CHAPTER IV

RESULTS AND DISCUSSION

4.1 Product Result

The high demand for jackfruit intake may be influenced by the fruit's varied nutritional benefits and distinctive flavor. According to (Saxena, Bawa, and Raju (2011), ripe jackfruit has a flavor that is very fruity and flowery due to the presence of volatile esters. In particular, bioactive components such as flavonoids, phenolic compounds, and carotenoids contents, which contribute to chronic inhibition, have been shown to be a potential source of vitamins, minerals, carbs, and fatty acids (Qu et al., 2019; Saxena et al., 2011).

In addition to the fruit's numerous nutritional benefits, jackfruit's physical characteristics are fascinating to scientific research. According to reports, delicate jackfruit has a feel comparable to flesh, leading to the fabrication of substitute meat using jackfruit as a plant based widely (Aji, Wibowo, & Mayasiri, 2016). Due to their propensity to create structures that resemble meat, alternative proteins have been the subject of numerous efforts to create meat analogs. According to (Sakai, Sato, Okada & Yamaguchi (2002), various protein sources may influence the physiological characteristics of the meat in different ways.

Because they are an excellent source of macronutrients (protein and fiber) and micronutrients (essential amino acids, vitamins, and minerals), as well as having low fat, salt, and energy levels, mushrooms have been employed as meat substitutes in human diets. In order to provide healthier protein dishes with a decent appearance, flavor, and texture, mushrooms have been added in the creation of vegetarian beef Rendang. Oyster mushrooms are used as to provide nutritional benefits (high protein and fiber) and also to enhance the orgonaleptic texture as to re create the meat texture.

But, even with the addition of mushroom in which contains a high protein and fiber, it is still not enough protein as to the product that being made with the intend to recreate a meat like texture and proteins. As to make a complete vegetarian meat, soy beans paste are being added. According to the Protein Digestibility Corrected Amino Acid Score (PDCAAS), which compares protein quality to beef, egg whites, and casein, the soybean has about 38% protein. The soybean is a fantastic source of plant protein since it contains all the essential amino acids required for good human health.

4.2 Nutrition Fact

4.2.1 Nutrition Table

The Nutritional value of Young Jackfruit per 100g are as below:

Table 4. 1 Nutrtion table if Young jackfruit /100gr

Calorie	**57 kcal**
Fat total	**0.40 g**
Vitamin B1	0.07 mg
Vitamin B2	0.06 mg
Vitamin B3	0.70 mg
Vitamin C	9 mg
Carbohydrate total	**11.30 g**
Protein	**2 g**
Dietary fiber	**8.30 g**
Calcium	45 mg
Phosphorus	29 mg
Sodium	**1 mg**

Potassium	246.50 mg
Cooper	40 mcg
Iron	0.50 mg
Zinc	0.10 mg
B-Carotene	21 mcg
Water	85.40 g
Ash	**0.90 g**

It has been established that all phases of unripe jackfruits have better chemical characteristics than ripe jackfruit. With the exception of carbohydrate content, proximate characteristics of green jackfruit had higher values than those of ripe fruit. As maturity increased, TPC, TFC, DPPH scavenging activity, FRAP reduction power, dietary fiber, and amino acid content decreased as a result of the described enzymes and some biochemical interactions. All maturation stages demonstrated a propensity for the release of bioactive substances during in vitro digestion to modestly increase from the gastric phase to the intestinal phase. The nutritional value of soy beans per 100gr are as below:

Table 4. 2 Nutrtion table of Soybeans/100gr

Calorie	**189 kcal**
Fat total	**8.20 g**
Vitamin B1	0.20 mg
Vitamin B2	0.04 mg
Vitamin B3	0.50 mg
Carbohydrate total	**12.70 g**

Protein	**20.20 g**
Dietary fiber	**1.60 g**
Calcium	91 mg
Phosphorus	270 mg
Sodium	**181 mg**
Potassium	615 mg
Cooper	1300 mcg
Iron	3.90 mg
Zinc	3.70 mg
B-Carotene	4 mcg
Water	56.80 g
Ash	**2.10 g**

Soybeans are among the best sources of plant-based protein. The protein content of soybeans is 36–56% of the dry weight (2Trusted Source, 3Trusted Source, 4Trusted Source). One cup (172 grams) of boiled soybeans boasts around 31 grams of protein (C M Grieshop , G C Fahey Jr (2001).

Soy protein has a very high nutritious value but a lower quality than some animal proteins (5Trusted Source, 6Trusted Source). Glycinin and conglycinin, which make up around 80% of the overall protein composition, are the two primary protein groups in soybeans. For certain persons, these proteins may cause allergic reactions (M C García , M Torre, M L Marina, F Laborda (1997).

The nutritional value of Oyster Mushroom per 100gr are as below:

Table 4. 3 Nutrtion table of Oyster Mushroom /100gr

Calorie	**30 kcal**
Fat total	**0.10 g**
Vitamin B1	0.30 mg
Vitamin B2	0.20 mg
Vitamin B3	1 mg
Carbohydrate total	**5.50 g**
Protein	**1.90 g**
Dietary fiber	**3.60 g**
Calcium	9 mg
Phosphorus	83 mg
Sodium	**22 mg**
Potassium	226 mg
Iron	0.70 mg
Zinc	0.80 mg
Air	92.50 g
Ash	**0.60 g**

A 100g of raw, sliced oyster mushrooms has 30 calories, 1.90g of protein, 5.50g of carbohydrate, and 0.10g of fat. Niacin, fiber, and riboflavin are all abundant in oyster mushrooms. (Nilaigizi.com)

Numerous vitamins, including niacin (21% of your daily recommended intake), riboflavin (18%), and pantothenic acid (11%), are abundant in oyster mushrooms. Additionally, you'll receive lesser doses of thiamin, folate, and vitamin B6.

Oyster mushrooms include phosphorus, potassium, copper (10% of each day's requirement), iron, magnesium, zinc, manganese, and selenium, among other minerals.

4.2.2 Nutrition Calculation

Nutritional calculation of ingredients (250 gr)\

Table 4. 4 Nutrtional value of ingrediients used in the recipe for vegetarian rendang /250gr

Ingredients	Calories (Kcal)	Carbohydrate (g)	Protein (g)	Fat (g)	Sugar (g)	Fiber (g)	Sodium (mg/100g)
Young jackfruit (80gr)	45.6	9.04	1.6	0.32		6.64	0.8
Oyster mushroom (80gr)	151.2	10.16	16.16	6.56		1.28	14.4
Soybeans (40gr)	12	2.2	0.79	2.44		1.44	8.8
Cornstrach (15 gr)	57.15	13.69	0.03			0.13	1.35
Pepper (1 gr)	1.48		0.1				
Xantham gum (2.5 gr)	5.07	1.95	0.08				
Mushroom powder (5 gr)							7
Coconut milk (150 ml)	345	6	3.45	36	4.95	3.3	22.5
Coconut oil (25ml)	215.5			25			
Brown sugar (60 gr)	114	29.4	0.03		29.1		8.4
Candlenut (1 gr)	6.75	0.08		0.63			
Red chilli (75 gr)	30	2.64	1.4	0.33	3.97	1.12	6.75
Fresh ginger (12.5gr)	10	2.22	0.22	0.09	0.21	0.25	1.62
Fresh galanggal (17.5 gr)	6.65	1,01	0.12	0.08	0.31		
Fresh Tumeric (12.5 gr)	44.25	8.11	0.98	1.23			
Coriander (5 gr)	13.44	0.64	0.53				
Salt (7.5 gr)							750
Shallots (43.5gr)	31.32	7.30	1.08	0.04			5.22
Total	**1,089.41**	**94.44**	**26.57**	**72.72**	**38.54**	**14.16**	**826.84**

4.2.3 Nutrition Label

Nutrition Facts

3 servings per container

Serving size **(80g)**

Amount Per Serving

Calories **360**

	% Daily Value*
Total Fat 24g	**31%**
Saturated Fat 0g	**0%**
Trans Fat 0g	
Sodium 280mg	**12%**
Total Carbohydrate 31g	**11%**
Dietary Fiber 5g	**18%**
Total Sugars 13g	
Includes 0g Added Sugars	**0%**
Protein 9g	**18%**

Not a significant source of cholesterol, vitamin D, calcium, iron, and potassium

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Figure 4. 1 Nutrition label

4.3 Food Safety And Packaging

4.3.1 Processing & Storage Temperature

In the making of Vegetarian rendang, there are several steps that needs to be done by order. The steps in making the vegetarian rendang are divided by 2, the meat analogue cooking process and the rendang making process.

In the making of the meat analogue there are steps that needed to be done by order are Mixing, Shaping Steaming, resting, pan searing (to reduce the water content in the meat analogue).

start from the making of the analogue meat, after done doing the mixing step in making the analogue meat. There are the steaming process,

these process are needed to be done as to activate the cornstarch and Xanthan gum in binding the analogue meat into a whole chunk of meat. After done with the steaming, we need let the analogue meat rest for a bit. This process are intended to let the meat to firm up a bit so on the later step we could pan sear it without worrying for the meat to break apart. On the pan searing step are intended so the water content inside the meat could further reduced and firming up in hopes for the meat to got the meat texture like of the of a real meat. The pan searing step are intended to caramelized the analogue meat and adding a bit of smokey flavor to further enhance the taste of the meat analogue.

On the second step (Rendang making) by order, the steps starts from sauteing the spices, and then followed by the blended spice and coconut milk till thicken and reduced and lastly is adding the already cut analogue meat. The rendang will be a dry rendang instead of wet rendang. It is decided to be a dry rendang as to futher prolong the shelf life for the rendang, especially when it's being frozen.

4.3.2 Shelf Life

There are 2 kinds of rendang, a wet rendang (which still have a bit of gravy) and a dry rendang (Only oil and spices left) Produce should be stored at appropriate refrigeration temperatures to prevent pathogen growth, which will mostly affect psychrotrophic pathogens, such as L. monocytogenes, Y. enterocolitica, non-proteolytic Cl. botulinum, and A. hydrophila. Psychrotrophic species, like L. monocytogenes, can thrive at low temperatures, however lowering the storage temperature (to 4°C) can drastically slow down growth (Beuchat and Brackett, 1990a; Carlin et al., 1995). On packaged veggies kept at 4°C, L. monocytogenes numbers either remained the same or declined, whereas at 8°C

Rendang has a long shelf life it is thought to be contributed by the spices used during the cooking process. the vegetarian rendang as it

is made from a vegetarian ingredients, it doesn't contains any kinds of non-vegetarian ingredients. The shelf life of the vegetarian rendang in the chiller (4°C) could stay for 2 - 3 days at most while it could last up to 2 month at most. As long as it is stored in a heat-resistant plastic bags wit zip-lock and put in the freezer (-18°C).

4.3.3 Product Packaging

Food packaging is critical for maintaining the quality and safety of foods during their storage, transportation, and sale. Traditional packaging materials are primarily designed to protect foods from mechanical abuse, damaging light waves, and gasses that promote undesirable reactions, as well as to prevent contamination by spoilage/pathogenic microorganisms or toxic chemicals (Wang & Wang, 2017). However, food packaging may also play a number of other roles, such as providing information about the nature and status of the foods insi de (Yam & Lee, 2012). Packaging is a medium to stick the image brand to consumers so consumers easily remember and fanatical to choose a product.

According to Marangoni Júnior et al., (2019) and Dobiáš, and Vápenka (2017) main packaging material requirements for HPP and PATS are: flexibility, dimensional stability, heat seal integrity, head space reduction, heat transfer, proper barrier characteristics and resistance to the total volume changes.

In this context, the flexible material used should be able to withstand the rapid compression and decompression, and provide flexibility to compensate for the collapse of the head space and possible reduction of the food volume within the packaging (Caner et al., 2000, Caner et al., 2004, Galotto et al., 2009, Schauwecker et al., 2002). However, irreversible changes to the materials may occur during

processing, such as visible deformation, possibly impacting the packaging's functionality and visual appearance (Richter et al., 2010). In addition, the choice of flexible packaging materials must ensure that processing will not affect the integrity of the heat seal and its mechanical properties (Marangoni Junior et al., 2019, Marangoni junior et al., 2020), since failures in the sealing regions could allow pressurization fluid to enter, consequently contaminating or leaking the product (Koutchma et al., 2010).

The suitable flexible and/or semi-rigid packages for HPP comprise the polymer bottles (made of polyethylene terephthalate or high density polyethylene) or the packages formed from layered polymer films (e.g. sachets, thermoformed or semi-rigid trays sealed with a film). Flexible packaging materials are mainly composed of multi-layer films consisting of a sealable layer (polyolefin), a barrier layer (polyamide, polyester, metallic polymer film, aluminum foil, ethylene vinyl alcohol copolymer) and sometimes an outer layer. mechanical resistance (polyamides, polyesters)

Plant-based rendang or Vegan rendang are made as a ready-to eat food product. It is packed into an air tight plastic vacuum packaging as it’s primary packaging and an air tight seal aluminum standing pouch for easy storage and especially for freezer storage.

Figure 4. 2 polyamide (PA) food grade vacuum plastic 16 x 14

Figure 4. 3 aluminiun standing pouch with zipper

Figure 4. 4 sticker 14 x 16 (front)

Figure 4. 5 Sticker 14 x 16 (Back)

Figure 4. 6 Logo

4.4 Financial Aspects

4.4.1 Product Cost (Variable cost, Overhead cost, Fixed cost)

There will be 3 costs to be highlight:

- The product cost are calculated based of the total of all cost /month. The total cost consist of labour, packaging, utility, & raw material
- The labour cost will be considered based on monthly working days (5 days/week) which will be 20 days/ month.
- The quantity of raw material will be calculated as 25 recipes/days or 500 recipes /month which will be equal as 50 portions /day or 1,000 portions /month

1. Start Up Capital

Table 4. 5 Start up capital

Tools and equipment	Quantity	Price/Unit	Sub total
Chopper	2	Rp 300,000	Rp 600,000
Pan	2	Rp 75,000	Rp 150,000
Big steamer	1	Rp 68,000	Rp 68,000
Knife	4	Rp 38,000	Rp 152,000
Cutting board	4	Rp 24,000	Rp 96,000
Big pot	1	Rp 50,000	Rp 50,000
Digital scale	2	Rp 23,000	Rp 46,000
Plastic sealer	1	Rp 98,000	Rp 98,000
Large mixing bowl	5	Rp 8,850	Rp 44,250
Spatula	3	Rp 10,500	Rp 31,500
Big wok	1	Rp 154,000	Rp 154,000
	TOTAL		Rp 1,489,750

2. Labour Cost

Table 4. 6 Labour cost

Occupation	Personel	Salary/month	Sub total
Cook	1	Rp 4,500,000	Rp 4,500,000
Staff	1	Rp 2,500,000	Rp 2,500,000
	TOTAL /month (20 days)		Rp 7,000,000

3. Packaging Cost

Table 4. 7 Packaging cost

Pacakging	Quantity	Price/unit	Sub total
Vacuum plastic	50	Rp 400	Rp 20,000
Aluminium Pouch	50	Rp 920	Rp 46,000
Sticker logo	100 (back & front)	Rp 500	Rp 50,000
	TOTAL /day		Rp 116,000
	TOTAL /Month (20 days)		Rp 2,320,000

4. Utility Cost

Table 4. 8 Utility cost

Facility	Quantity	Price (/Unit)	Sub total
Water	600 L (/day)	Rp 1,700 (m3)	Rp 1,020
Electricity	20 kwh (/day)	Rp 1,400 (1 kwh)	Rp 28,000
Gas	300 gr	Rp 261,000 /12,000gr	Rp 6,525
	TOTAL /day		Rp 35,545
	TOTAL /month (20 days)		Rp 710,900

5. Raw Material Cost (25 Recipes or 50 portions/ days)

Table 4. 9 Raw Material

Raw Material	Quantity	Price (/Unit)	Sub total
Young jackfruit	2,000 gr	Rp 10,700 /500gr	Rp 42,800
Oyster mushroom	2,000 gr	Rp 6,000 /250gr	Rp 12,000
Soybeans	1,000 gr	Rp 18,000 /1000gr	Rp 18,000
Cornstarch	750 gr	Rp 11,800 /500gr	Rp 17,700
Pepper	50 gr	Rp 11,500 /100gr	Rp 5,750
Xantham gum	125 gr	Rp 12,800 /65gr	Rp 24,625
Mushroom powder	250 gr	Rp 27,500 /400gr	Rp 17,187
Coconut milk	7,500 gr	Rp 32,000 /1000ml	Rp 240,000
oil	125 ml	Rp 12,500 /500ml	Rp 3,125
Brown sugar	1,500 gr	Rp 7,300 /250gr	Rp 43,800
Candlenut	50pcs (50gr)	Rp 5,500 /100gr	Rp 2,750
Garlic	750 gr	Rp 39,000 /1000gr	Rp 29,250
Red chilli	3,750 gr	Rp 8,000 /250gr	Rp 120,000

Fresh ginger	625 gr	Rp 25,900 /1000gr	Rp 16,187
Fresh Galanggal	875 gr	Rp 10,000 /1000gr	Rp 8,750
Fresh Tumeric	625 gr	Rp 6,000 /1000gr	Rp 3,750
Coriander	250 gr	Rp 25,000 /1000gr	Rp 6,250
Salt	375 gr	Rp 4,700 /500gr	Rp 3,525
Shallots	2,175 gr	Rp 30,000 /1000gr	Rp 65,250
Coconut oil	1,250 ml	Rp 28,000 /1000ml	Rp 35,000
Lime leaf	50 pcs (100gr)	Rp 4,000 /125gr	Rp 3,200
Lemongrass stalk	25 pcs (1,050gr)	Rp 11,830 /1000gr	Rp 12,421
Cinnamon	8 pcs (25cm)	Rp 14,000 /100gr (12 biji)	Rp 9,400
Bayleaf	25 pcs	Rp 200 /1 lembar	Rp 5,000
Star Anise	50 pcs (50gr)	Rp 16,000 /100 gr	Rp 8,000
		TOTAL /day (25 recipes)	Rp 753,720
		TOTAL /month (500 recipe)	Rp 15,074,400

6. Rent Cost

Table 4. 10 Rent cost

Facility	Size	Price	Sub total
Ruko	4,5 x 10 m	Rp 2,000.000 (/Month)	Rp 2,000.000 (/Month)
	TOTAL /month		Rp 2,000.000

7. Total Cost

Fixed Cost = Labour cost & Raw Material

(Rp 7,000,000 + Rp 15,074,400)

Variable Cost = Raw material cost, Packaging cost & Utility cost

(Rp 15,074,400 + Rp 2,320,000 + Rp 710,900)

Total Cost (/month) = Labour + Raw Material + Packaging + Utility + Rent Cost

= 7,000,000 + 15,074,400 + 2,320,000 + 710,000 + 2,000,000

= Rp 27,104,000

4.4.2 Selling Price

$$\text{Product Price} = \frac{\textit{Total cost (/Month)}}{\textit{Total Product Units (/month)}}$$

$$= \frac{\textit{Rp 27,104,000}}{\textit{1,000}}$$

= Rp 27,104 /Portion

Product Selling Price = Product Price + (Product price x Profit %)

= Rp 27,104 + (27,104 x 47%)

= Rp 27,104 + 12,738.88

= Rp 39,842.88 (Rp 40,000)