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Abstract

The objectives of this study were to 1) design artificial flowers from Thai silk fabric and further develop them into fashion accessories products; 2) develop the artificial flowers from Thai silk fabric of Patama Brand using fragrance microencapsulation technology; and 3) survey on consumer satisfaction on Thai silk artificial flowers of Patama Brand developed by using fragrance microencapsulation technology.

In this study, Thai silk artificial flowers were designed and developed into fashion accessories products using sustainable fashion design concepts for the maximum benefits and variety of silk fabric applications in combination with bag hardware and accessories. Twenty draft designs were presented to the experts for assessment and six designs. The coating experiment using fragrance microencapsulation technology showed that Fragrance P01 had a highest average score of 4.8, which was at the highest level, followed by Fragrance P04 with an average score of 4.2, which was at a high level. Silk fabric coated with microencapsulated fragrance was covered with powder, resulting in slight discolouration of the fabric. However, the texture remained the same and showed a pleasant smell. According to the results, it can be concluded that P01 fragrance microcapsules on silk fabric were more effective compared to P04 fragrance microcapsules. P01 Fragrance gave feelings of cleanliness, freshness, and relaxation and is reminiscent of younger workers. P04 Fragrance gave a sensation of sweetness with a floral scent and is reminiscent of a sweet woman. However, P04 fragrance microcapsules showed higher concentration compared to silk fabric coated with P01 fragrance microcapsules. This research study shows the application of flowers as the fragrance of silk and the concept of using Thai silk for maximum benefit and diversity.

Keywords: Thai silk, artificial flowers, microencapsulation technology, fragrance, scented

1. Introduction

Ms. Patama Khamwan, the founder of Patama Brand, offers Thai silk flower brooches for women, which are produced using local Thai silk fabric. This brand has used Thai silk fabric and scraps to create flower brooches that represent Thai identity and raise awareness of woven cloth products from Thai wisdom. In addition, their products are eco-friendly and sustainable due to reduced

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waste and cost-effective use of silk fabric.

The charm of fragrance is linked to memories. It brings aesthetics and promotes the image, which reflects hidden values. In the past, the creation of fragrance was associated with beliefs and cultures. For example, Thai people in the past enjoyed drinking "jasmine-scented water" to quench their thirst. The scent of jasmine flowers makes you feel refreshed and delighted. Jasmine-scented water has also been used as an ingredient in many Thai desserts. For these reasons, jasmine has become a unique and memorable scent among Thai people for a long time. Incorporation of fragrance into products is one of the marketing strategies to achieve recognition, create value and stand out from the competition. "The science of scent" is one factor contributing to emotions, feelings, and impressions, which can reduce stress and help you relax.

Textile finishing is an enhancement of product attractiveness by developing the properties suitable for use. One of the most popular improvements in textile properties is finishing with various types of fragrances using microencapsulation technology. It is a technology used to encapsulate the substance within a thin polymer layer in the form of a micrometre-sized capsule for the benefit of stabilising and slowing down the reaction for the more prolonged effectiveness of such properties. Due to the small size of the molecule, microcapsules can penetrate into the matrix, making micro-encapsulation a highly efficient and popular technology applied to a wide variety of textile applications. In 2011, Nonglak Suthapot conducted research on the development of aroma coated on bedding sheets by microencapsulation technology and found that consumers were satisfied with different fragrances. The consumers indicated the following feelings towards the scents. The lavender scent is a cool scent from dried flowers, giving you a relaxing. The subtle scent of roses during sleep enhances the consumer's memory, while the peppermint scent makes you feel refreshed and relaxed and relieves headaches, and the jasmine scent makes you feel refreshed.

As mentioned above, the researchers aim to create other fashion accessories products in combination with the identity of Thai silk artificial flowers of Patama Brand. In addition, the researchers aim to add value to the products using microencapsulation technology and to create an identity with the charm of the scent to enhance commercial performance and competitiveness.

2 Objectives

There are three objectives in this study.

1. To design artificial flowers from Thai silk fabric and further develop them into fashion accessories products;

2. To develop the scented Thai silk artificial flowers of Patama Brand using microencapsulation technology;

3. To survey on consumer satisfaction on scented Thai silk artificial flowers of Patama Brand developed by using microencapsulation technology.

3 Research Methodology

3.1 Type of Research

In this study, the researcher focuses on the design and development of scented Thai silk artificial flowers using microencapsulation technology to add value to the products and raise awareness of the use of woven fabrics from Thai wisdom. The brand's name, "Patama", was used as a design concept for fabric patterns. The fabric used in this study was woven using the ikat (Madmee) weaving technique. The fabric obtained was then coated with fragrance using fragrance microencapsulation technology in order to develop and design contemporary fashion accessories from silk fabric. The silk fabric scraps were used to make the Thai silk artificial flowers that can be used with the above fashion accessories. This is in order to add value to the "Patama" brand and for the cost-effective use of silk fabric. The research methodology is as follows.

3.2 Population and Sample

Population

Group of Thai silk artificial flower entrepreneurs, Patama Brand, the experts and Thai consumers.

Sample

Key informant: Patama Brand, such as Ms. Patama Khamwan.

A group of experts in fashion accessories design and textiles with at least ten years of design experience was selected by purposive sampling method for a total of 5 persons, comprising: 1) Asst. Prof. Dr Ravitep Musikapan, Deputy Dean for Special Affairs and Chair of Fashion, Textiles and Accessories Program, College of Creative Industries, Srinakharinwirot University; 2) Dr Koraklod Kumsook, Deputy Dean for Intellectual Innovation and Research, Fashion, Textiles and Accessories Program, College of Creative Industries, Srinakharinwirot University; 3) Ms Araya Intra, stylist and special lecturer in Fashion, Textiles and Accessories Program, College of Creative Industry, Srinakharinwirot University; 4) Somporn Soonthornthamrong, Director of Bunka Fashion School and Advisor to Fashion Apparel Department, Thai Wacoal Public Company Limited; and 5) Praewa Ruchinarong, textile designer and owner of Termtem Studio.

Thai consumers from nonprobability sampling using convenience sampling. Due to the COVID-19 pandemic, online questionnaires were used for satisfaction surveys instead of inhalation tests with a sample of 100 people to prevent infection from droplet transmission according to the social distancing measures.

4 Procedures

Step 1 (R1: 1st Research) Problem analysis, fundamental survey and synthesis of information obtained from relevant studies, documents and research

Step 2 (D1: 1st Development): Experiment with microencapsulation technology in designing and developing prototypes of fashion accessories products.

Step 3 (R2: 2nd Research) The results from Step 2 were used to develop the prototypes and survey of satisfaction towards the designs of scented Thai silk artificial flowers.

Step 4 (D2: 2nd Development) Performance summary, presentation and dissemination

Fragrance coating using microencapsulation technology

Experimental method: Soapy water was prepared at a concentration of 20 g/L in distilled water. The silk fabric was then cleaned with the above solution at 80 °C for 1 hour. After boiling, the silk fabric was rinsed with 60-70°C water for 2 minutes and then rinsed it twice with water at room temperature for 2 minutes each and then air dried.

Coating of the microcapsules on the fabric starts with preparing a solution of the essential oil microcapsules at a concentration of 50 g/L in distilled water and stirring well. The coated fabric was soaked in the solution for 1 hour, with the solution covering the entire fabric. After soaking, the fabric was removed from the container and then squeezed to remove excess water and then air dried.

5 Results

5.1 Design of Fabric Pattern and Development of Scented Silk Fabric Using Microencapsulation Technology

According to the guidelines for the design and development of value-added textile products design and development guidelines for adding value of textile products (Information and Digital Industry Centre, Textile Industry Development Institute, 2018) that take into account the applications, contemporary pattern designs, modification and modernisation of the original patterns and raw materials, as well as the application of technology to add product value and to meet the needs of customers and market, the design guidelines can be summarised as follows.

5.1.1 Design of patterns

The researchers designed the ikat fabric patterns for the Patama Brand by inquiring the stakeholder, Ms. Patama Khamwan, about the need in the development of new patterns for the brand identity to communicate about the beauty of the lotus flower as a modern woman. The researcher created a mood board to convey the mood of pattern development. The components of the lotus flower were trenched and rearranged to create rhythm and colour according to the mood, which can be woven using the ikat technique. The researchers designed the fabric patterns by using a computer graphics program. Once the desired patterns were obtained, the patterns were then improved with a textile specialist, Praewa Ruchinarong, a textile designer and owner of Termtem Studio. This is in order to extract the designs into a graph grid and to prepare for the process of tying the silk threads to create a pattern as follows:

Figure 1. Fabric pattern's designed by the Researcher

Figure 2. Lotus patterned fabric of Patama Brand. Source: The Researcher

5.1.2 Results of fragrance coating using microencapsulation technology

The researchers inquired the entrepreneurs about the needs and trends of fragrances such as aromatherapy, floral fragrances, perfume fragrances and herbal fragrances. The entrepreneurs and fashion and textile experts agreed that the product identity of the Patama Brand should be created from perfume fragrances, as they are easy to recognise and distinguish among competitors and similar products, most of which use floral and aromatic scents. Six fragrances that give different feelings were selected as follows:

Figure 3. Specimens coated with six fragrances using microencapsulation technology. Source: The Researcher

Table 1. Satisfaction towards the fragrance microcapsules

Fragrance microcapsule	Assessment results		
	Mean	S.D.	Satisfaction Level
P01 Fragrance	4.8	0.45	Highest
P02 Fragrance	3.4	0.90	Medium
P03 Fragrance	3.8	0.84	High
P04 Fragrance	4.2	0.84	High
P05 Fragrance	3.8	0.84	Medium
P06 Fragrance	3.2	0.45	Medium

From Table 1, P01 Fragrance, showed an average score of 4.8, which was at a highest level of satisfaction, followed by P04 Fragrance with an average score of 4.2, which was at a high level of. P03 Fragrance and P05 Fragrance showed an average score of 3.8, which was at a high

level. P01 Fragrance showed an average score of 3.4 at a moderate level, and P06 Fragrance showed an average score of 3.2, which was at a medium level. Overall, the experts think that P01 Fragrance gave feelings of cleanliness, freshness, and relaxation and is reminiscent of younger workers. P02 Fragrance gave a sense of vitality with the pungent smell of mixed spices suitable for gentlemen. P03 Fragrance gave a fresh sensation with its cool and seductive scent and is reminiscent of a sexy woman. P04 Fragrance gave a sense of sweetness with a floral scent and is reminiscent of a sweet woman. P05 Fragrance gave a bright and refreshing feeling and is reminiscent of a cute, fun young girl. P06 Fragrance gives a very energetic feeling with a sporty scent and is reminiscent of health lovers.

P01 fragrance microcapsules were coated on black patterned fabric, and P04 fragrance microcapsules were coated on pink patterned fabric. It was found that silk fabric coated with microencapsulated fragrances was covered with powder, resulting in a slight discolouration of fabric. However, the texture remained the same and showed a pleasant scent.

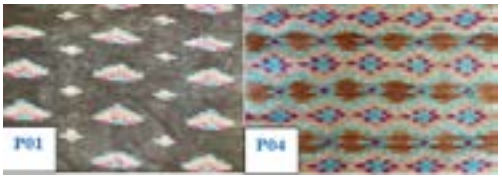

Figure 4. Silk fabric coated with microencapsulated fragrance. Source: The Researcher

Microstructural analysis of unwashed silk fabric coated with fragrance microcapsules was conducted using a Scanning Electron Microscope (SEM) in order to determine the number of microcapsules adhering to silk fabric at 400x and 1000x magnifications. It was found that microcapsules are spherical and similar in size. P01 fragrance microcapsules on black patterned fabric were approximately 20 microns in diameter, and P04 fragrance microcapsules on pink patterned fabric were about 16 microns in diameter. However, the number of P04 microcapsules on pink patterned fabric was higher compared to P01 microcapsules on black patterned fabric, as shown in Figure 7.

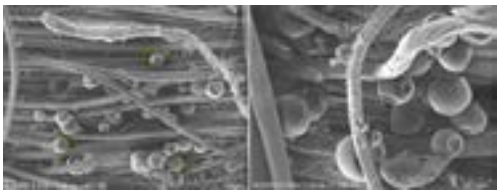

Figure 5. Microcapsules on black patterned fabric at 400x and 1000x magnifications. Source: The Researcher

Figure 6. P04 microcapsules on pink patterned fabric at 400x and 1000x magnifications. Source: The Researcher

According to SEM results shown in the above figures, it can be concluded that P01 microcapsules on black patterned fabric were more effective compared to P04 microcapsules on pink patterned fabric. However, P04 microcapsules on pink patterned fabric showed a stronger scent compared to black fabric coated with P01 microcapsules.

5.2 Design of Thai Silk Artificial Flowers and Further Development into Fashion Accessories Products

The researchers used the colour trend for winter 2020-2021 from the World Global Style Network (2020, online) derived from natural colours in combination with digital colour groups to enhance

the uniqueness and attractiveness of the products. The study on materials for winter fashion showed that a combination of genuine or synthetic leather and natural texture of materials should be used in order to meet the concept of sustainable fashion design, as well as to maximise the use of scraps. In addition, the use of soft satin or silk will add a luxurious touch to the product, and versatility should be considered.

Figure 7. Draft Design 1-20. Source: The Researcher

Table 2. Satisfaction towards the fragrance microcapsules

Fragrance microcapsule	Assessment results		
	Mean	S.D.	Satisfaction Level
Draft Design 1	3.00	1.22	Medium
Draft Design 2	3.00	1.22	Medium
Draft Design 3	4.00	0.83	High
Draft Design 4	3.20	0.70	Medium
Draft Design 5	4.00	1.09	High
Draft Design 6	4.20	0.83	High
Draft Design 7	3.40	0.83	Medium
Draft Design 8	3.00	1.41	Medium
Draft Design 9	4.60	0.43	Highest
Draft Design 10	4.00	0.83	High
Draft Design 11	4.00	0.71	High
Draft Design 12	3.40	0.87	Medium
Draft Design 13	3.00	1.48	Medium
Draft Design 14	2.80	1.09	Low
Draft Design 15	3.40	0.43	Medium
Draft Design 16	4.00	0.43	High
Draft Design 17	4.00	0.83	High
Draft Design 18	3.40	0.87	Medium
Draft Design 19	4.20	1.00	High
Draft Design 20	3.80	0.71	High
Overall, how satisfied are you with the draft designs in promoting image and value of Patama Brand?	4.20	0.83	High
Overall, how satisfied are you with the beauty, uniqueness and creativity of the draft designs?	4.40	0.43	High

The resulting design concept is customisable for different applications. For example, earrings that can be used to decorate shoes and brooches that can be used to decorate a bag. The hardware

of the bags and jewellery were also used as the components, such as earring clip, brooch base, buckle, and magnetic button fastener for convertible styles. Thai silk artificial flowers, the identity of Patama Brand, were used in combination with fashion accessories. In addition, silk fabric scraps from the creation of prototypes for shoes and bags were also used to maximise the use of silk fabric.

From Table 2, it can be concluded that that majority of consumers were satisfied with Draft Design 9 at highest level (with an average score of 4.60), followed by Draft Design 6 and 19 at high level (average score of 4.20); Draft Design 3, 5, 10, 11, 16 and 17 at high level (average score of 4.00); Draft Design 20 at high level (average score of 3.80); Draft Design 7, 12, 15 and 18 at medium level (average score of 3.40); Draft Design 4 at medium level (average score of 3.20); Draft Design 1, 2, 8 and 13 at medium level (average score of 3.00); and Draft Design 14 at low level (average score of 2.80), respectively.

The experts were satisfied with the draft designs in promoting the image and value of the Patama Brand at a high level (with an average score of 4.20) and satisfied with the beauty, uniqueness and creativity of the draft designs at a high level (average score of 4.40). The experts gave further opinions that the target group of Thai silk should be more clearly defined.

Six draft designs of fashion accessories with high and highest levels of satisfaction were selected in order to create the prototypes of fashion accessories from silk fabric coated with microencapsulated fragrances, which were Designs 3, 6, 9, 10, 11 and 19 as follows:

Figure 8. Prototypes of Designs 3 and 6. Source: The Researcher

Figure 9. Prototypes of Designs 9 and 10. Source: The Researcher

Figure 10. Prototypes of Designs 11 and 12. Source: The Researcher

Table 3. Satisfaction towards the fragrance microcapsules

Fragrance microcapsule	Assessment results		
	Mean	S.D.	Satisfaction Level
Prototype for Design 3	3.20	0.70	Medium
Prototype for Design 6	4.00	1.09	High
Prototype for Design 9	4.20	0.83	High
Prototype for Design 10	3.40	0.83	Medium
Prototype for Design 11	3.00	1.41	Medium
Prototype for Design 19	4.60	0.43	Highest

Table 4. Evaluation of opinions on prototypes of fashion accessories products

Opinion	Percentage
What feelings you should get from the fragrance suitable for Thai silk artificial flowers of Patama Brand?	
Feelings of cleanliness, freshness and relaxation, and is reminiscent of younger workers	28.0
A feeling of vitality with pungent smell of mixed spices suitable for gentlemen	0.0
A fresh sensation with a cool and seductive scent, and is reminiscent of a sexy woman	6.0
A sensation of sweetness with floral scent, and is a reminiscent of f a sweet woman	48.0
A bright and refreshing feeling, and is a reminiscent of a cute, fun young girl	6.0
A very energetic feeling with sporty scent and is a reminiscent of health lovers	12.0
What are the effects of microencapsulated fragrance used on silk fashion accessries?	
No effect	4.0
Add value to the products	23.0
Enhance the charm and identity of the brand	57.0
Achieve recognition	15.0
Others	1.0

The table revealed that the majority of consumers were satisfied with Prototypes for Design 9 (with an average score of 4.52), followed by Prototypes for Design 6 (average score of 4.40), Prototypes for Design 11 (average score of 4.15), Prototypes for Design 10 (average score of 4.06), Prototypes for Design 3 (average score of 3.88) and Prototypes for Design 19 (average score of 3.80) at high to the highest level of satisfaction. Most of the respondents were of the opinion that the fragrances with the most suitable character for Thai silk artificial flowers of Patama Brand were the fragrance which gives a sensation of sweetness with floral scent and is reminiscent of a sweet woman (48.0%), followed by the fragrance which gives the feelings of cleanliness, freshness and relaxation, and is reminiscent of younger workers (28.0%); the fragrance which gives a very energetic feeling. Sporty smell. reminds of health lovers (12.0%); the fragrance which gives a bright and refreshing feeling and is reminiscent of a cute, fun young girl; the fragrance which gives a fresh sensation with its cool and seductive scent and is reminiscent of a sexy woman (6.0%); and the fragrance which gives a feeling of vitality with the pungent smell of mixed spices suitable for gentlemen (0.0%), respectively. For the use of microencapsulation technology on silk used in producing fashion accessories, most of the respondents believed that this technology would enhance the charm and identity of the Brand (57.0%), followed by adding value to the products (23.0%), achieving recognition (15.0), other aspects (1.0%) and no effect (4.0%).

Most consumers were of the opinion and suggested that the packaging should be designed to preserve and enhance the scent that matches the artificial flowers. For example, an artificial rose should have a rose scent. However, some artificial flowers should use the scent of other flowers that are more refreshing and relaxing. The fragrance used on the products must not be too strong as the product will always be carried by the user. Too strong a fragrance may cause discomfort. The soft and subtle scent can help achieve recognition during product selection and purchase. The flower designs should be sleek and stylish with a greater variety and adaptable to be used with shoes and bags. The uniqueness of the patterns of silk fabric makes it distinctive and beautiful. Thus, too strong a fragrance should not be used. The researchers preferred the creative idea of using artificial flowers in combination with other fashion accessories products to increase its applications.

6 Suggestions

According to the results, suggestions for the applications of future research are as follows:

1. Researchers, authorities or entrepreneurs can use these design guidelines. However, the odour fastness test should be performed, and Oko-tex standard 100, the global standard for textile fibres indicating safe and formaldehyde-free textiles, should be used according to EU standards.
2. The designs should be improved and developed to meet the needs of the consumer at the time of use, taking into account the trends and target groups
3. The designers can use these design guidelines to further develop into other products, such as home décor products.
4. Other forms of fragrance may be used for a greater variety.

Conflict of Interests

The author declares no potential conflict of interest was reported by the author.

Endnotes

This paper has been presented at the SPACE International Conference 2021 on Architecture and Design Education.

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