

INTISARI

PENGEMBANGAN PRODUK COKELAT BATANG YANG DIFORTIFIKASI β -KAROTEN MENGGUNAKAN METODE KANSEI ENGINEERING

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Cokelat batang adalah produk dengan senyawa bioaktif yang bermanfaat bagi kesehatan, sehingga penting mengembangkan produk inovatif yang sesuai dengan kebutuhan konsumen dan memperhatikan nilai gizi. Tingginya minat konsumsi makanan manis di Indonesia membuat anak muda rentan terkena diabetes. β -karoten merupakan senyawa antioksidan yang berfungsi sebagai agen hipoglikemik melalui mekanisme penghambatan radikal bebas, dapat mengurangi risiko komplikasi diabetes. Cokelat batang yang difortifikasi β -karoten dapat menjadi pangan fungsional yang memberikan nilai gizi tambahan bagi anak muda tanpa mengorbankan kesehatannya. Penelitian bertujuan mengembangkan produk cokelat batang yang difortifikasi β -karoten dengan mengidentifikasi kebutuhan konsumen, menentukan purwarupa terbaik berdasarkan analisis fisikokimia dan sensoris, serta mendapatkan formula optimal dari model matematis. Metode *kansei engineering* digunakan untuk menerjemahkan kebutuhan konsumen menjadi atribut desain yang konkret, serta merancang produk sesuai dengan data *kansei*. Metode ini melibatkan pendekatan rekayasa berupa metode Taguchi dan *linear programming*. Metode Taguchi membantu merancang eksperimen menggunakan matriks *Orthogonal Array* agar didapatkan kombinasi optimal dari berbagai parameter desain. Sedangkan *linear programming* diterapkan sebagai pengoptimalan alokasi sumber daya dan memastikan bahwa desain produk memenuhi semua batasan yang ada, sehingga didapatkan formula dengan biaya minimum. Hasil penelitian menunjukkan terdapat empat faktor yang memengaruhi preferensi konsumen terhadap cokelat batang, yaitu sensasi mengonsumsi cokelat, kepadatan kakao dan lemak kakao, penampilan dan keseimbangan rasa, dan kualitas cokelat batang. Purwarupa terbaik berdasarkan analisis fisikokimia yaitu konsep 7 dengan perlakuan A3 (Kakao Nibs 250g), B1 (Lemak kakao 200g), C3 (β -karoten 7g), dan D2 (Gula 300g), didapatkan skor warna 12,44, kekerasan 49,59 N, kadar air 1,65%, kadar abu 2,44%, kadar protein 9,24%, kadar lemak 37,38%, kadar karbohidrat 49,28%, dan kadar β -karoten 95,29 μ g/g. Purwarupa terbaik berdasarkan uji sensoris yaitu konsep 5 dengan perlakuan A2 (Kakao Nibs 200g), B2 (Lemak kakao 235g), C3 (β -karoten 7g), dan D1 (Gula 250g), dengan skor warna 11,87, kekerasan 39,39 N, kadar air 1,45%, kadar abu 2,23%, kadar protein 9,31%, kadar lemak 40,11%, kadar karbohidrat 46,90%, dan kadar β -karoten 91,10 μ g/g. Formula optimal berdasarkan *linear programming* yaitu pada konsep 7 dengan proporsi kakao nibs 0,383g, lemak kakao 0,081g, β -karoten 0,127g, gula 0,329g, dan susu bubuk 0,139g, dengan biaya Rp 163,7896/g produk. Pada Konsep 5 yaitu 0,392 g kakao nibs, 0,077 g lemak kakao, 0,121 g β -karoten bubuk, 0,302 g gula, dan 0,138 g susu bubuk, dengan biaya minimum sebesar Rp 158,8388/g produk.

Kata Kunci: β -karoten, cokelat batang, *kansei engineering*, pengembangan produk, preferensi konsumen

ABSTRACT

DEVELOPMENT OF CHOCOLATE BAR PRODUCTS THAT ARE FORTIFIED β -CAROTENE USING THE KANSEI ENGINEERING METHOD

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Chocolate bars are products with bioactive compounds that benefit health, so developing innovative products that meet consumer needs and pay attention to nutritional value is essential. The high interest in consuming sweet foods in Indonesia makes young people vulnerable to diabetes. β -carotene is an antioxidant compound that functions as a hypoglycemic agent by inhibiting free radicals, reducing the risk of diabetic complications. Chocolate bars fortified with β -carotene can be a functional food that provides additional nutritional value for young people without compromising their health. The research aims to develop a chocolate bar product fortified with β -carotene by identifying consumer needs, determining the best prototype based on physicochemical and sensory analysis, and obtaining the optimal formula from the mathematical model. According to Kansei data, the Kansei engineering method is used to translate consumer needs into concrete design attributes and design products. This method involves engineering approaches such as the Taguchi method and linear programming. The Taguchi method helps design experiments using an Orthogonal Array matrix to obtain the optimal combination of various design parameters. Meanwhile, linear programming is applied to optimize resource allocation and ensure that the product design meets all existing constraints to obtain a minimum-cost formula. The results showed that four factors influence consumer preferences for chocolate bars: the sensation of consuming chocolate, the density of cocoa and cocoa butter, the appearance and balance of flavors, and the quality of chocolate bars. The best prototype based on physicochemical analysis was concept 7 with treatment A3 (Cocoa Nibs 250g), B1 (Cocoa butter 200g), C3 (β -carotene 7g), and D2 (Sugar 300g), obtained a color score of 12.44, hardness 49.59 N, moisture content 1.65%, ash content 2.44%, protein content 9.24%, fat content 37.38%, carbohydrate content 49.28%, and β -carotene content 95.29 $\mu\text{g/g}$. The best prototype based on sensory test is concept 5 with treatment A2 (Cocoa Nibs 200g), B2 (Cocoa butter 235g), C3 (β -carotene 7g), and D1 (Sugar 250g), with color score 11.87, hardness 39.39 N, moisture content 1.45%, ash content 2.23%, protein content 9.31%, fat content 40.11%, carbohydrate content 46.90%, and β -carotene content 91.10 $\mu\text{g/g}$. The optimal formula based on linear programming is concept 7 with the proportion of cocoa nibs 0.383g, cocoa butter 0.081g, β -carotene 0.127g, sugar 0.329g, and milk powder 0.139g, for Rp 163.7896/g product. Concept 5 is 0.392g cocoa nibs, 0.077g cocoa butter, 0.121g β -carotene powder, 0.302g sugar, and 0.138g milk powder, with a minimum cost of Rp 158.8388/g product.

Keywords: *β -carotene, chocolate bars, kansei engineering, product development, consumer preference*