

The Production of Enzyme Based Cosmetics in Thailand & the Emerging Cosmetic and Personal Care Cottage Industry.

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The Thai people have always been above average per capita users of cosmetics and personal care products in the Asian region¹. Cosmetic, personal care and toiletry market segments have always been competitive, with a lot of local innovation, not always seen in other countries of the region. Over the last few years, consumers in Thailand has also shown a tremendous interest in '*green products*', as can be seen in the various handicraft markets around Bangkok. Thailand is perhaps a unique country due to the way Buddhism is practiced, which has promoted a deep awareness of the environment on the part of consumers.

Thai farming has also undergone quick evolution from chemical dependent practices to chemical free practices over the last decade. Organic and sustainable farming practices have been introduced to the point where all rice paddy production in the country will soon be organic. Unlike organic farming in Western countries, where it is considered a premium activity in agriculture, organic farming is developing its strong base in Thailand as a method to lower cost inputs in agriculture.

Another change to Thailand which is beginning to have great impact on daily consumer habits is the development of the "*One Tambon One Product*" (tambon meaning village sub-district) or OTOP program for short, initiated nationwide by the government in 2001. The original objective of the program was to enhance social protection through; the development of local handicrafts, development of collaboration between public agencies, local Government and the people in developing micro-entrepreneurship, to promote human self-sufficiency at the village level, to develop best practices and quality products at village level, to cluster this development in regions, to link agriculture and tourism, and to link micro-enterprises to the local, regional, national and international markets².

The Thailand OTOP program is based on the Japanese One Village One Product Movement (OVOP) - The OVOP movement started 1979 in Oita Japan as a means to promote regional revitalization and autonomy. Each community identified one or more products or industry that was locally specific and distinct. Resources were then concentrated on the production of these products, establishing them as local brands, and marketing them to the entire country or beyond. The program is based on the following principles: 1) Local yet global –the development of globally accepted products that reflect pride in the local culture; 2) Self-reliance and creativity; and 3) Human resource development – Rewarding creativity and industry. Villagers found that their local products turned into national brands, which encouraged interest in their local traditions and products – leading at times to an increase in tourism.

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Publicized through mass media, research and guidance facilities were established to provide technical support to varying industries; a sales and distribution mechanism for OVOP products was organized, and education and training was offered to industrial and regional leaders. A reward system was also set up for those who successfully implemented the program³.

The OTOP program in Thailand has developed into an umbrella platform where multiple programs have been set up to enhance product development, skill, technology and marketing. Marketing is undertaken through multiple marketing channels, including;

1. Regional Retail Outlets
2. Retail outlets in Tourist precincts
3. Exhibitions (regional, domestic and international)
4. Road-shows (domestic and international)
5. Internet Marketing
6. Catalogue marketing
7. Permanent central exhibition centre in Bangkok
8. Through hypermarkets like MAKRO, Carrefour, Tops and Tesco
9. Direct marketing, and
10. International OTOP trade offices

OTOP now covers all product areas including handicrafts, cosmetics, herbs, essential oils, foods, beverages, wine, produce, textiles and clothing, and many other categories. The OTOP program is now in its third strategy phase of developing international markets and agreements are being made with international companies and department stores to carry OTOP products in Europe and Japan⁴.

The culmination of factors discussed above have assisted in creating a growing cottage industry of enterprises manufacturing herbal products, essential oils, cosmetics, personal care products and household cleaning products. The OTOP program has provided both the knowledge and marketing channels so that people in remote villages are able to develop products and sell them. Even the Thai Farmers Bank is on a nationwide basis is conducting classes on how to manufacture cosmetics and toiletries and also selling the raw materials in the most remote towns to village people. Thus, this people empowerment is reversing concentration of the cosmetic and personal care industries and creating a 'new' local cluster of micro-industries, where products are growing in popularity.

The Thais seem to be different from many other Asian cultures, where they are deeply proud of their own nation's products and will buy them, if they are easily available. This is in stark contrast to some other countries in the region, where imported products are considered of higher quality to the local ones. Perhaps Thailand's position as the only country in South East Asia, never to be occupied by a colonial power has something to do with this.

Village Production of Enzyme Based Products

The development of organic agriculture in Thailand has provided knowledge to village people about the value of enzymes. Most farmers have the skills to produce their own enzymes from local fruits through natural fermentation. As enzymes are cheaper to produce than purchasing cosmetic raw materials and their cleaning efficacy powerful, many products produced in rural areas of Thailand are enzyme based. This is encouraged by the urban consumers who have a favourable disposition to natural products, which is spurring on the growth in production and innovations in new products, at the micro-enterprise level.

Enzymes are produced at farm level to trigger compost and fertilizer fermentation. Imported *bokashi* (photosynthetic organisms, lactobacillus) are too expensive to purchase, so local formulae were developed to produce a local version of effective microorganisms (EM), which also had the same fermenting effects. These are used in both dry and wet composts (rice bran, oil cake, fish meal, etc), mixed with molasses. Water is added to around 60-70% of the mixture, and fermentation will take place in around 3-4 days, without generating much heat above 35-40°C². Neem leaves and/or fruits (*Azadirachta indica*) can be added during fermentation to produce a dual fertilizer/pesticide or a number of other additives utilised to produce an organic herbicide. *Pseudo Hormones* are also made using another variation of the basic enzyme formula to promote flowering and the production of fruit.

Usually, the 'EM'² is produced in excess quantities to what is needed for agriculture. A general formula or variances of it are produced, so they can be utilized in the production of cleaners and other products for home consumption. Experimentation has lead to tailor made enzyme production for specific purposes.

Fruits are rich in natural enzymes, which act as a catalyst to ripen and then disintegrate the same fruit through over-ripening, where the fruit becomes softer an un-edible. Different fruits will produce different enzymes (i.e., citrus fruits ascorbic acid oxidase, pineapple bromelase, tomatoes pectinase, and papaya papain). Vegetables will produce other enzymes (i.e., sweet potatoes beta-amylase, leafy vegetables chlorophyllase and phenolase) and animal waste will produce yet others (i.e., peroxidase, elastase, lactase, etc). These are the basic ingredients in the production of the 'EM'. Thus the specific production of enzymes for cosmetic and other product applications at village level has been developed with experience and trial and error, rather than scientifically. Different people will have come up with their own enzyme making formula, which suits their particular purposes. This of course means that the relative activity of different products will vary greatly depending on the skill and knowledge of the producer.

Insert Box "What's Happening Here: How Enzymes are Produced"

² This is the local name given to enzymes as a generic term

Formula 1: A General Enzyme Base for Cosmetic Products

Banana, grape, Pineapple, apple, orange, papaya, Mango stein	6 kilograms in various proportions according to person's own formula
Honey	2 liters
Water	20 Liters

Procedure: Place all ingredients together in a sealed tank and mix. Leave for at least one year. This process can be sped up by placing an existing enzyme in the mixture.

The primary enzymes that are produced are proteases in the form of bromelase from pineapples (*Ananas comosus*) and papain from papaya (*Carica papaya*). Bromelain is really a collection of similar protease, which are good protein digesting enzymes. Papain is also good at breaking down fibrous substances. The table above shows a general formula for enzymes produced at village level, although as mentioned previously, most people will have their own proprietary methods and ingredients. Some of these enzymes exhibit mild detergency properties, which can be further enhanced with ingredients like tamarind (*Tamarindus indica*), which was used as a soap substitute by many indigenous peoples of South East Asia for centuries⁶.

Once the basic enzyme is produced, and there are varying fermentation times in each varied process, the enzyme will be removed from the scum and cellulose material left at the bottom of the fermentation bins. The enzyme will be used as a base to produce a number of products including; facial and body scrubs, body lotions, shampoo, cleansers and face tonics, make up removers, acne treatment products, detergents, all purpose cleaners, window cleaners, laundry detergents, liquid soaps and health tonics. People in the villages tend not to use compounded fragrances, as they are difficult to purchase in small quantities and expensive. Usually plants like lemongrass, lime, pandan, and cinnamon will be used, ground up into a powder and added into the product. In addition natural dyes are also extracted from local flora and amazingly show great stability. Some basic examples of formulae are illustrated below.

Formula 2: Facial Scrub

Tamarind pulp	1 kilogram
Enzyme (base)	1 Kilogram
Turmeric	50 grams
Honey	20 grams

Procedure: Mix all ingredients together uniformly. Talc can be added and ground leaves to create a pumice effect.

Formula 3: Mouthwash

Enzyme (base)	50grams
Water	1 Kilogram
Menthol	To taste

Salt

Qs

Formula 4: Dishwashing Liquid

Enzyme (base) Base will consist heavily of citrus fruits	15 Kilograms
Coconut oil or CDE	2 kilogram
Ash water	15 kilograms

Formula 5: Hair Shampoo

Chopped Lemongrass	5 kilograms
Natural Saponins	1 Kilogram
Enzyme	1 kilogram
Honey	1 kilogram
Water	10 Kilograms
Natural home made dye	-q.s.-

Procedure: Keep for one month and then mix 1 part to 20 of ash water⁷ until pH 5-6.

In face scrubs the enzymes have the properties of assisting in the removal of dried and dead skin. In mouthwashes, enzymes help breakdown food substances and maybe assist in teeth whitening. In shampoos, enzymes perform the same process as in the face scrub for dandruff removal. In dishwashing detergents and all purpose cleaners, enzymes assist detergency in removing protein, greases and other organic substances.

Most villagers don't use any preservatives, believing that the enzyme has preservative qualities in it's own right. The beauty in these products are in their simplicity and naturalness, which makes them popular with consumers who appreciate them, from the point of view that they have efficacy, are green and are helping low income, rural groups in the Thai society. These products under the OTOP program are exempt from registration under the Food and Drug Administration of Thailand.

In the literature, the dangers and toxicity of enzymes have been highlighted. Bromelase and papain were examined in powder forms during the manufacturing process of detergents, which in the form of dust could easily find its way into human respiratory systems⁸⁹. Probably in the form of a liquid health risks¹⁰ are greatly reduced, and they are accepted by the US FDA for use in a number of products, including meat tenderizers and health tonics. Local folklore espouses the benefits of these enzymes for arthritis, swelling bruising and as a digestive aid.

Although, this emerging trend is still very basic without much scientific research to support and develop them further, they do represent an almost absolute natural product, fully manufactured without any synthetic or commercially available materials whatsoever. However a great number of difficulties still exist in the production of natural products, such as the

difficulties of obtaining consistent quality of natural raw materials (standardization), the limited availability of these raw materials for production on a mass scale, the limited number of suitable raw materials and technical problems, like viscosity, stability, preservation, discoloration, polymerization, etc¹¹. Even though, this is another step towards creating a truly natural product, and there is definitely a story to tell the consumer¹², if an opportunistic company seizes this marketing line, as is demonstrated in the Thailand scenario.

However the Thai cottage movement has shown that enzymes can be made simply and cheaply at home. Enzymes in cosmetics need not be expensive ascetic materials that formulators use in their products. With this simplicity of manufacture, enzymes can fulfill a full functional role in the formulation of cosmetics.

Whether one of the local players in the cosmetic, personal care and toiletry industry, or even one of the multinationals takes up this concept to the same extent that these village producers have, is something we will have to wait to see. There are a number of companies from the US and Europe, that are using enzymes in the production of personal care products, but still utilizing conventional surfactant bases, exploiting this '*niche*' quite successfully. The problem However, the cost of production is very high in Western countries, making these very premium products, in terms of pricing. There is also a barrier to entry to the large players because of the logistics in gathering and standardizing the raw materials. Thus, at this point of time, it will remain one of the many curiosities and specialized market '*niches*' of the cosmetic industry. One thing this trend has achieved in conjunction with the opportunities the OTOP program, has provided: the development of micro-enterprises, in rural Thailand, where the people need to develop self reliance.

Suggested Box:

What's Happening Here: How Enzymes are Produced¹³

In layman's terms the following diagram shows the process of enzyme development in the bucket while the mixture is left to mature. This basic process involves an energy source (glucose) that enables microbes to produce enzymes from the fruits stored in the bucket. As the microbes increase glucose levels will decrease until a point where new enzymes will be produced. At the village level quality control is done by smell. Glucose levels can be monitored by a refractometer. This process will produce a number of different enzymes within the mixture that will roughly follow the mix of feedstock (fruits) used in the process. The level and types of enzymes formed can be measured using a spectrophotometer.

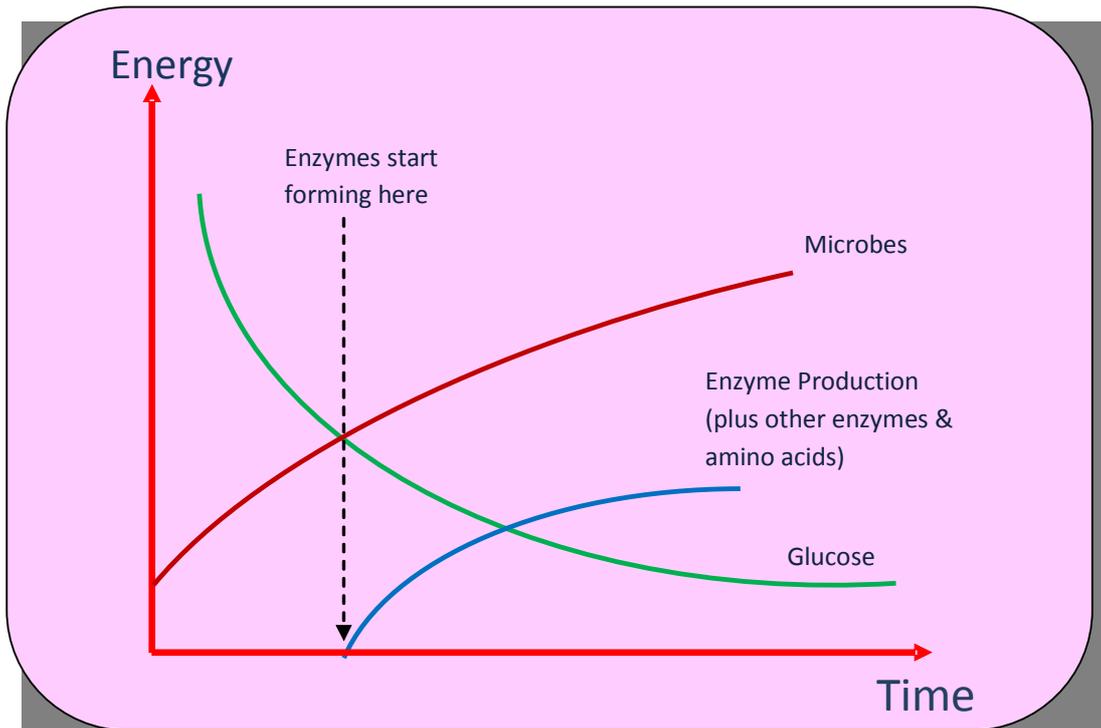


Figure 1. The enzyme development process.

- ¹ Hunter, M, The Challenge of South East Asia for the Australian Cosmetic manufacturer, *Cosmetics, Aerosols and Toiletries in Australia*, Vol. 8., No 1, September, 1993
- ² <http://72.14.207.104/search?q=cache:nM11cwMWWHcJ:www.nrct.net/downloads/251104integrated2006.pdf+otop+strategies&hl=en&gl=my&ct=clnk&cd=9> (accessed March 2006)
- ³ <http://www.undp.org.my/uploads/files/Microfinance%20Communications%20and%20Empowerment%20Campaigns.pdf> (accessed March 2006)
- ⁴ Annon., Japanese firm to Assist in Setting up OTOP distribution centre in Japan, Thai News Agency, MCOT, Bangkok, 16th February 2006, <http://etna.mcot.net/query.php?nid=6740>
- ⁵ Zakaria, A, (2005) Compost and Compositing, in Aini, Z., Sivapragasm, P., Vimala, M.N. and Mohamad Roff (eds.), *Organic and Vegetable Cultivation in Malaysia*, Kuala Lumpur, MARDI, P. 86.
- ⁶ Burkill, I. H., *A Dictionary of the Economic Products of the Malay Peninsula*, London, Government of the Straits Settlements, Volume 2, 1934, pp. 1876.
- ⁷ Ash water is a lye water made from burnt paddy husks.
- ⁸ Lewis, R. J., Hazardous Chemicals Desk Reference, 2nd Ed., New York, Van Nostrand Reinhold, 1991
- ⁹ Selinger, B., Chemistry in the Marketplace, 3rd Ed., Sydney, Harcourt Brace Jovanovich, 1986, P. 38
- ¹⁰ Davidson, A.S. and Milwidsky, B., Synthetic Detergents, 7th Ed., Burnt Hill, Harlow, Longman Scientific & Technical, 1987, P. 101
- ¹¹ Hunter, M., M., The Use of Natural Fragrances in Cosmetics – Should it be Considered?, *Cosmetics, Aerosols and Toiletries in Australia*, Vol. 10., No 3, October, 1996, pp. 43-44
- ¹² Ibid., P. 45
- ¹³ The author's thanks to Dr. Dachyar Abain, who is co-authoring a textbook on village biotechnology with the author for release in 2014.