PALM-BASED HAIR CARE PRODUCTS

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Hair is composed mainly of protein (keratin) and non-protein materials, lipids, trace elements, water and pigments. Hair consists of three layers:

- an innermost layer or medulla, which is only present in large thick hair;
- a middle layer known as the cortex. The cortex provides strength, colour and texture to the hair; and
- an outermost layer which is known as the cuticle. The cuticle is thin and colourless and serves to protect the cortex.

Hair grows from a bulb which consists of the dermal papilla and the hair matrix. The structure of hair is shown in *Figure 1*. Below the surface of the skin is the hair root, which is enclosed within a hair follicle. At the base of the hair follicle is the dermal papilla. The dermal papilla is fed by the bloodstream, which carries nourishment to produce new hair. The dermal papilla is an important structure for hair growth because it contains receptors for male hormones and androgens.

The hair follicles grow in repeated cycles (*Figure 2*). One cycle can be divided into three phases:

Anagen: growth phase.
Catagen: transitional phase.
Telogen: resting phase.

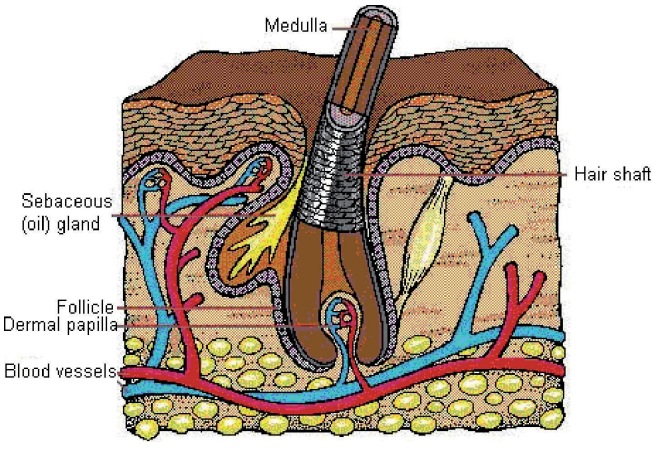

Figure 1. Hair structure.

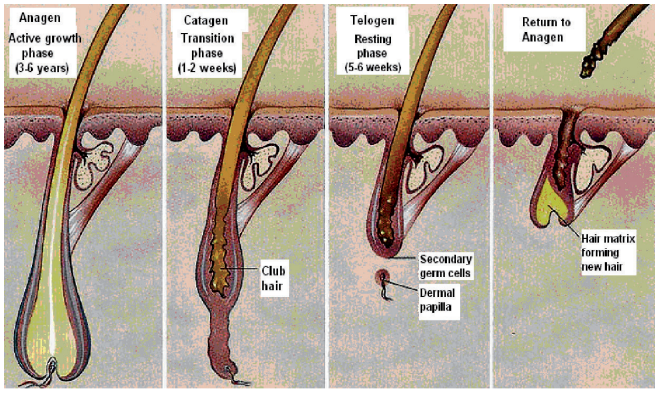

Figure 2. Growth cycle of hair.

The average human head has around 100 000 hair follicles. It is normal to lose hair through everyday actions such as washing, combing and brushing. However, it is difficult to determine what is normal hair fall because it varies from person to person. A hair loss problem is usually realized when a person's hair decreases over a period of time.

There are several factors that can cause hair loss such as genetic factors, ageing, stress, mechanical damage to the scalp and hair, skin infections, diseases that affect the body generally (*e.g.* thyroid disease), and the use of certain medications such as cancer-reducing drugs.

Hair loss or alopecia is a common problem in both men and women, regardless of their age. Common types of hair loss are:

- androgenetic alopecia;
- alopecia areata;
- telogen effluvium;
- medical problems; and
- discoid lupus erythermatosus (DLE).

Androgenetic alopecia is the most common cause of hair loss, affecting about 50% of men and women older than 40 years of age (Olsen, 1994). This problem is induced by androgens (male hormones). Dihydrotestosterone (DHT) is a potent metabolite of the androgen testosterone which

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causes gradual and progressive shrinkage of the hair follicles that leads to the production of smaller and finer hair. There are a few possible options for the treatment of hair loss, such as hair prostheses, surgery and topical or oral medications. MPOB has successfully developed hair care products with palm bioactive materials for topical application (*Figure 3*). The effectiveness of these products in reducing hair loss and promoting hair growth has been studied.

Figure 3. Reducing hair-loss shampoo, conditioner and treatment cream.

MARKET ANALYSIS

Figure 4 shows the global market and forecast value of hair care products by segment, for which shampoo was the key hair care segment accounting for 31% of the sales in 2007. In the market, there are many hair care products which have been produced to cater to customer needs. The majority of men or women who suffer from hair loss problems will use hair care products to solve these problems. They prefer to apply hair care products rather than to take pills which can cause side-effects. Therefore, most of the hair care products currently in the market have been developed specifically to treat hair loss or to control hair fall.

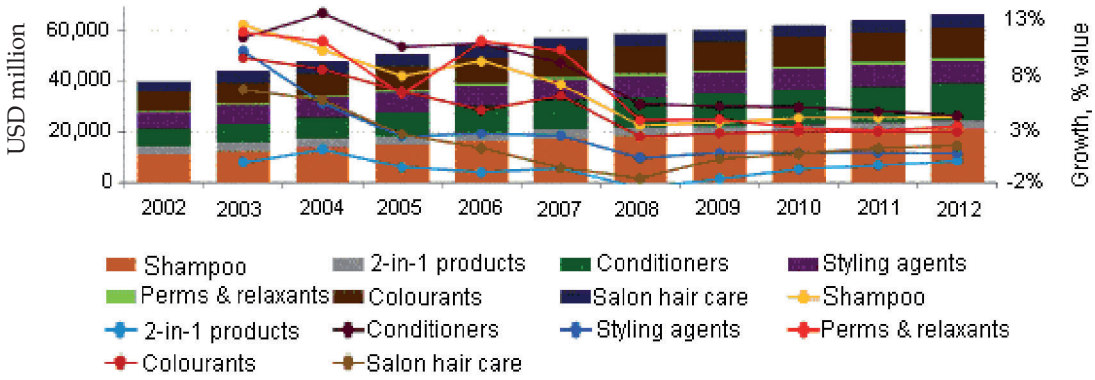
PERFORMANCE OF REDUCING HAIR-LOSS SHAMPOO, CONDITIONER AND TREATMENT CREAM

Foaming Power and Foam Stability of Reducing Hair-Loss Shampoo

Figure 5 shows the foaming power and foam stability of reducing hair-loss shampoos formulated with crude palm oil (CPO), gold Tri-E or vitamin E (GTE), inositol (I), and with a combination of these actives (CGI) in comparison with a commercial shampoo, a placebo and D-panthenol in tap water, deionized water and in water of 350 ppm hardness. The results show that foaming power and foam stability of the formulated reducing hair-loss shampoos, *i.e.* CPO, GTE and CGI, were lower than the commercial shampoo, placebo and D-panthenol in all the tested water. However, foaming power and stability of the shampoo formulated with inositol were comparable to the commercial shampoo. This indicates that the presence of oil affects the foaming power and foam stability of the shampoos.

Hair Strength

Figure 6 illustrates results in tensile strength of hair after treatment with the reducing hair-loss shampoos and conditioner. The results show that hair treated with inositol and CGI showed better strength than the rest of the test products.



Source: Euromonitor International.

Figure 4. Global market value of hair care products by segment from 2002 to 2009, and forecast value from 2010 to 2012.

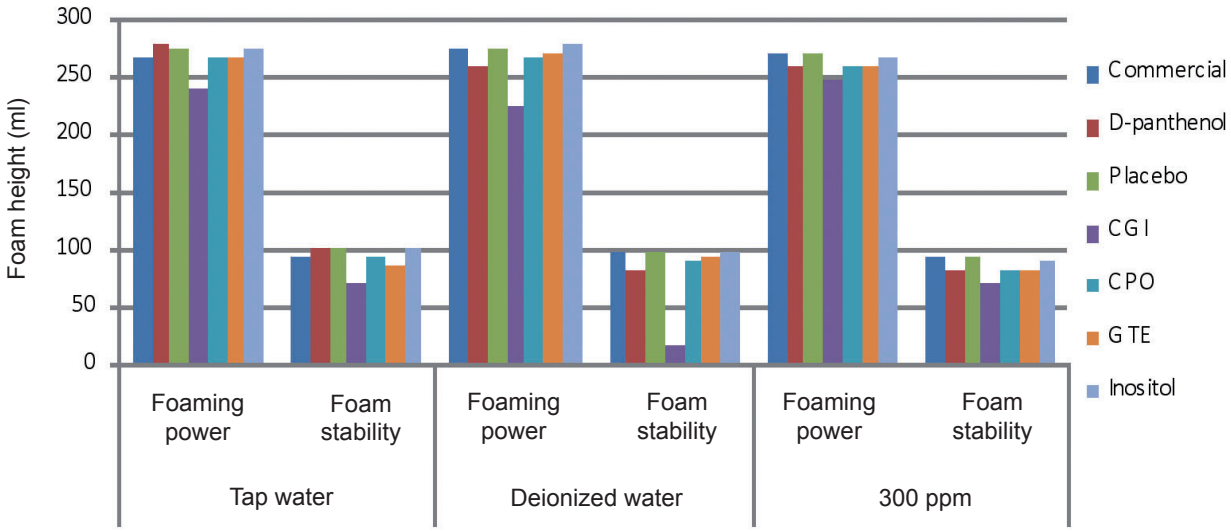


Figure 5. Foaming power and foam stability of reducing hair-loss shampoos in tap water, deionized water and water of 350 ppm hardness.

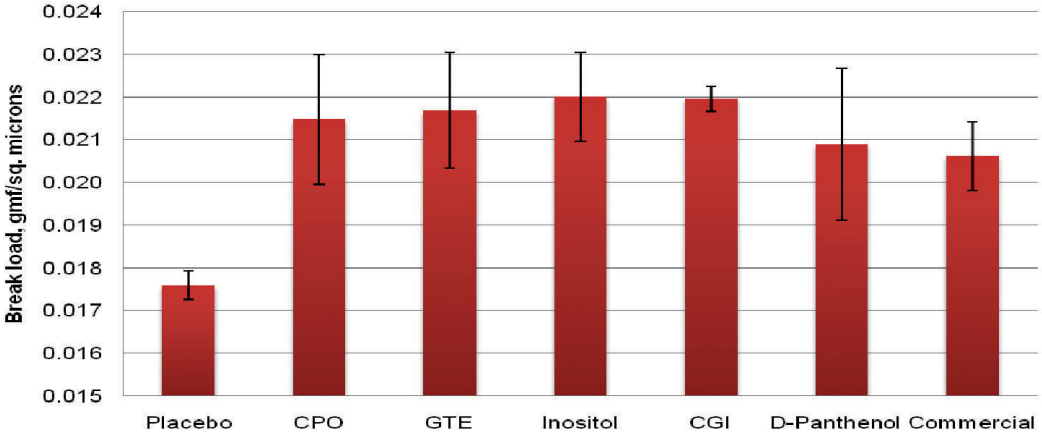


Figure 6. Tensile strength of hair after treatment with reducing hair-loss shampoos and conditioner.

In vivo EFFICACY TEST

Efficacy studies, *i.e.* wash, pull and phototrichogram tests, were performed on volunteers who had a hair loss problem. The female volunteers were selected according to type II of the Ludwig hair loss scale (*Figure 7*), while the male volunteers were selected according to types II to IV based on the Hamilton baldness scale (*Figure 8*).

Wash and Pull Tests

The volunteers were divided into three groups and had to apply the treatment cream twice a day, and to wash their hair with shampoo and conditioner once in every two days. The first group used placebo products, the second group used products containing vitamin E, CPO and inositol (CGI), while the last group used commercial products.

Figure 9 shows the percentage of hair fall during washing. The results indicate that the percentage of hair fall during washing decreased to 13% after 90 days of treatment with CGI products which was significantly different from the placebo at a probability $p<0.05$, while the percentage of hair fall during washing using the commercial products increased to 25% from 45 to 90 days of treatment.

Figure 10 illustrates the results of the pull test. After 90 days of treatment, the percentage of hair removed for the treatment with CGI was lower than when the placebo and commercial products were used. Therefore, it is confirmed that after

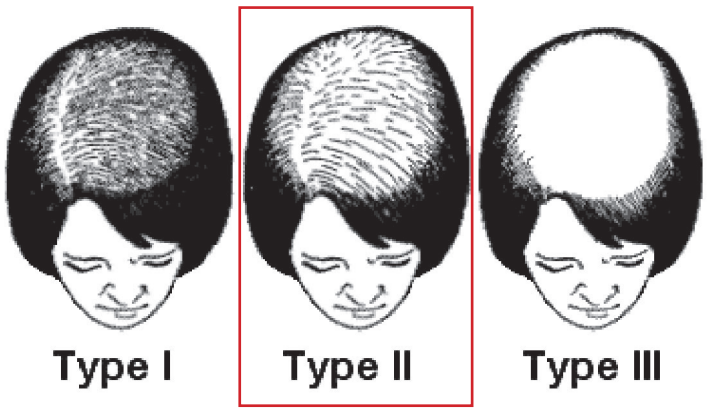


Figure 7. Ludwig hair loss scale.

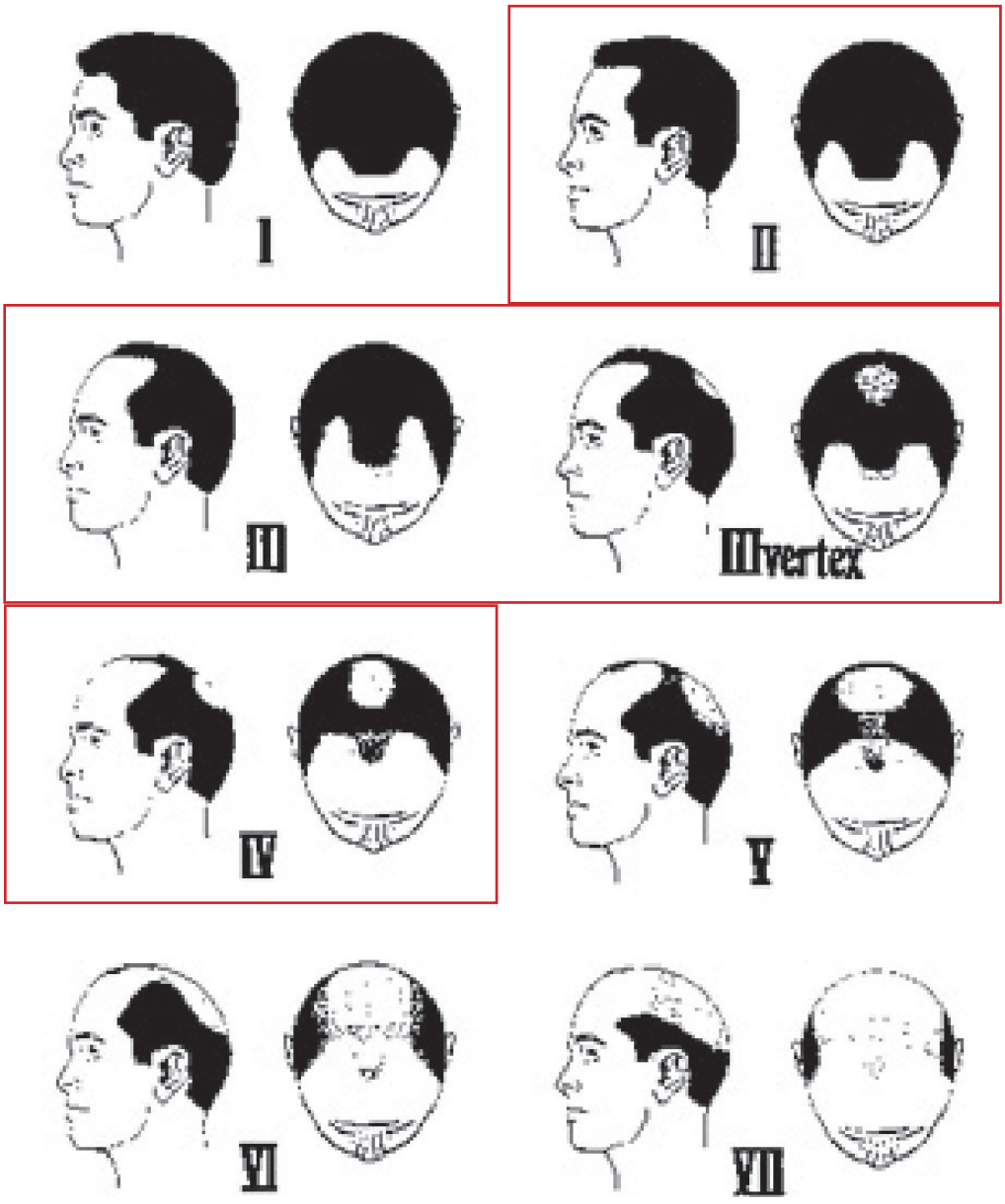


Figure 8. Hamilton baldness scale.

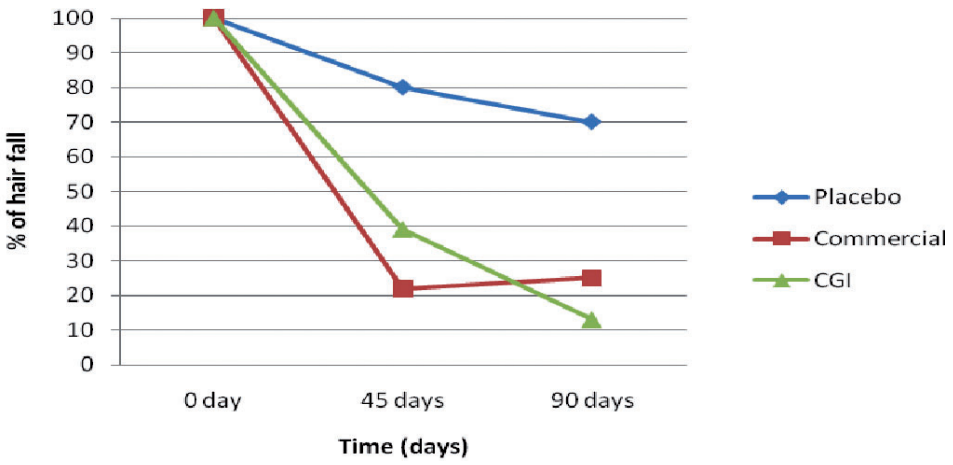


Figure 9. Percentage of hair fall during washing after treatment with reducing hair-loss shampoo, conditioner and treatment cream.

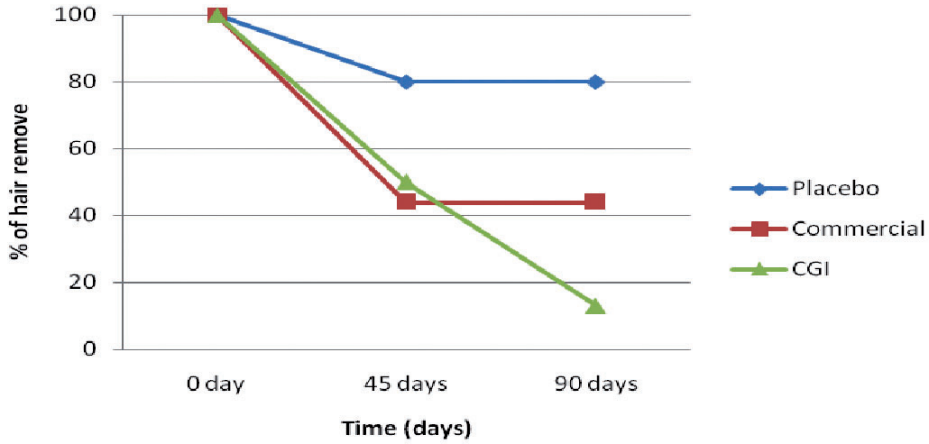


Figure 10. Percentage of hair removed by pulling after treatment with reducing hair-loss shampoo, conditioner and treatment cream.

treatment with CGI products, hair fall during washing decreased while hair strength was improved.

Phototrichogram Test

The phototrichogram test was carried out on 10 volunteers. The objective of this test was to study the effectiveness of the products in promoting hair growth. A small area of the scalp was shaved prior to measurement. An image of the area was then taken with a visioscan98 after 48 hr. The volunteers were required to apply the treatment cream on the shaven area of their scalp for a period of three months.

As may be seen in *Figure 11*, hair in the anagen phase is long, thick and black, while in the telogen phase it is short, slim and fair.

The number of anagen hair was counted manually from the image taken, and the results are presented

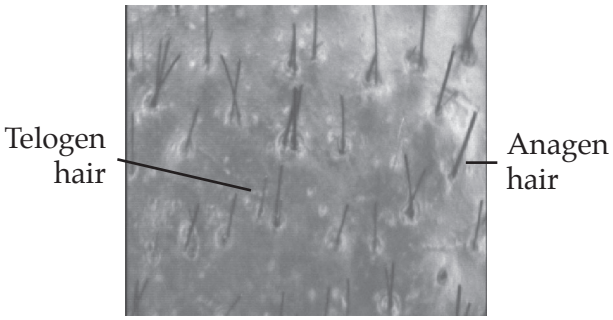


Figure 11. Anagen and telogen hair.

in *Figure 12*. The results show that the amount of anagen hair increased after treatment with the cream products containing either a combination of CPO, vitamin E and inositol (CGI) or vitamin E (GTE) as compared to the other products. *Figure 13* illustrates the images of male scalp areas of the control and after treatment with the cream products. From the images it may be seen that the scalp treated with CGI showed hair growth and the amount of anagen hair increased every month.

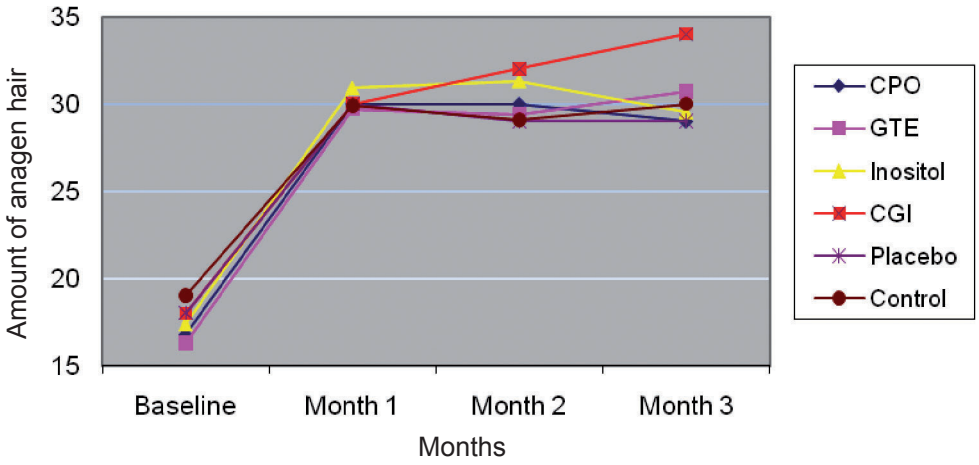


Figure 12. Amount of anagen hair after treatment with the cream products.

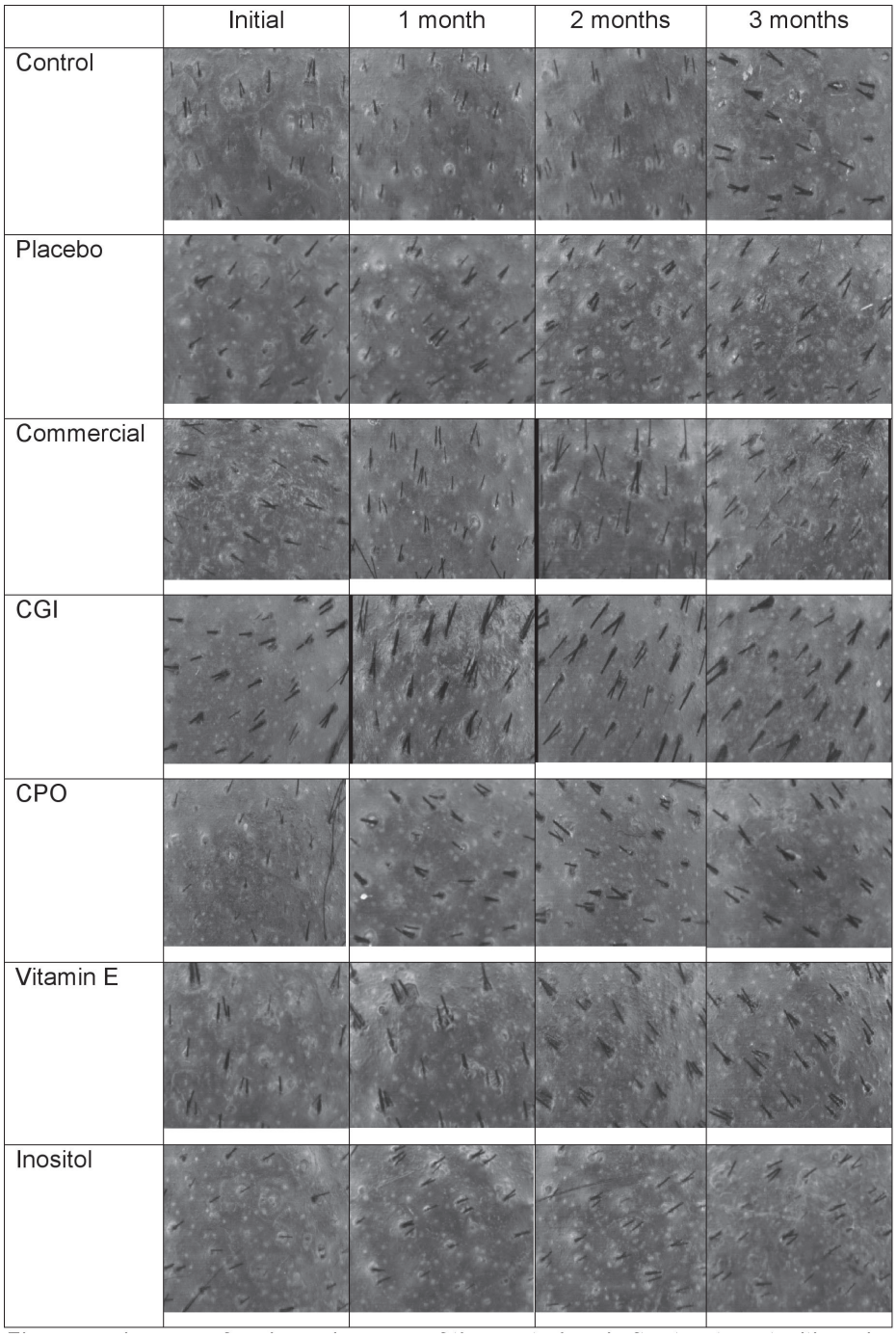


Figure 13. Images of male scalp areas of the control and after treatment with various cream products.

ECONOMIC ANALYSIS

	Reducing hair-loss shampoo	Reducing hair-loss conditioner	Reducing hair-loss treatment cream
Capital expenditure (CAPEX)	RM 1 082 500	RM 1 082 500	RM 1 082 500
Internal rate of return (IRR)	25	26	20
Payback period	4 years	4 years	4 years
Net present value @ 20%	RM 108 058.09	RM 150 473.14	RM 10 951.30
Estimated sales price/packaging size	RM 30/250 g	RM 23/200 g	RM 80/50 g

CONCLUSION

Reducing hair-loss products with vitamin E alone or in a combination with CPO, vitamin E and inositol have shown potential as hair growth promoters.

REFERENCE

OLSEN, E A (1994). *Disorders of Hair Growth: Diagnosis and Treatment*. McGraw-Hill, New York. p. 257-283.

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