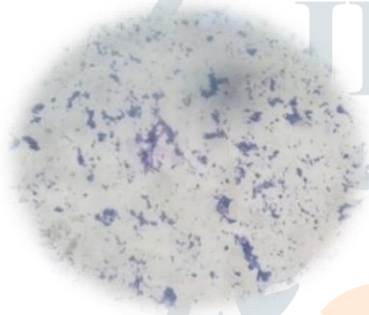


Fig 7: Gram positive organism isolated from Ambemohar rice water

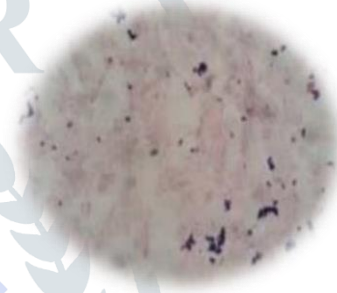


Fig 8: Gram negative organism isolated from Kalam rice water

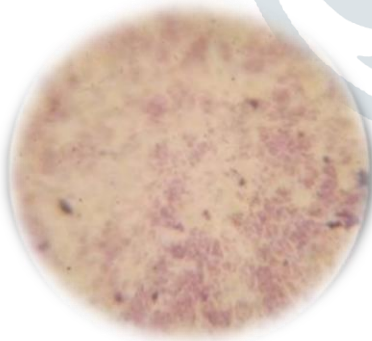


Fig 9: Gram negative organism isolated from Basmati rice water

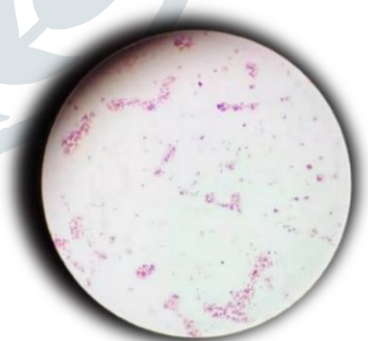
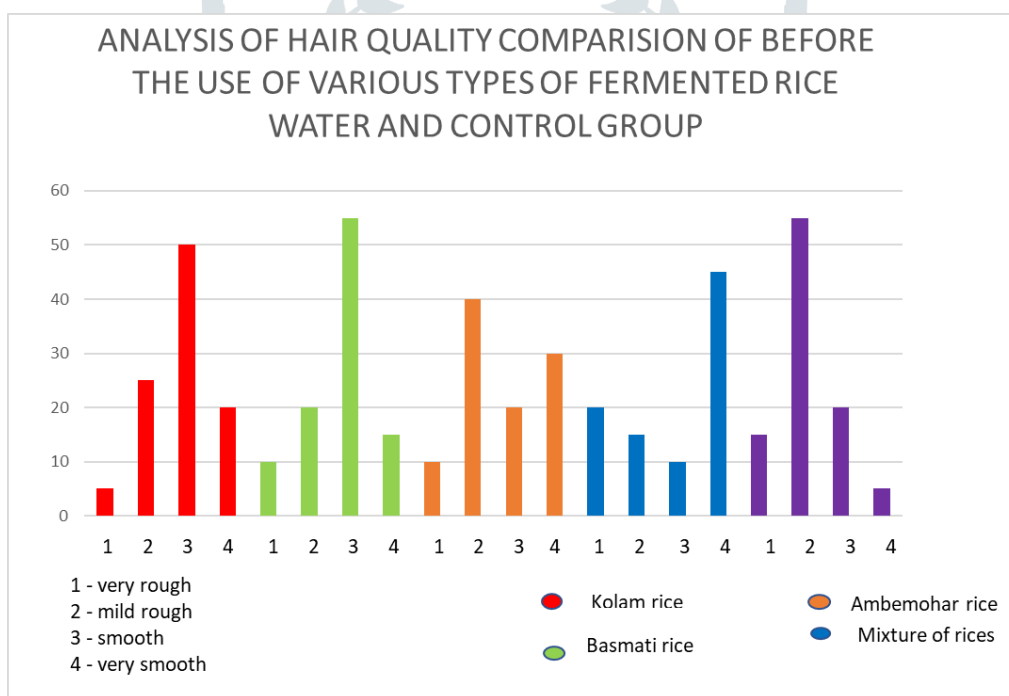


Fig 10: Gram negative organism isolated mixture rice water

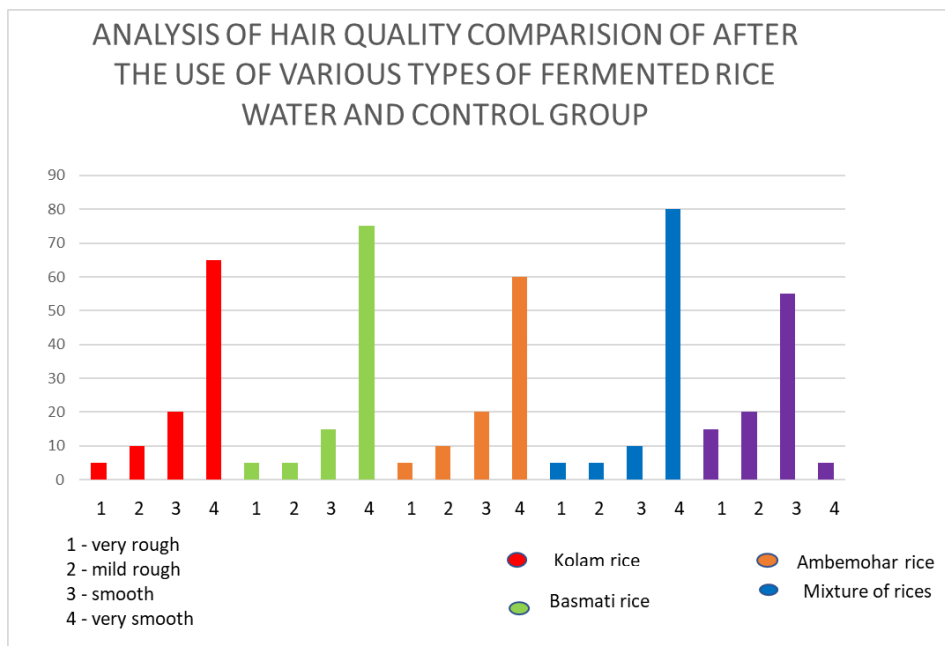
Colony characteristics

Table 1: Colony characteristics of isolated colonies from LB plates of each type of rice water

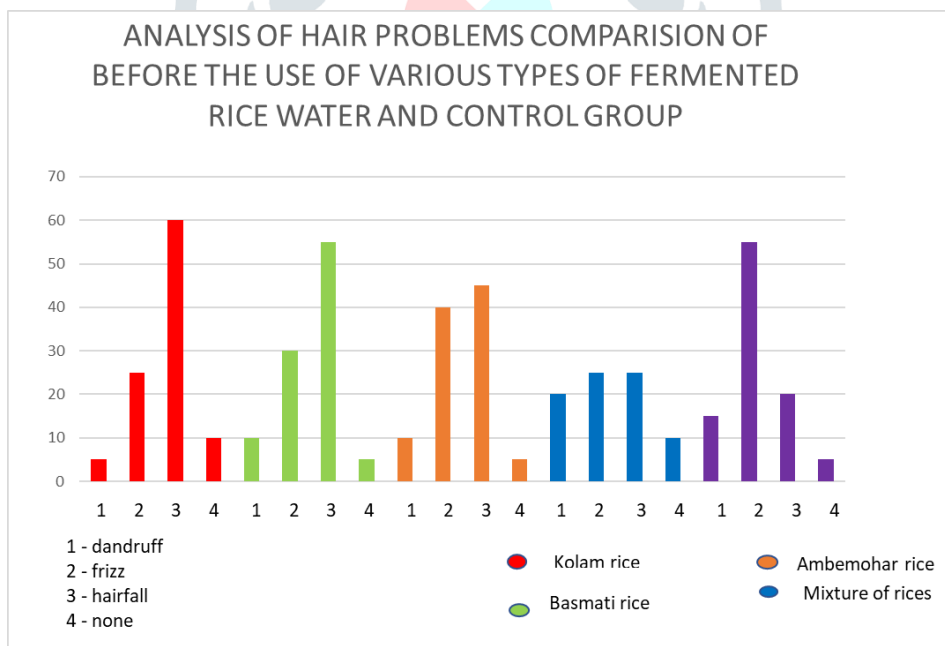
Characteristics	Rice Type			
	Mixture	Kolam	Basmati	Ambemohar
Size	1mm	2mm	2mm	1mm
Shape	Circular	Circular	Circular	Pin Point
Colour	White	White	White	White
Margin	Entire	Entire	Entire	Entire
Opacity	Opaque	Opaque	Opaque	Opaque
Elevation	Elevated	Elevated	Slightly flat	Depressed centre
Consistency	Rough	Mucoid	Mucoid	Mucoid
Gram Nature	Gram Negative	Gram Positive	Gram Negative	Gram Positive
Arrangement	Cocci in Cluster	Bascilli in Cluster	Short rods in cluster	Bascilli in cluster



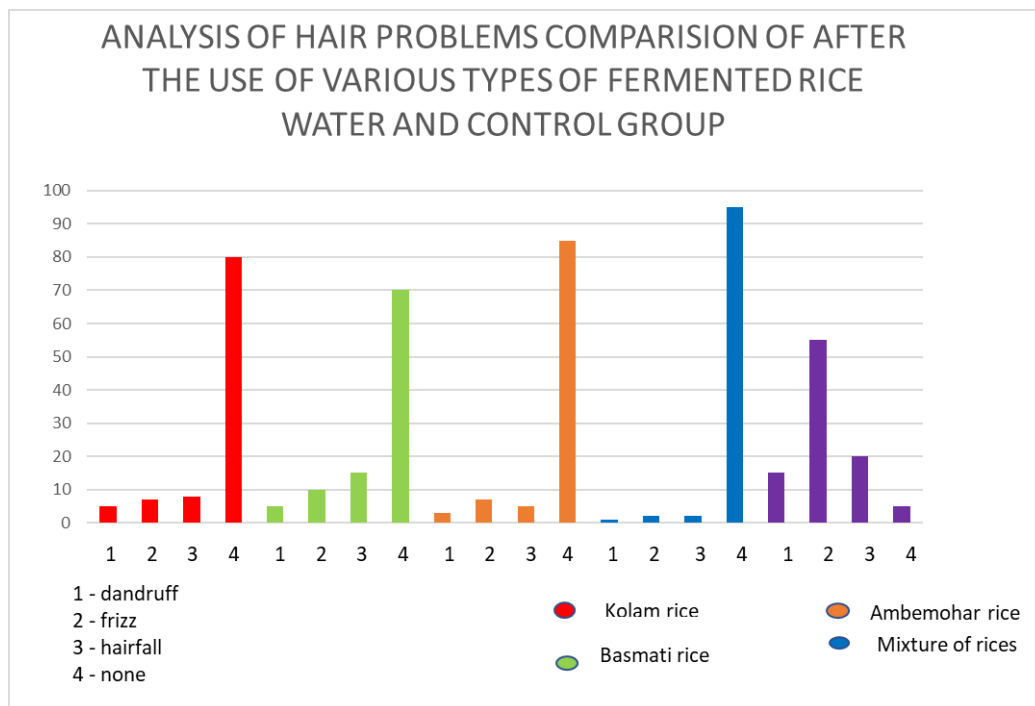
Graph 1: Analysis of hair quality before the rice water treatment



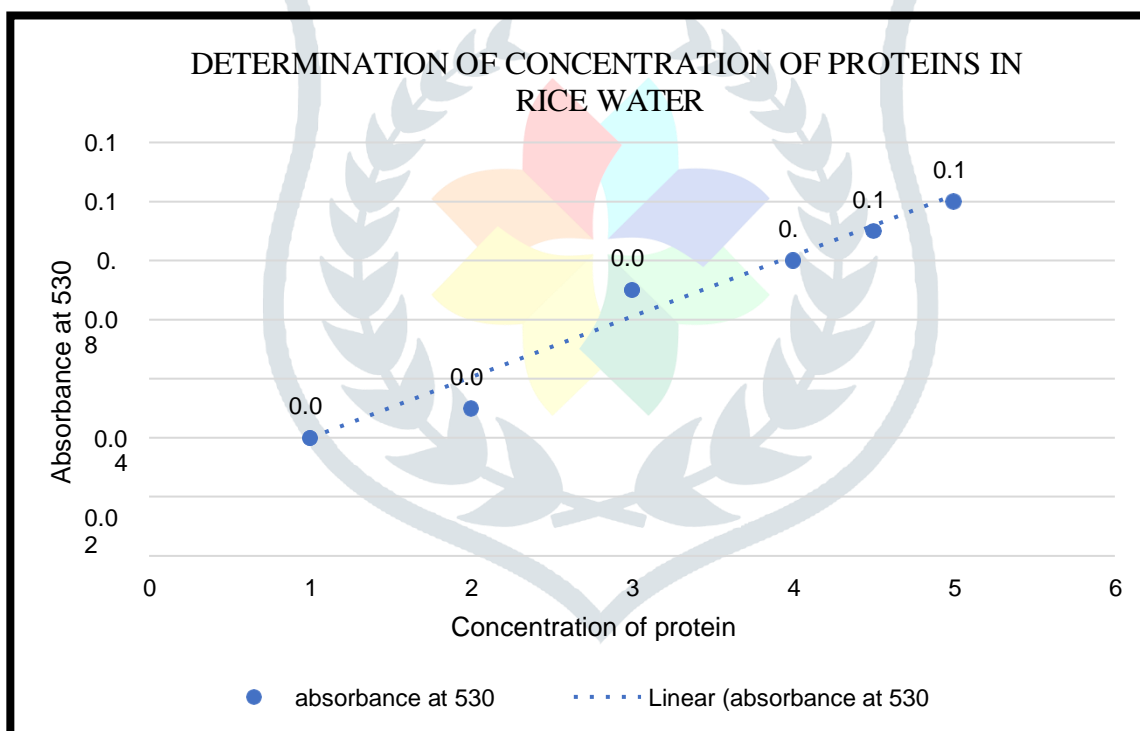
Graph 2 : Analysis of hair quality after the rice water treatment



Graph 3: Analysis of hair problems before the rice water treatment



Graph 4: Analysis of hair problems after the rice water treatment



Graph 5 : Determination of protein concentration in rice water

Statistical analysis :

t test: -

H0: Hair growth was not observed after 30 days using mixture of rice water.

($\mu \neq 1.5\text{cm}$) H1: Hair growth was observed after 30 days of using mixture of rice water. ($\mu = 1.5\text{cm}$)

Analysis	Control	Mixture of rice	Kolam Rice	Basmati Rice	Ambemohar Rice
Mean	0.63± cm	2.02± 0.3041 cm	1.72± 0.2438 cm	1.8± 0.2332 cm	1.8± 0.1153 cm
T test Value		5.4	4.0322	41.0959	8.2192
T test Reults	Null Hypothesis Accepted	Null Hypothesis Rejected and T test is Significant	Null Hypothesis Rejected and T test is Significant	Null Hypothesis Rejected and T test is Significant	Null Hypothesis Rejected and T test is Significant

Critical values of $t_{0.05}$ for 19 degree of freedom is 2.28

Critical values of $t_{0.05}$ for 9 degree of freedom is 2.262

The effect of fermented rice water on hair growth was checked using trials and biostatistics. The chemical tests performed for the 4 types of rice water shows the presence of alkaloid (Fig 5), tannins (Fig 2), flavonoids (Fig 3), glycosides (Fig 6) and steroids (Fig 4) along with protein. The concentration of protein for Mixture of rice, Kolam rice, Basmati rice and Ambemohar rice was found to be 4.5mg/ml, 1mg/ml, 4mg/ml and 3mg/ml (Graph 5) respectively. This indicates good amount of protein content in the tonic and is good of hair growth. The microbiological analysis was done using LB, CLED, MacConkey and Sabroude's Agar plated for all 4 rice types. The growth of colourless colonies on MacConkey's Agar and CLED Agar shows the presence of lactose non-fermenters. The Gram staining of organisms on LB Agar shows presence of Bacilli, cocci and short rods of gram positive and gram-negative nature (Fig 7, 8, 9 and 10) was observed indicating presence of microbes which can be normal microflora of the body and scalp helpful in maintaining good hair quality. The comparison between control and rice water shows that the average hair growth of Mixture of rice, Kolam rice, Basmati rice and Ambemohar rice is higher than that of control. The t test performed shows that for all the rice types the hair growth is more than that of 1.5cm/month which was the least expected hair growth. The comparison by graphical method for qualitative data such as Hair quality and hair fall shows that after the use of fermented rice water of any type, high smoothness was achieved with almost zero to low hair fall. Amongst all the rice varieties used mixture of rice types shows the best results. This might be due to the highest amount of protein present out of all rice types.

The obtained data strongly suggests that the use of fermented rice water correctly can help in the growth of hair at a faster rate than the average hair growth. This is highly beneficial to even maintain good quality of hair and reduce hair fall significantly with almost no hair problems like frizz and dandruff. The natural products used in the formulation ensures lower chances of development of allergies of toxic effect. The ingredients used are widely available in almost all parts of the world and are basically the waste products of the food products making the method highly economical for majority of the people. The Yao fermented rice water therapy is not just region specific and can be effective in various parts of the world. The highest hair length in the Yao village is not just a mere result of their environmental conditions of genetic factors and life style but the use of rice water for constant period of time and at regular intervals with good hair care routine is also a major factor. Thus, the dream long hair can be achieved with the help of proper use of fermented rice water and good hair care routine. More detailed research and better formulation to improve shelf life can help to take this product to the commercial level and can help in manufacturing of various hair care product.

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