Product development of piper retrofractum vahl candy in supporting the local potential of madura

Khoirul Hidayat[1*], *R. Arief* Firmansyah[1], *M Fuad Fauzul* Mu'tamar[1], *Annafatur* Rohmaniyah[1]

[1]Department of Agroindustrial Technology, Faculty of Agriculture, Universitas Trunojoyo Madura, Bangkalan, Indonesia

Abstract. Spices are often used as ingredients to add flavor to food and as raw materials in herbal medicine. Traditional herbal medicine consists of several spices: curcumin, turmeric, piper retrofractum vahl. Spices contain curcumin, essential oils, and piperine, which are helpful for anti-bacterial, anti-cancer, antioxidants, and increased appetite. However, not all children like herbal medicine, so it is necessary to develop products to attract children's interest in consuming herbal medicine, such as candy. This research aims to find the spice candy products consumers want using the QFD Quality Function Deployment (QFD) method. The QFD method is a method for designing a product by analyzing consumer needs to achieve a product with attributes that prioritize consumer desires. Based on the study's results, it was found that candy products were by consumer desires, and the product contained 12 attributes. The 12 attributes consist of 9 attributes related to the product and 3 attributes related to the packaging. Attributes that are prioritized in terms of product and packaging are distinctive aromas and do not contain preservatives, plastic packaging, or product composition information attributes. Technical requirements determined by experts have 6 attributes product and 5 packaging. The technical requirements that must be prioritized both in terms of product and packaging are the composition of the ingredients with a priority value of 5.78, the heating temperature for candy making with a value of 3.44, packaging design with a priority value of 7, and the type of packaging with a value of 3.

1 Introduction

Spices are parts of plants that are used to enhance the taste of food [1]. Spices can be used as traditional medicine to support health. Spices are also used as raw materials for making herbal medicine, which can be used for treatment [2]. Traditional herbal medicine consists of several spices which are processed into health drinks. Twenty thousand plants can be used as medicine, and there are more than 2,200 medicinal plants in Indonesia [3]. Ginger, turmeric, piper retrofractum vahl, and so on are often used in making herbal medicine. According to BPS East Java, ginger production will be 2,311 tons in 2021, turmeric production will be 1,516 tons in 2016, and piper retrofractum vahl production in Madura will be 15,480 tons in 2020.

Temulawak, turmeric, and Piper retrofractum vahl, contain very beneficial ingredients for health. Temulawak, turmeric, and piper retrofractum vahl contain essential oils, curcumin, and piperine, which are helpful as anti-bacterial, anti-cancer, and antioxidant and increase appetite so that digestive activity is good [4]. Temulawak contains 3.81% essential oil, 2.29% curcumin, and 12.62% fiber [4]. Turmeric contains 3-4% curcumin, which gives an appetizing yellow color effect [5]. Piper retrofractum vahl contain around 4.6% piperine and around 1% essential oils so that piper retrofractum vahl can stimulate appetite [6]. Ginger, turmeric, and piper retrofractum vahl can be processed into traditional herbal medicine with these ingredients. However, not all children like herbal medicine, so it is necessary to develop products such as candy so children can like it. Candy is a snack that children like because it has a sweet taste. There are two types of candy: hard candy and soft candy [7].

Product development in this research uses the Quality Function Deployment (QFD) method to develop products by analyzing consumer needs [8]. QFD can also be used to develop more customer-oriented products [9]. Many studies use the QFD method, including dipped piper retrofractum vahl drink products [10], corn rice [11], [12], carrot syrup [13], dragon fruit [14], Madura satay [15], crispy Peperek fish products [16], chocolate drinks [17], and organic product [18]. The QFD approach uses the House of Quality (HOQ) matrix, which helps know the relationship between customer needs and technical responses [19]. This research aims to develop spice candy products that suit consumer desires.

2 Methods

The method used in this research is the Quality Function Deployment (QFD) method. The QFD method is used in the product planning and development process to

* Corresponding author: irul_ie@yahoo.co.id

determine specifications for consumer needs and desires, as well as to systematically evaluate the advantages and disadvantages of the capability of a product or service in meeting consumer needs and desires. The process in QFD begins with hearing the voice of the customer and continues through 4 main activities, including product planning, product design, process planning, and process control planning. The benefits of using QFD are that it can reduce costs, increase income, and reduce production time [20]. The QFD method can also be used to improve customers' understanding and develop products, services, and processes more customer-oriented [15]. The QFD approach is the House of Quality (HOQ) matrix [21]. This matrix is designed to determine the relationship between customer needs and technical responses. This matrix converts the voice of customer directly to the technical characteristics or specifications of a product produced. The target value in HOQ contains several parts that must be adjusted to function correctly [22]. Making the HOQ matrix aims to find out what consumers want so that they can fulfill those needs [23]. The HOQ matrix was first used to display the voice of customer (VOC) or consumer needs regarding technical responses [18]. The HOQ matrix is composed of the level of consumer interest, level of consumer satisfaction, technical parameters, the relationship between consumer interest attributes with technical parameters, analysis of the relationship between technical parameters, technical importance level values, and relative technical importance level values that can be seen in one scheme [24].

3 Result and discussion

3.1 Identification of consumer needs (WHATs)

Identification of consumer needs is carried out to get an overview of consumer needs for products [25]. Based on distribution to 30 respondents, 12 attributes were obtained consisting of 9 attributes related to the product and 3 attributes related to packaging. The twelve attributes of consumer needs include sweet taste, striking color, distinctive aroma, attractive shape, not contain preservatives, easy-to-chew texture, texture that is not sticky to hands, medium size, long shelf life, packaged in plastic, product composition information on the packaging, and easy to open the packaging. Based on the analysis that has been carried out, the results obtained from each calculation of the level of consumer interest for each attribute of consumer needs have meaning, namely that the higher the value of the level of consumer interest, the higher the attribute of consumer needs [15].

3.2 Identification of technical requirements (HOWs)

Based on the calculation of the level of consumer satisfaction for spice candy products from a product perspective, consumers are satisfied with the striking color attribute with a consumer satisfaction value of 4.73. However, consumers are not satisfied with the distinctive aroma attributes with a value of 3.00. Meanwhile, in terms of packaging, consumers are satisfied with the easy-to-open packaging attribute with a score of 4.33. Meanwhile, consumers are not satisfied with the plastic packaging attribute, which has a value of 3.03. The low level of satisfaction in terms of product and packaging makes it necessary to evaluate product improvements to create consumer satisfaction with the product. The level of satisfaction is a function of the difference between perceived performance and consumers' expectations that they will be satisfied with the product as desired. Attributes calculated from the level of customer satisfaction: The higher the value obtained from calculating the level of consumer satisfaction for an attribute of consumer needs, the higher the level of customer satisfaction with that attribute will be with the spice candy product.

Based on product comparison analysis, there are differences in consumer needs for spice candy products for all attributes of consumer needs for the two products based on consumer preference. In terms of spice candy products, consumers like them based on the consumer's liking level. However, for the aroma of spice candy, consumers prefer the aroma of the antangin product because the aroma of the spice candy product itself is less liked. Meanwhile, in terms of packaging, consumers prefer the packaging of antangin candy products rather than the packaging of spice candy products. Therefore, spice candy products must be evaluated or improved so consumers can be more interested in them.

Determination of targets is used as a reference to find out what kind of products consumers prefer, with the attributes and technical requirements that must be considered so that they can fulfill consumer desires. Calculating the improvement ratio is an evaluation stage for each attribute to determine which attributes need to be repaired. The evaluation is based on the improvement ratio value of the consumer needs attribute. The Improvement Ratio (IR) value of the consumer needs attribute is obtained based on the table. Calculating the improvement ratio (IR) value means that if the calculation results show an IR value > 1, it is necessary to carry out a repair or quality improvement process. The attribute must significantly improve its quality if the improvement ratio value is higher. Consumers need several attributes, namely striking color, long shelf life, and easy-to-open packaging, with an IR value of 1. Meanwhile, the attributes that consumers need are sweet taste, distinctive aroma, attractive shape, not contain preservatives, texture that is easy to chew, texture that is not sticky to hands, size medium, packaged in plastic, and the product composition information in the composition has an IR value of more than 1, meaning that it is necessary to improve the quality of the attributes that consumers need.

Based on the calculation of determining sales points, the consumer needs attributes in terms of spice candy products and packaging, namely not containing preservatives, easy-to-chew texture, long shelf life, and easy-to-open packaging can increase product sales

because the value of the attribute is 1.5, which means it can influence product sales. Based on raw weight calculations, the highest weight value for spice candy products in terms of product is the consumer needs attribute that does not contain preservatives with a weight of 6.624. Meanwhile, in terms of packaging, the highest weight value is the easy-to-open packaging attribute, with a value of 5.7. The greater the raw weight value of an attribute, the higher the development priority.

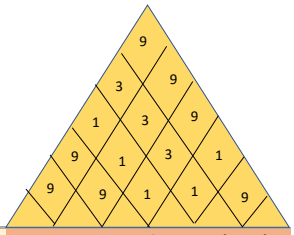
Based on normalized raw weight, the highest weight of spice candy products in terms of product is that they do not contain preservatives, with a value of 0.141. Meanwhile, in terms of packaging, the highest weight is the easy-to-open packaging attribute, with a value of 0.357. The draft technical requirements are technical parameters so that the spice candy products produced meet the expectations desired by consumers. In general, the technical requirements for spice candy products relate to the stages of the process of making spice candy products. This spice candy product is first carried out by peeling ginger, turmeric, and piper retrofractum vahl. Then, wash and grate the ginger, turmeric, and piper retrofractum vahl. The next stage is weighing with a ratio of 1:4 for ginger, turmeric, piper retrofractum vahl, and distilled water. Next, the infusion process is carried out on the solution of ginger, turmeric, and piper retrofractum vahl for 3 minutes and then left at room temperature until cold so that extracts of ginger, turmeric, and piper retrofractum vahl are obtained. These three extracts were continued at the sample-making stage by weighing sucrose, glucose, distilled water, ginger extract, turmeric, and piper retrofractum vahl. Next, the first cooking process was carried out by adding the three spice extracts and continued with the second cooking process to a temperature of 145 °C. The final stage is the molding process so that spiced candy is produced.

3.3 Matrix of relationships between HOWs attribute

The relationship value of technical requirements in the correlation matrix was obtained from the interview and discussion process with two sources or experts who were the same as the sources when determining technical requirements to determine the relationship between consumer needs attributes and technical requirements. The trade off matrix is used to analyze the relationship between technical requirements. Making a trade off matrix aims to find out how strong the relationship is between one technical requirement and other technical requirements. Based on priority calculations and contributions to technical requirements, the composition of the ingredients in the product must be prioritized in product development from a product perspective. The composition of the ingredients in this product will affect the taste, color, aroma, shape, texture, not contain preservatives, and the product's long shelf life. Spice candy manufacturers must consider this when developing products to meet consumer satisfaction. Based on calculations, what must be prioritized in product development in terms of packaging is packaging design. An attractive packaging design can increase consumers' attraction to spice candy products, so manufacturers must pay attention to this when developing spice candy products.

3.4 House of quality

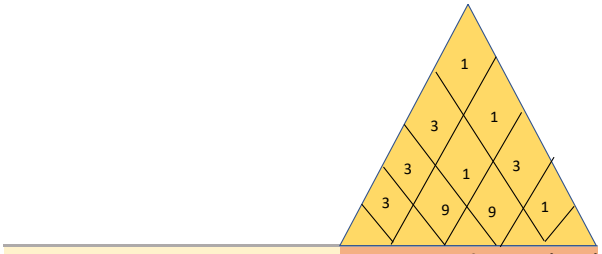
The HOQ matrix is obtained from the data in the previous stage, which is entered into the matrix based on each part. The HOQ matrix in terms of the spice candy products obtained shows that there are consumer needs attributes that need to be improved to increase the quality of the spice candy products. The consumer needs attributes of not containing preservatives, and a distinctive aroma is important attributes that must be considered to improve the quality of spice candy products with higher IR values compared to other attributes. The technical requirements that need to be considered in developing this spice candy product are the technical requirements for the composition of the ingredients and the heating temperature for making the candy. A good composition of ingredients used in the candy-making process will produce an excellent product to attract consumers to buy spiced candy products. The selection of raw materials is a benchmark for maintaining product quality [7]. The product will be of good quality if the materials used are of good quality. The optimal heating temperature for making candy is 140 °C to 145 °C [26].



House Of Quality		Technical Specifications (How)					
		Temperature	Composition	Heating time	Size	Heating technique	Viscosity
	Customer Requirements (What)	1	2	3	4	5	6
1	Sweet taste	3	9	3		1	3
2	Striking color	9	9	9		3	1
3	Distinctive aroma	3	9	1		1	1
4	Attractive shape	1	1	1	9	1	3
5	Not contain preservatives		3	1		1	1
6	Easy to chew texture	9	9	9	3	3	9
7	Texture that is not sticky to hands	3	3	3	1	1	3
8	Medium size				9		
9	long shelf life	3	9	3	1	3	3
	Priority value	3,44	5,78	3,33	2,56	1,56	2,67
	Contribution %	17,8%	29,9%	17,2%	13,2%	8,0%	13,8%
	Priority squence	2	1	3	5	6	4

Fig. 1. House of Quality matrix piper retrofractum vahl candy products in terms of products.

Based on the HOQ matrix in terms of spice candy packaging above, 2 attributes of consumer needs need to be improved to increase the quality of this spice candy product, including the plastic packaging attribute and the product composition information attribute. The plastic packaging attribute is an important attribute that must be considered for developing spice candy products with a higher IR value compared to other attributes. Packaging in plastic can prevent spice candy products from being damaged and guarantee their quality. The product composition information attribute in the composition can provide information about the product to consumers so that information about the product can attract consumers to consume the product. The technical requirements that need to be considered in developing this spice candy product are the design attributes and type of packaging. The right design and type of packaging can protect the product from damage and maintain the quality and contents of the product. The technical requirements that must be prioritized both in terms of product and packaging are the composition of the ingredients with a priority value of 5.78, the heating temperature for candy making with a value of 3.44, packaging design with a priority value of 7, and the type of packaging with a value of 3.



House Of Quality		Technical Specifications (How)				
		Tyoe	Shape	Design	Color	Size
	Customer Requirements (What)	1	2	3	4	5
1	Plastic packaging	3	3	9	1	1
2	Product composition information	3	1	9	1	1
3	Easy to open	3	3	3	1	3
	Priority value	3,00	2,33	7,00	1,00	1,67
	Contribution %	19,3%	15,0%	45,0%	6,4%	10,7%
	Priority squence	2	3	1	5	4

Fig. 2. House of Quality matrix piper retrofractum vahl candy products in terms of packaging.

4 Conclusion

Based on the analysis carried out in developing spice candy products using the QFD method, 12 consumer needs attributes must be considered in developing spice candy products as children's food supplements. The 12 attributes consist of 9 attributes related to products and 3 attributes related to packaging. The prioritized attributes in terms of product and packaging based on the improvement ratio value are distinctive aroma with a value of 1.2, does not contain preservatives with a value of 1.2, plastic packaging with a value of 1.2, and product composition information attributes on packaging with a value of 1. ,1. The technical requirements that experts have determined regarding spice candy products are 6 attributes, and in terms of packaging, there are 5 attributes. The technical requirements that must be prioritized both in terms of product and packaging are the composition of the ingredients with a priority value of 5.78, the heating temperature for candy making with a value of 3.44, packaging design with a priority value of 7, and the type of packaging with a value of 3.

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