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Short Communication

Production of an Instant Functional Beverage Made from Ciplukan (*Physalis angulata* L.) With *Cassia vera*

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Abstract

Objective: This study was designed to evaluate the physicochemical and sensory properties of an instant functional beverage which was formulated using ciplukan plant as the main material with *Cassia vera* powder. **Materials and Methods:** The experiment consisted of five treatments which were as follows: (A) 2%, (B) 4%, (C) 6%, (D) 8% and (E) 10% of ciplukan whereas the composition of *Cassia vera* and sucrose were constant. The antioxidant capacity, chlorophylls and physalin content were evaluated for raw materials. The appearance, soluble time, insoluble part, moisture content, ash content and a sensory test were conducted for the resulting products. **Results:** All raw materials were containing the beneficial compounds that indicated by positive results for antioxidant activity, chlorophyll and physalin. Based on sensory test, the product derived from formula C (ciplukan powder 0.6 g and *Cassia vera* 0.2 g) indicated as the most acceptable product with average value of insoluble parts (1.07%), soluble time (16.62 sec), water content (0.76%), ash content (0.86%), physalin (++) , antioxidant activity (39.63%) and chlorophyll content (6.67%). **Conclusion:** The production of ciplukan powdered beverage with addition of *Cassia vera* had improved functionality, practicality and consumers acceptance of existing ciplukan-derived beverage.

Key words: Ciplukan, *Cassia vera*, instant functional beverage production, liquid, powdered

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The demand for functional foods and beverages has increased in many countries all over the world. The different approaches have been conducted in order to develop the functional foods and beverages such as exploitation of microorganism functionality, optimization of the production and formulation of novel functional beverages, use of prebiotics and synbiotics, use and processing of natural ingredients and use of by-products of fruit and food industries as functional ingredients¹. Nowadays an increasing trend in global society is green consumerism, that is consumer interest and focus toward natural products, where the use of synthetic additives is limited. Natural products have been used since ancient times and in folklore for the treatment of many diseases and illnesses. One of these natural products is a plant called ciplukan (*Physalis angulata*, L.). Ciplukan is one of Indonesian local plant which classifies as a herbaceous annual plant of the family Solanaceae². Ciplukan has been known as a natural resource that contains saponins, flavonoids, polyphenols and physalin³. Especially, physalin is as an active compound contributes to inhibit the growth of cancer cells⁴. In practically, all parts of ciplukan plant such as leaves, fruits, stems and roots were used for functional beverage in liquid form. However, this existing product has some limitations such as limited shelf life, undesirable aroma and bitter taste².

The existing functional liquid ciplukan beverage has a short shelf life due to high moisture content. This condition indicates a high water activity which leads the quality loss in products by increasing the enzyme activity and microbial growth. Therefore, the reducing moisture content in a product is considered for extending the shelf life. Drying is an ancient technique to preserve food products by remove moisture content. There are many drying techniques that have invented, among of them is spray drying. Dehydration by spray drying is used in the wide range of products in food industries to produce dry powders. In this study, the production of powdered ciplukan beverage was attempted in order to develop a functional ciplukan beverages that has long shelf life and easy to serve. Since ciplukan delivered bitter taste and unpleasant aroma, combination with another natural product which has good taste and aroma was also considered in production of ciplukan-derived beverages. *Cassia vera* was proposed as an additive ingredient since it has high content of antioxidant with good characteristics. It was noted that adding *Cassia vera* in pegagan instant powder

beverage gave a good result on sensory properties⁵. Therefore, the objective of this study was to evaluate the physicochemical and sensory properties of an instant functional beverage which was formulated using ciplukan plant as the main material with *Cassia vera* powder.

MATERIALS AND METHODS

The ciplukan (whole plant) was obtained from the area Aia Dingin Lubuk Minturun, West Sumatera and *Cassia vera* and sucrose were obtained from traditional market in Padang City, West Sumatera, Indonesia. This research was conducted at laboratory of Department of Agricultural Product Technology, Andalas University, Padang, West Sumatera, Indonesia.

Preparation of ciplukan and *Cassia vera* powder: The extract of ciplukan and *Cassia vera* were obtained by the maceration process using 70% ethanol and 96% ethanol for 20 h, respectively. Each crude extract obtained was then evaporated using a rotary evaporator (Eyela, Japan) and powdered by the addition of maltodextrin using a spray dryer (Armfield, UK). The production of instant functional beverage was following the formula in Table 1.

Observations: The determination of antioxidant activity using 2,2-Diphenyl-2-picrylhydrazyl (DPPH) method, physalin content (qualitative-Liebermen-Buchard test) and chlorophyll content (spectrophotometry) were conducted for both raw materials and the resulting products. The appearance, soluble time, insoluble part, moisture content, ash content and a sensory test were conducted for the resulting products.

Statistical analysis: All the analyses were replicated at least three times. Statistical analysis was performed with SPSS (Software version 15) using one way ANOVA. Duncan multiple range test was carried out to compare the mean values for samples with significant differences taken at $p < 0.05$.

Table 1: Experimental design for functional beverage formula

Material (g)	Treatments				
	A	B	C	D	E
Ciplukan powder	0.2	0.4	0.6	0.8	1
<i>Cassia vera</i> powder	0.2	0.2	0.2	0.2	0.2
Sucrose	10	10	10	10	10

RESULTS AND DISCUSSION

There are many steps to obtain phytochemicals from plant such as milling, grinding, homogenization and extraction. Among these steps, extraction is the main step for recovering and isolating phytochemicals as beneficial compounds from plant materials. Extraction efficiency is affected by the chemical nature of phytochemicals, the extraction method used, sample particle size, the solvent used as well as the presence of interfering substances⁶. Ethanol extraction is reported as a suitable condition in extraction of phytochemical in plant material especially for food application⁷. Moreover, the combination of ethanol and water could enhance the efficacy of phytochemical extraction⁸. Therefore, based on researchers preliminary results on extraction efficacy of beneficial compounds in ciplukan and *Cassia vera* (data not shown), 70% ethanol and 90 % ethanol were chosen as an optimum condition for the extraction of phytochemicals in ciplukan and *Cassia vera* plants, respectively.

Ciplukan and *Cassia vera* contained many beneficial compounds that can be characterized as antioxidants. Table 2 shows that *Cassia vera* powder at 1000 mg L⁻¹ solution has higher antioxidant capacity compared to ciplukan powder while physalin was obviously detected in ciplukan. Based on these results, it can be suggested that *Cassia vera* as an additive ingredient was powerful to improve bioactivity of the physalin. Currently, a large variety of natural resources were utilized for enriching the diversity of ingredients for functional food production in Indonesia, especially in West Sumatera⁹, therefore, combination of ciplukan and *Cassia vera* as materials for foods and beverages is also promising to be developed further.

Figure 1 and 2 indicate the picture of raw materials, intermediate and resulting product of a functional beverage

Table 2: Information of nutritional compounds in ciplukan and *Cassia vera*

Parameters	Ciplukan	<i>Cassia vera</i>
Antioxidant (%)	13.33	36.76
Physalin	+	-
Chlorophyll (mg L ⁻¹)	15.54	-



Fresh ciplukan plant



Dried ciplukan plant



Cassia vera



Dried *Cassia vera*

Fig. 1: Materials of ciplukan and *Cassia vera*



Fig. 2: Intermediate and final product of functional beverage made from ciplukan and *Cassia vera*

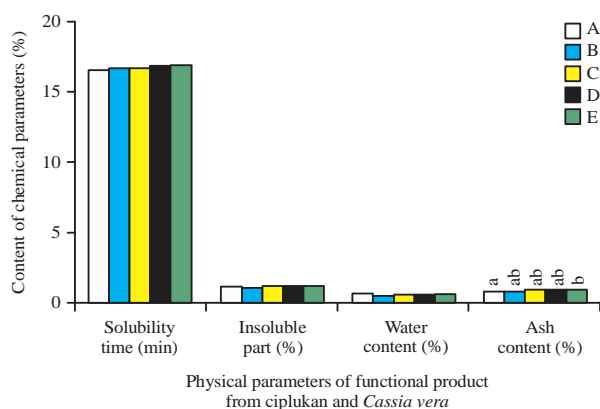


Fig. 3: Physical characteristics of functional beverage product from ciplukan and *Cassia vera*

made from ciplukan and *Cassia vera* powder. Results of the present study indicated that *Cassia vera* could reduce the original green color of ciplukan and suggested it becoming an attractive thing for consumer with the presence of bright color.

Figure 3 shows physical parameters such as soluble time, insoluble parts, water content and ash content of resulting product. No significant difference was observed among each parameter except on ash content. In development of an instant functional beverage, physical parameters such as product solubility time in water, insoluble parts and water content are crucial since these parameters could indicate physical quality of the product. Product solubility time and insoluble parts influence product practicality. Ciplukan concentration affected the ash content of the products. Since ash content has a correlation with the presence of minerals¹⁰, hence, ash content could also reflect the nutritional value of the product. It can be suggested that the abundance of chlorophyll in ciplukan increased minerals content in treated products. According to Soetan *et al.*¹¹, magnesium that classified as a beneficial mineral for human could be derived from plant's chlorophyll.

Figure 4 shows antioxidant activity and chlorophyll content of the resulting products. Results of the present study indicate that increasing ciplukan concentration affected the

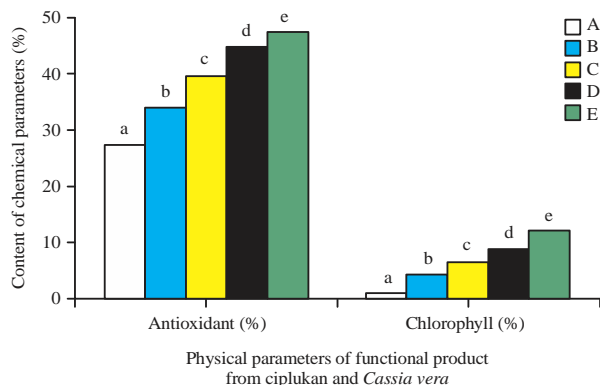


Fig. 4: Chemical characteristics of functional beverage product from ciplukan and *Cassia vera*

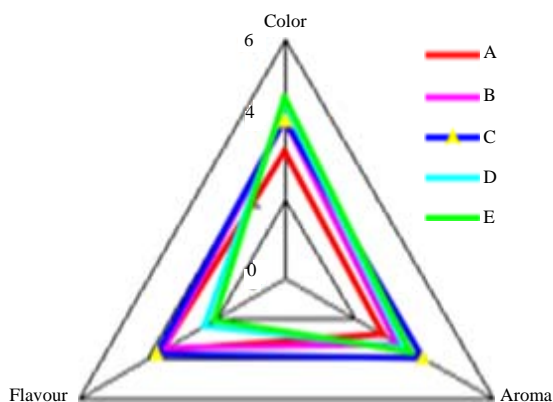


Fig. 5: Sensory analysis of functional product from ciplukan and *Cassia vera*

antioxidant activity, chlorophyll content and physalin content (data not shown) of the resulting products. The presence of chlorophylls, physalin and other beneficial compounds in ciplukan and *Cassia vera* are responsible for increment of antioxidant capacity of the resulting products. Substantial evidence indicates that food containing high antioxidants is important for human health such as disease prevention¹².

Since the main problem of functional beverage made from ciplukan was undesirable characteristics such as unpleasant aroma and bitter taste, the effect of *Cassia vera* addition on consumers acceptance was observed by organoleptic sensory analysis. Figure 5 indicates the radar chart of organoleptic sensory test, including analyses of color, aroma and taste, the resulting product. It shows that formula C was the most acceptable product with average acceptance value of color, aroma and flavor were 3.9, 3.9 and 3.7, respectively. Results of the current study indicate that there is an optimum combination of ciplukan and

Cassia vera in order to produce a good quality product based on consumers acceptance. The use of *Cassia vera* with an appropriate ciplukan composition has successfully reduced the undesirable characteristics of ciplukan. Abundance of essential oils in *Cassia vera* reduced undesirable aroma and bitter taste of ciplukan.

According to Lestari¹³, ciplukan has been consumed as liquid for years in Indonesia. To authors knowledge, consumers dislike ciplukan due to its undesirable aroma and bitter taste when it is consumed as liquid and there is no development of powdered ciplukan beverages till date. In this study, a powdered beverage that derived from ciplukan was successfully produced and also improved the consumer acceptance of the product by the addition of *Cassia vera*. The use of *Cassia vera* in the production of functional beverage has been developed in many products such as instant pegagan⁵, instant coffee and ginger beverages^{14,15} and make it as a popular additive ingredient for healthy products. In agreement with present study results, the addition of *Cassia vera* could give positive impact to the quality and economic value of the resulting products.

CONCLUSION

Utilizing all natural ingredients for the production of functional food products make the consumer comfortable and satisfied with the taste and functionality of ingredients. This is the key idea that will set this product apart from the existing form. The production of ciplukan powdered beverage with addition of *Cassia vera* had improved functionality, practicality and consumers acceptance of existing ciplukan-derived beverage. This product is required for enrichment of foods and beverages diversity in Indonesia.

SIGNIFICANCE STATEMENT

This study discovers the possible synergistic effect of ciplukan and *Cassia vera* powder in order to produce an alternative functional beverage in West Sumatera province, Indonesia. This study will provide preliminary data that can use for researchers to further improve this product for a better human health.

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