Market Potential Evaluation for Local Herbal Extracts Used in Skincare Through the New Product Development Process

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Abstract
Thailand is well known for biodiversity of herbs which has been used for traditional medicine and cosmetics since ancient time. Recently, Thai government has launched the National Master Plan for Herbs to enhance the usage of their extracts as they are very interesting as active ingredients in cosmetics. However, some herbal extracts have drawbacks e.g. low water solubility and unstable in the environment leading to limitation of their use. Encapsulation technology has been widely applied to overcome the mentioned problems. A New Product Development (NPD) concept is adopted to develop a new herbal skincare product.
The objective of this study is to evaluate market potential for the skincare through a NPD process defined in this study. New ideas were generated and screened. As a result, extract from mangosteen's pericarp has been selected for suncare product development. Market potential for the new product and factors affecting willingness to buy the new product has been investigated.
Keywords: New Product Development, Herbal, Skincare

Introduction
Thailand is well known for biodiversity of herbs which has been used for traditional medicine and cosmetics since ancient time. It is not surprisingly Thailand has huge number in exportation of herbs and their extracts to many countries as well as local consumption for health supplement and cosmetics purpose (K-SME Analysis,2019). Recently, Thai government has launched the National Master Plan for Herbs to enhance their usage with applications of technology for sustainable economic development (DMSIC, 2017). Herbal extracts are very interesting as active ingredients in cosmetics because they possess biological activities such as anti-inflammation, anti-oxidant and anti-obesity. Moreover, herbal cosmetic

products are in high demand by consumers as they perceive the products are safer than chemical ones.

The cosmetics market in Thailand is very tough competition and has a high potential to growth. In 2016, it was reported that the market value was 251 Billion Thai Bath and continues to grow. Almost half of cosmetics market is occupied by skincare product which has the highest growth compared with other types of cosmetics (K-SME Analysis, 2018).

Based on interesting Thai herbal extracts as well as attractive of skincare market in Thailand, it has been decided to launch of new herbal skincare product. Thus, the objective of this study is to evaluate market potential for Thai natural extracts used in skincare through a NPD process defined in this study.

Literature review

New Product Development

The New Product Development (NPD) concept is widely adopted during a new product development as it has shown a relationship to a successful launch of the product. Screening and evaluation of generated ideas for new product could help firm to decide to go or no-go for further development. Thus, it is critical to have an effective management to prevent failure in later stage of development (Herstatt & Verworn, 2004; Koen et al., 2001). A study has reported the execution rate of NPD activities especially idea generation, idea screening and business analysis were higher in best performers firms compared to average and worst ones (Kim, Park, & Sawng, 2016).

NPD theories from well-known authors such as The Stage-Gate® Idea-to-Launch Process by Cooper (2001) and Ulrich and Eppinger (2011) have been reviewed. Additionally, NPD processes specifically for cosmetic development have been studied e.g. Cernasov (2009) and Pisetpackdeekul (2015) as shown in table 1. All these models have various common steps; thus, we have adopted and established the NPD process to facilitate our main framework as illustrated in figure 1. This study aimed to focus for market potential evaluation for local herbal used in skincare product. Thus, only activities in opportunity evaluation phase will be discussed.

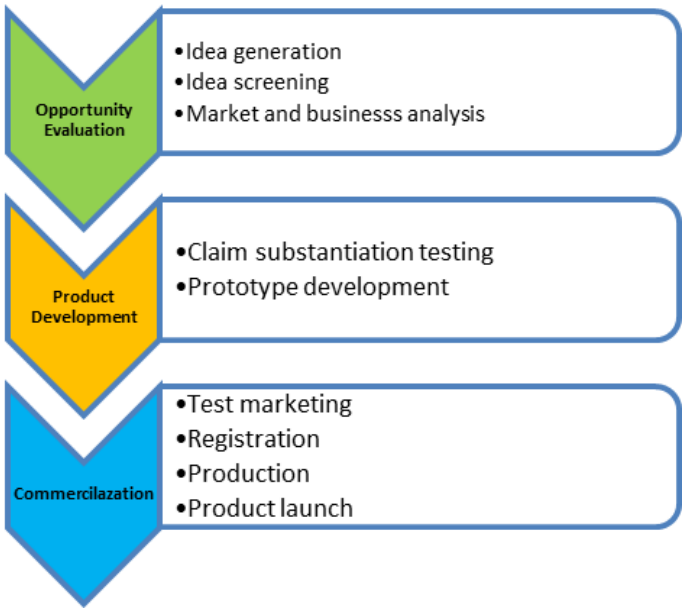

Figure 1 The proposed NPD process of herbal skincare product

Table 1 List of the NPD process reviewed in this study

Topic	Cooper 2001	Cernasov 2008	Ulrich & Eppinger 2011	Pisetpackdeekul 2015
New Product strategy development				
Idea generation	P		P	P
Idea screening	P		P	P
Marketing /Business analysis	P	P	P	P
Development	P	P	P	P
Prototype development		P		P
Claim substantiation / safety standard testing	P	P	P	P
Test marketing	P		P	P
Registration		P		P
Production	P	P	P	P
Product launch	P		P	P
Post launch review	P	P		

Opportunity evaluation (Idea generation, Idea screening and market and business analysis): It starts from generating new ideas from various sources e.g. staff, customers, competitors and patent database. Technical, market and financial feasibility is needed to screen for the most potential idea (Baker & Sinkula, 2005; Im & Workman, 2004). The effective screening process is essential to ensure successful launch of the new product (Elmquist & Segrestin, 2007; Kohn, 2005; Rosenthal & Capper, 2006). The most important factor of technology feasibility assessment is its competitiveness in the market. Applicability and patentability of the assessed technology are also considerable factors (Cho & Lee, 2013). It was reported that continuity of raw materials and related equipment is also significant.

Understanding a target market landscape and competitors are required to evaluate commercialization potential of the new product. Moreover, customers' feedback and suggestions are valuable because a new product which satisfy customers' needs the most trends to achieve the successful launch (Crawford and Di Benedetto, 2003). Thus, these mentioned factors must be applied as screening criteria to evaluate generated ideas before entering the development phase. Financial pre-feasibility e.g. level of investment and profitability also determine the possibility of the project.

Once the screening process is done and the most potential idea for a new product is selected, market and business analysis are performed. The analysis aims to reveal voice of customers to collect valuable information for product development as realizing their unmet needs is often initiation of a breakthrough solution (Cooper & Edgett, 2008). Survey and focus group meeting are an approach widely adopted to interact with target customers.

Encapsulation technology

Encapsulation has been widely used in various industries e.g. pharmaceutical, food, biochemical and cosmetic (Dubey, Shami, & Bhasker Rao, 2009). The principle is to shield or encapsulate active ingredients or core by shell as illustrated in figure 2. This technology aims to alter undesired properties of interesting biologically substances used in cosmetic to improve water solubility, enhance stability and control the release of active ingredient (Casanova & Santos, 2016).

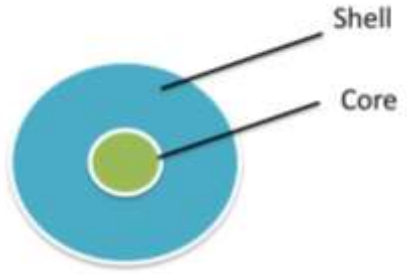

Figure 2 Scheme of encapsulation

Advantages of encapsulation technology are widely recognized not only altering active ingredients' characteristics but also adding a new value to the product. Moreover, encapsulation is helpful for a product differentiation in cosmetic market where the competitive is very tough. Examples of encapsulated core materials used for cosmetic are vitamin C, green tea extracts and essential oils (Anchisi, Meloni, & Maccioni, 2007; Wisuitiprot, Somsiri, Ingkaninan, & Waranuch, 2011; Yang, Lee, Han, Park, & Choy, 2003).

Related researches

Available literatures related customers' purchase intention towards skincare product were reviewed for factors affecting to their behaviors. It was found that marketing mix factors; product, price, place and promotion play important role in purchase behaviors as well as different demographic data of customers lead to different buying behaviors (Mek-Um, 2015; Mitpratan, 2011; Traikulnipat, 2016; Vimolratanakit, 2010; Vorapongsathorn, Kanlayavattanakul & Nathakankitkul, 2008).

Regarding to the reviewed literatures, factors affecting purchase intention towards skincare product have been defined and established a framework applied in this study. Figure 3 illustrated the research framework to investigate factors affecting purchase intention towards a new herbal suncare product.

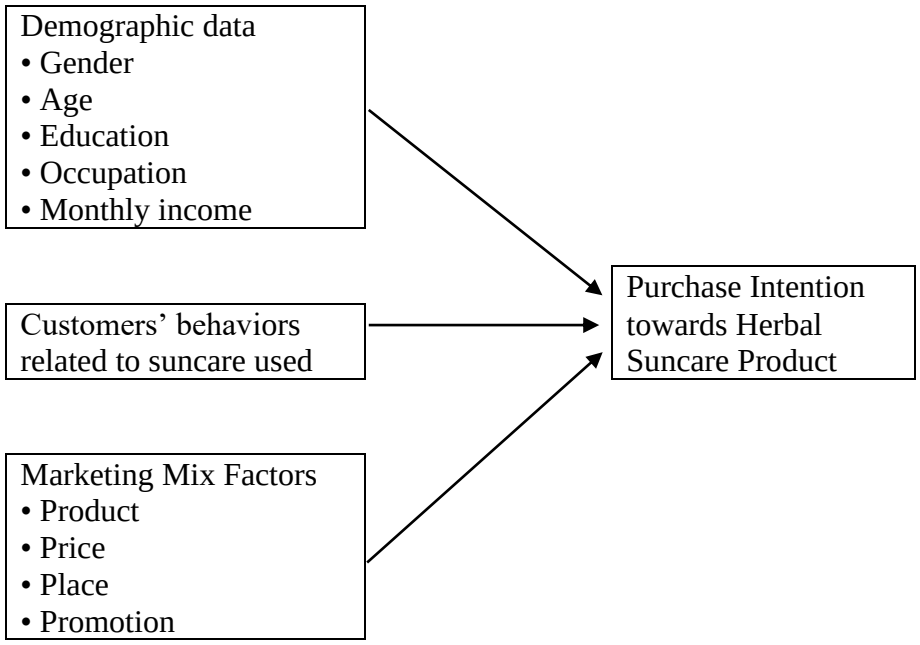

Figure 3 Conceptual framework to investigate factors affecting purchase intention towards herbal suncare product

Methodology

Idea generation and Idea screening process

Ideas for herbal skincare product were generated from related theories, researches and discussion with expert from cosmetics area. Proposed ideas were evaluated by three experts. The evaluation criteria have been established from reviewed literature to assess the feasibility.

Focus group meeting on consumers' behaviors pre and post sun exposure

The meeting was conducted to understand consumers' behaviors related to using of skincare products for pre and post sun exposure and to explore their unmet needs of suncare products. Participants were invited to attend the meeting based on following inclusion criteria; male or female, age 30-45 years old and routinely have outdoor activities exposed to sunlight. Discussion was performed based on pre-designed questions.

Study of consumers' behavior and purchase intention towards herbal suncare

The objective of this survey was to explore consumers' behaviors related to suncare use including their purchase intention towards herbal suncare. Population is defined as male and female, age less than 25 up to more than 46 years old living in Bangkok Metropolitan Area which is 2,349,784 (BMA, 2018). Sample size was calculated by Yamane's equation, with error level at 0.05 and confident interval 95%. Therefore, the samples size for collecting questionnaire is 400. The well validated questionnaires were distributed online to achieve 400 completed questionnaires.

Statistical analysis

Descriptive statistics was used to describe obtained data while inference statistics (Pearson's' chi-square and logistic regression) were applied to test hypothesis with confidence interval 95%. The SPSS program was used for analysis.

Results

Idea generation and Idea screening process

Based on literature review and discussion with experts, there are three encapsulated herbal extracts with interesting medicinal activities to be used in skincare product. The summary of their interesting medicinal property, technology advantages and potential application are shown in table 2.

• α - Mangostin is a main compound extracted from pericarp of Mangosteen (Garcinia mangostana L.). Garcinia mangosta extract (GME) has been widely used in Southeast Asian countries as medicinal resource. Recently; α-mangostin has been well-proven for its excellent anti-inflammation activity (Pedraza-Chaverri, Cardenas-Rodriguez, Orozco-Ibarra, & Perez-Rojas, 2008). Moreover, the extract α-Mangostin demostrated for its protective effect on UV-B damaged in in vitro and in vivo (Im, Kim, Chin, & Chae, 2017; Ko, 2015). However, α-mangostin has low solubility in water. These factors cause a limitation used of the extract in skincare. Therefore, encapsulated α-mangostin has been successfully prepared to overcome the problem (Pan-in and Wanichwecharungruang, 2013).

• 1'- Acetoxychavicol acetate (ACA) is extracted from the rhizome of Alpinia galangal or generally known as galangal which has been used as food ingredients in Southeast Asian countries. ACA has proved for its efficacy as anti-obesity substance. However, ACA is a thermal labile and degrade into inactive compound. ACA has successfully encapsulated by polymer to overcome the stability issue (Siangphloen, 2014).

• Curcumin is an extract from the rhizome of Curcuma longa. The extract has interesting anti-oxidant and anti-inflammation activities. However, curcumin has low chemical stability and low solubility in water. These factors restrict its application in food and cosmetics. Encapsulation technology has been applied to prepare the particle of curcumin

(Janesirisakule, Sinthusake, & Wanichwecharungruang, 2013). This enhancement of curcumin stability and solubility is benefit for further applications.

Table 2 Summary of proposed compounds and their potential applications

Proposed Encapsulated compound	Interested medicinal properties	Technology advantages	Potential application
GME-loaded nanoparticle	Anti-inflammation	Increase water solubility of α - mangostin	Suncare product
ACA-loaded nanoparticle	Anti-obesity	Increase water solubility and stability of ACA	Anti-obesity product
Curcumin-loaded nanoparticle	Anti-oxidant	Increase water solubility and increase stability of curcumin	Skincare product

Potential application of proposed ideas was assessed by the evaluation criteria for technology, market and financial potential described earlier. Three experts in cosmetic field have evaluated and scored as shown in table 3. GME-loaded nanoparticle for suncare use was the most feasibility idea followed by ACA-loaded nanoparticle and curcumin-loaded nanoparticle, respectively. Thus, in the next step only GME-loaded nanoparticle for suncare use is focused.

Table 3 Evaluation criteria for generated idea for a new skincare product

Evaluation Criteria	Weight scoring	GME-loaded nanoparticle		ACA-loaded Nanoparticle		Curcumin-loaded Nanoparticle	
		Score	Final score	Score	Final score	Score	Final score
1) Technology potential							
1.1) Newness to the market	10	9	9	7	7	5	5
1.2) Applicability	10	10	10	7	7	10	10
1.3) Patentability	10	10	10	10	10	10	10
1.4) Continuity of raw material supply	10	10	10	10	10	8	8
2) Market potential							
2.1) Market potential	15	15	15	12	12	10	10
2.2) Customers' needs	15	15	15	12	12	10	10
2.3) Market competition	10	10	10	10	10	10	10
3) Financial potential							
3.1) Level of investment	10	10	10	10	10	10	10
3.2) Profitability	10	10	10	9	9	8	8
Total	**100**		**99**		**87**		**81**

Focus group meeting

The focus group meeting was conducted among 11 participants to gain insights related to before and after sun exposure activities. Most of participants were men. Average age of participants is 36.54 ± 0.25 years old. Seventy three percent of participants are spending their time of recreational outdoor activity; running which take 1-5 hours per time. Only 64% of them routinely use sunscreen products prior to sun exposure.

Most of participants applied sun protection methods e.g. wearing hat, UV cut clothes and using sunscreen product prior to sun exposure. However, there was some participants never use any sun protection because they believe the protection is useless. Most of participants concern about their skin after expose to the sunlight e.g. acute skin redness, skin darkening as well as pain. Thus, they use skincare products whether it is general or aftersun product for special care. They responded to aftersun product's attributes as gel formulations with cooling feeling. Participants suggested raising awareness of importance of aftersun product to the public to create product importance.

Study of consumers' behavior and purchase intention towards herbal suncare

Most of respondents are female (70%) and younger than 25 years old (45.75%). Mainly, they are student (43.50%), the highest education level is bachelor's degree (56.00%) and average monthly income is less than 10,000 Thai Baht (38.00%).

Customer's behaviors

Most of respondents use sunscreen daily (65.00%). The most preferred SPF and formulations is over 50 (43.00%) and cream (71.25%), respectively. Major of respondents buy sunscreen product one time per month (68.50%) and spend less than 500 Thai Baht per buying. Health and Beauty shop e.g. Boots and Watsons are the place where respondents frequently buy the products (45.25%). They usually seek for related information through website and magazine (44.00%). Buying influencer towards buying is themselves (63.25%). The top 5 most used sunscreen brands are Nivea (20.75%), followed by Garnier and Shishedo (8.00%) and Biore and Oley (7.00%), respectively.

Importance of Marketing mix factors towards purchase intention of suncare products

Respondents rated 4P factors related to product as 'important' except price as 'the most important'. As shown in table 4, the top three factors related to product are hypo-allergic, able to protect skin from UV-A & UV-B and non-greasy formulation while the factors related to price are appropriate price compared with product quality and available of price tag. Additionally, respondents rated overall factors related to place and promotion as 'important'. The top three factors related to place are convenient to buy, available in department stores and convenience shops and various payment methods and the factors related to promotion are sale campaign and free give away gift availability of testing samples and availability of promotional event.

Table 4 Importance of Marketing Mix factors

Marketing mix factors	Mean	SD	Interpretation
Products			
Hypo-allergic	4.56	0.73	Most important
UV-A and UV-B protection	4.44	0.71	Most important
Non-greasy formulation	4.42	0.82	Most important
Available of SPF and PA on the label	4.41	0.72	Most important
Certified by relevant agencies	4.40	0.73	Most important
Different from other products	3.64	0.89	Important
Nice packaging	3.58	0.91	Important
Imported brands	3.33	0.95	Neutral
Total	**4.10**	**0.49**	**Important**
Price			
Acceptable of purchased cost	4.40	0.72	Most important
Acceptable of purchased quantity	4.27	0.80	Most important
Available of price tag	4.19	0.85	Important
Comparable price with other products	3.97	0.84	Important
Total	**4.21**	**0.18**	**Most important**

Table 4 (Con.)

Marketing mix factors	Mean	SD	Interpretation
Place			
Convenient to buy	4.23	0.84	Most important
Available in department stores and convenience shops	4.20	0.87	Important
Various payment methods	3.79	1.06	Important
Outstanding position in shops	3.75	0.97	Important
Able to purchase online	3.72	1.15	Important
Total	**3.94**	**0.25**	**Important**
Promotion			
Sale campaign and free give away gift	3.89	0.99	Important
Availability of testing samples	3.84	1.03	Important
Availability of promotional event	3.77	0.95	Important
Availability of product brochure	3.56	1.07	Important
Availability of sale assistant	3.54	1.01	Important
Advertised by well-known person	3.40	1.06	Important
Total	**3.67**	**0.19**	**Important**

Purchase intention towards herbal suncare

Purchase intention towards herbal suncare with different demographics group, customers' behaviors and level of importance towards Marketing Mix factors (4Ps) have been statistically test for difference. The result shows that the intention was significantly different in people with different demographic data e.g. age, occupation, education level and monthly income except gender. Also, intention towards herbal suncare among customers' behaviors was significantly different among people who have different in frequency of sunscreen use and spending amount per time. Additionally, the results suggest that online distribution channel and promotional event statistically affecting the purchase intention towards herbal suncare product.

Conclusion

NPD process is an effective tool for creating, developing and launching a new product. This study aimed for development of a new herbal skincare product has followed the activities along the process for planning a launch of new product. Based on the abundant of herbs and attractive cosmetic market profile in Thailand, ideas were generated and focused on the project's objective. GME-loaded nanoparticle has been proposed for suncare product while ACA-loaded nanoparticle for slimming product and curcumin-loaded nanoparticle for skincare product. Subsequently, these ideas were evaluated by experts based on technology, market and financial feasibility to ensure only the most potential idea could entry to the development phase. It was found that GME-loaded nanoparticle for suncare product has the maximum score when compared to others. Then, the suncare market in Thailand as well as customers' behaviors related to suncare use was intensely investigated. All retrieved data has been consolidated and finalized that GME-loaded nanoparticle is suitable for aftersun product because of its anti-inflammation activity. Additionally, there is opportunity for the new aftersun product to grow in Thai market.

From the survey, most of respondents participated in this study usually apply sunscreen product prior to expose to the sunlight and they rated 'price' as the most important and 'product', 'place' and 'promotion' as important factor affecting purchase of sunscreen product. Purchase intention towards a new herbal suncare product was significantly different in people in different demographic data e.g. age, occupation, education level and monthly income except gender. Additionally, the purchase intention was significantly different by

customers' behaviors such as frequency of use, occasion of use and spending amount per buying. Moreover, level of importance for marketing mix factors (4P) such as place and promotion especially online shopping channels and promotional event, have shown their influence on willingness to buy a new herbal suncare product.

In conclusion, the development of a new aftersun product containing GME-loaded nanoparticle is interesting as the product's attribute and market is not highly competitive. Further study is required to confirm its efficacy and safety for registration with health authority. The new product launch plan should consider these factors to ensure successfulness e.g. target customers, distribution channel and promotional campaign.

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