

Designing Convertible Packaging for Convenient Access and Sustainable Distribution of *Sesbania Grandiflora* Tea: A Solution for Consumer Accessibility and Market Penetration

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Abstract – Convertible packaging is designed to provide greater convenience, versatility, and sustainability, as it allows for easier storage, transportation, and reuse of packaging materials. This study was to analyse and design a convertible package that can be easily converted and placed in easily accessible locations such as homes, workplaces, and leisure areas to ensure the convenient availability of the “*Sesbania Grandiflora*” tea product for potential consumers. The research goals included using stackable shapes in making conversions; analysing existing Sri Lankan convertible export packaging shapes to map out the issues of using the locally generated shapes; overcoming the issues identified by introducing a convertible shape that can be adaptable for shelf display and consumer usage; and testing the adaptability of the newly developed shape, to fit a targeted audience. Convertible packaging can be ideally implemented in industries that require versatility, convenience, and sustainability, such as the food and beverage industry, where it can be used for single-serve portions. This convertible packaging for “*Sesbania Grandiflora*” tea is to be combined with a variety of factors, such as flexible materials, mind-soothing graphics, light pastel colour schemes, and interactive product arrangement, to make the product a behaviour prompt. This study shows the possibilities to create and design functioning convertible export packaging for “*Sesbania Grandiflora*” tea to be used as a diabetic supplement drink and a behaviour reinforcement beverage in the US market.

Keywords: Convertible Packaging, *Sesbania Grandiflora* tea, diabetic supplement drink

*Contact: phone +94-766404499

DOI: <https://doi.org/10.31705/IDR.2023.10>

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Introduction

Convertible packaging, which allows the packaging to transform or be repurposed, began to be explored in the early 1990s as a means of adding value to products and meeting consumer demand for convenience and sustainability. Convertibility allows the packaging to be designed for multiple functions, ensuring more efficient use of resources and a reduced environmental impact (Wang et al., 2021). The evolution of convertible packaging started in the 1960s with the introduction of multilayer packaging materials (Zhang et al., 2015).

The use of airtight packaging materials, such as high-density polyethylene (HDPE) and polypropylene (PP), has been found to effectively preserve the nutritional quality of *Sesbania grandiflora* leaves and flowers during storage and transportation. The findings have shown that using low-density polyethylene (LDPE) with thicknesses of 0.04 mm and 0.05 mm for packaging *Sesbania Grandiflora* significantly maintained the quality of the product during storage (Figueiredo & Gomes, 2013). All these materials can extend into various streams of packaging, such as biodegradable plastics, which can help reduce the environmental impact of packaging waste. Furthermore, the use of convertible packaging can also extend to other industries, such as the medical and pharmaceutical industries, where airtight packaging is crucial for preserving the quality and safety of sensitive products. Convertible packaging can become exciting by providing a unique and interactive experience for consumers, especially for health supplements. It is done by incorporating personalised elements, such as customised packaging designs or messages tailored to the consumer's preferences. This can create a sense of exclusivity and make the consumer feel special, which can lead to a more positive experience with the product. Incorporating eco-friendly and sustainable packaging materials can also enhance the experience for health supplement consumers who value environmentally conscious practices. By providing packaging that is both functional and sustainable, consumers can feel good about their purchase and be more likely to become repeat customers.

Convertible packaging allows for the preservation of the nutritional quality of *Sesbania Grandiflora* leaves and flowers during transportation and storage, which can contribute to making this superfood a daily consumption commodity in the US, especially given the high diabetic status of the country, by providing a convenient and accessible way for consumers to incorporate this nutritious ingredient into their daily diet. This convertible packaging is still being developed to include flexible materials, calming graphics, light pastel colour schemes, and interactive product arrangements to prompt specific consumer behaviours, such as consistent daily intake of health supplements. This type of packaging is designed to not only provide protection and convenience for the product but also enhance the overall consumer experience through visually appealing graphics and interactive features that encourage continued usage of the product.

The development of convertible packaging is based on research into the high percentage of diabetic patients in the US; however, the current challenge lies in effectively handling the flexible materials, which could create a gap in the market for such packaging. And while Sri Lanka has a strong presence in the herb industry, the lack of suitable technology and resources for producing convertible packaging may hinder its promotion and daily consumption as a supplement. There are several possibilities for convertible package manufacturing in Sri Lanka,

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particularly in the herb industry where local essence can be highlighted in packaging design and materials; however, the challenge and the research objective lie in finding the right balance between promoting the nutritional benefits of *Sesbania Grandiflora* without positioning it solely as a diabetic medication and identifying suitable materials that are cost-effective and environmentally sustainable to meet the demands of the US market.

The Relevance and Need for Study

Sesbania Grandiflora, a nutritious herb native to India and Sri Lanka, is not widely available in Europe or the US, despite half the US population being diagnosed with diabetes and a high level of consumerism. Currently, Sri Lanka exports only raw materials of this plant, such as leaves and flowers, which are not widely understood for consumption in Western countries. By transforming *Sesbania Grandiflora* into a consumable product such as tea, it would become a more familiar form for Western consumers, thereby increasing its appeal and accessibility while also taking advantage of the herb's rich nutritional content. The adoption of *Sesbania Grandiflora* flower tea as a consumable product offers a significant opportunity to improve user engagement through the use of convertible packaging. By leveraging the latest advancements in packaging technology, such as eye-catching graphics, light pastel colour schemes, and interactive product arrangements, manufacturers can create a unique and memorable user experience that enhances the product's overall appeal. The incorporation of convertible packaging can also promote a sense of novelty and excitement among consumers, encouraging them to try the product and increasing the likelihood of repeat purchases. By featuring the rich local essence of Sri Lanka in the packaging design, manufacturers can create a sense of connection and authenticity, thereby enhancing the user experience further. The use of convertible packaging has the potential to shift consumer perceptions of *Sesbania Grandiflora* from a medicinal product to a dietary supplement, by presenting it in a more approachable and appealing format, which can ultimately encourage more widespread consumption and improved health outcomes. By expanding and promoting the consumption of *Sesbania Grandiflora* through the use of convertible packaging, Sri Lanka has the opportunity to generate economic growth and benefit from increased product demand, while also promoting the herb's rich nutritional content and traditional cultural heritage. The development of *Sesbania Grandiflora* flower tea through the use of convertible packaging presents a unique and innovative product offering that has the potential to meet the unmet demand for floral tea products aimed at supporting diabetes and represents an exciting new opportunity for both Sri Lankan and global markets.

Method and Material

The method of study consisted of four phases.

A) Analysis of existing convertible export packaging shapes in Sri Lanka and the US

Sri Lanka is known for its packaging industry, and there have been various efforts to adopt more sustainable and innovative packaging methods. One such method is convertible packaging, which allows for the multi-functional use of packaging materials. While there may not be specific examples of convertible packaging in Sri Lanka for the export of *Sesbania grandiflora*, there have been instances of convertible packaging being used for other products. For example, in 2017, a Sri Lankan packaging company introduced convertible packaging for the

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export of seafood products, which allowed the packaging to transform into a cooking tray. It is important to note that the use of convertible packaging is still relatively new and not yet widely adopted in Sri Lanka. There is certainly room for growth and innovation in the Sri Lankan packaging industry when it comes to adopting more sustainable and versatile packaging methods.

B) Introducing a convertible, adaptable shelf display shape

The development of a convertible, adaptable shelf display shape for the packaging of *Sesbania Grandiflora* flower tea is an innovative approach to promoting a niche product for the US market. With a focus on targeting health-conscious yoga retreat centres, this packaging design will not only attract the attention of consumers but also provide a behavioural prompt for daily use. The stackable shape of the package will allow for bulk exporting while also addressing any stacking problems during transit. The package's convertible mode will provide a safer way to carry the product, which is essential for long-distance transportation. Additionally, the package's design will display the inner product, highlighting its attractive features, and assisting in promoting the product to consumers. This innovative packaging approach could potentially contribute to the expansion of the Sri Lankan packaging industry and bring economic benefits to the country.

C) Usability tests

A usability test was conducted on a sample group of five participants across different age categories, and it was observed that the unboxing of the package was well understood by the participants. However, converting the package to convertible mode was a challenge for them, as they lacked the required knowledge. To aid the participants, graphical instructions were provided on the package, which helped them understand the concept of convertible mode. Based on these observations, it was concluded that communicating the concept of convertible packaging through graphics is more effective than through the physical package, which can become complex and harder to comprehend.

D) Conveying convertibility through graphics

To make the convertible packaging user-friendly, four identifiable icons were created based on observations of the physical model. Photos were taken and converted into clear, identifiable illustrations in the form of icons using Adobe Illustrator software. These icons will be used to indicate the method of conversion and make the process easier for users. By simplifying the graphics, users will be able to convert the package more easily and quickly, reducing the complexity of the die cut.

Results and Discussion

The triangular shape is a popular packaging design due to its ability to evenly distribute stress and weight throughout the package, which can minimise damage during transportation. This is particularly beneficial for fragile items such as glassware or electronics. Additionally, the triangular shape allows for easy stacking, which can help save space during transportation and storage.

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In the case of the *Sesbania grandiflora* tea package, the triangular shape can be especially suitable as it can provide stability and support for the delicate tea leaves while also allowing for efficient storage and transport. The package can also be designed with additional features, such as a convertible design, to make it more convenient and attractive for customers. The triangular shape is used in various industries, such as food and beverage, cosmetics, and electronics. For example, Doritos chips and Toblerone chocolate are popular triangular-shaped food products. In cosmetics, some brands use triangular-shaped packaging for lipsticks and eye shadows. The triangular shape is also used in the electronics industry for packaging microprocessors and other delicate electronic components.



Figure 1 - Use of triangular packaging shapes in the technological, beverage, and food industries

Triangular-shaped packaging is a popular choice in various industries due to its space efficiency, protection, and handling benefits. The shape enables tighter packing and stacking, which optimises space utilisation during storage and shipping and reduces costs. This is especially important for exports, where maximising the number of products in a container can result in significant cost savings. Additionally, the stable base of the triangular shape makes it easier to handle and stack, reducing the risk of the package rolling or tipping over, which can damage the product. Furthermore, the triangular shape evenly distributes stress throughout the package, which can minimise damage during transportation, particularly for fragile items. The shape's three sides provide support and distribute the weight evenly, making it more resistant to compression and deformation. This feature ensures that the product inside is well-protected during transit, reducing the risk of damage and the need for costly returns.

In terms of stackability, the triangular shape is ideal for creating stable and secure stacks, as it allows for the interlocking of the packages. This interlocking helps to prevent the packages from sliding and toppling over, ensuring that the stack remains intact and minimising the risk of damage to the products. In the case of the *Sesbania Grandiflora* flower tea package, a triangular shape is a suitable option as it meets the requirements for space efficiency, protection, and handling. The stable base of the package makes it easy to stack and handle, and the evenly distributed stress throughout the package ensures the product's protection during transportation. Additionally, the package's interlocking design will support bulk exports, as it will help prevent damage to the product during shipping.

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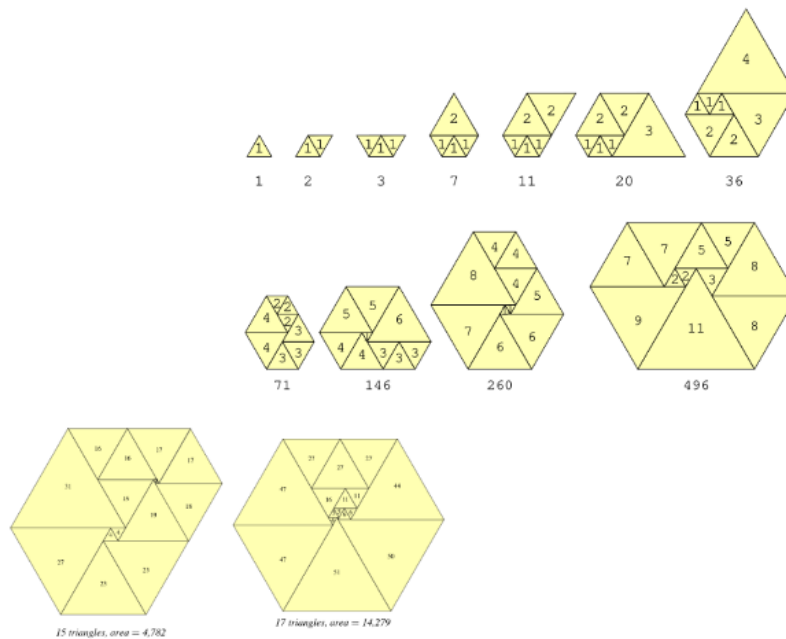


Figure 2 - Triangular shaped packaging stackability sourced from <https://mathworld.wolfram.com/TrianglePacking.html>

There are two ways to indicate the conversion process for the *Sesbania Grandiflora* tea package.

- The first method involves marking the flaps of the package using dotted lines to fold inward. This method allows consumers to easily follow the conversion process by referring to the outer and inner graphics of the package. The dotted lines provide a clear visual cue, making it easier for consumers to understand the folding process. This method is ideal for consumers who prefer to follow step-by-step instructions, and it ensures that the conversion process is intuitive and easy to follow.

- The second method involves indicating the conversion process on the outer side of the package using simple icon graphics. This method is ideal for consumers who have a tendency to follow icons along with the instructions provided. By incorporating simple icon graphics on the outer side of the package, the conversion process becomes more accessible and intuitive for consumers. This method ensures the conversion process is visible and easy to follow, even at a glance. It also provides an additional layer of clarity, reducing the likelihood of errors or confusion during the conversion process.

The success of the two conversion methods can be attributed to the use of graphics and visual aids to guide consumers through the conversion process. The initial testing revealed that, without any indications, the conversion process was not easily understood by users. However, after the introduction of graphics, users were able to understand the process more clearly. The finalisation of the graphic and die cut was a crucial step in ensuring the success of the packaging design, as it allowed for clear and concise instructions to be included in the package design.

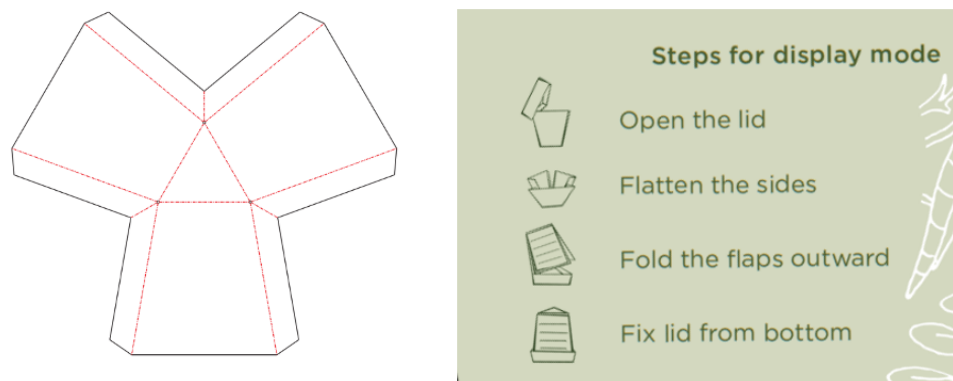


Figure 3 - Indicated bend lines on the package (left) and graphically indicated steps for conversion (right)

The initial design of the package included a lid attached to the body for easy opening. However, this caused an issue as one outer border was missing since it is attached to the body itself, resulting in the package losing balance. To address this, a separate lid was developed, which improved the overall stability of the package. Furthermore, during manufacturing, cutting the die and assembling the package became more challenging due to the attached lid, and material wastage occurred during template cutting. By using a separate lid, these issues were mitigated, simplifying the manufacturing process and reducing material wastage. Overall, the decision to use a separate lid for the *Sesbania grandiflora* tea package improved both the functionality and efficiency of the package.

Below is the template that was developed earlier.

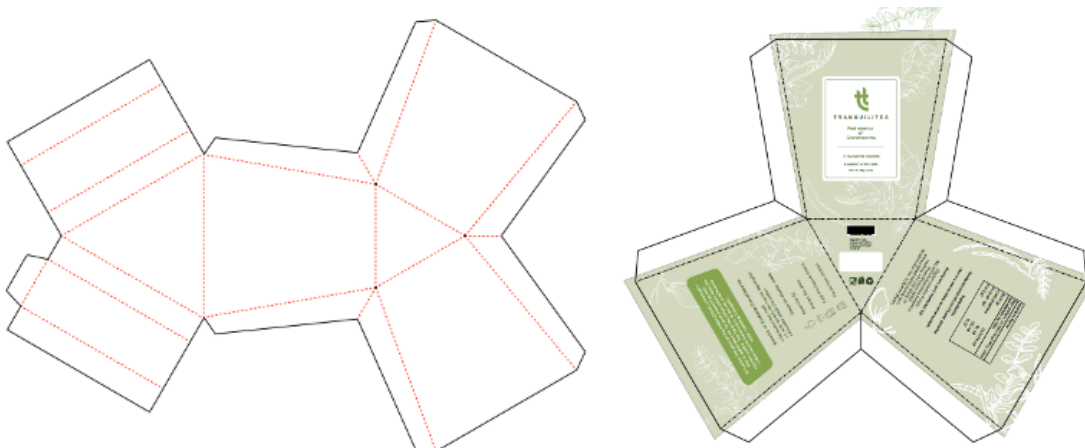


Figure 4 - Initial template with an attached lid to the package body (left) and the finalised, developed design with a detached lid (right)

The design of the *Sesbania grandiflora* tea package is intended to communicate the message that the tea is a supplement for diabetic patients, without appearing to be a medication. The package consists of seven pockets on each side, making a total of twenty-one sachet packets of tea. The number twenty-one symbolises the fact that it takes twenty-one days to form a

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habit, and the package is designed to encourage habitual use of the tea as a supplement for diabetic patients. The partitioning of the package ensures that each sachet packet is securely held, and the design also makes it easy for the user to access the tea sachets when needed. The design is not only functional but also meaningful, as it conveys an important message about the purpose of the tea and its intended usage.

The below figure shows the partitioned interior of the package to hold the sachet packets.



Figure 5 - The partitioned interior of the package to hold the sachet packets (left) and how it appears in convertible mode (right)

In addition to its functional design, the *Sesbania grandiflora* tea package also has an advantage in terms of product display. The packaging is structured in a way that allows it to be displayed on supermarket shelves as a sample, showcasing how it can be placed on a table or any other surface for convenient usage. This feature is not only beneficial for the consumer but also for the retailer, as it helps in promoting the product and increasing sales. By providing a clear and accessible display, customers are more likely to be attracted to the product and make a purchase. The design of the packaging not only enhances the functionality and usability of the product but also helps in its marketing and promotion.

Conclusion

The study reveals that medical supplements like *Sesbania Grandiflora* tea can offer additional support in managing diabetes without making users feel like patients. By not explicitly labelling it as a medication, users can incorporate it into their daily routine without any negative psychological impact. The tea can be seen as a health supplement that aids in developing a healthy lifestyle, and it can be habitualized with daily routine. This research highlights the potential of using natural supplements like *Sesbania Grandiflora* tea in managing diabetes and promoting overall health and well-being. The convertible packaging mode of this tea package offers a unique opportunity to habitualized *Sesbania grandiflora* flower tea among consumers. By placing the sachet packets in convenient places like home or office tables, consumers are

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reminded to consume one sachet packet daily. This not only creates a routine for the consumer but also serves as a subtle reminder to consume the tea as a health supplement. The potential of the convertible packaging mode to habitualized the product is a significant discovery, as it offers a new way to promote healthy habits among consumers.

The research conducted on the convertible packaging for *Sesbania Grandiflora* tea package has shown promising results in promoting the product as a health supplement for diabetes. However, there is still potential for further development of the package in terms of using sustainable, recyclable, and biodegradable materials. This can not only benefit the environment but also enhance the overall appeal of the product to consumers who prioritise eco-friendliness. Moreover, the concept of convertible packaging can be applied to other health supplements and herbal medications, allowing for a wider range of products to be promoted in a convenient and user-friendly way. This can be achieved by showcasing the packages in various retail settings such as supermarkets, hypermarkets, and wellness centres, allowing users to easily incorporate the product into their daily routine.

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