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Watermelon Rind Meatball, Functional Food to Normalize Blood Pressure for People with Hypertension

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Abstract— Hypertension is a very common disorder that causes negative impact especially for health and economy. Furthermore, hypertension also become major sources of morbidity and mortality in the world, including in Indonesia. Hypertension has caused 7.5 million deaths in 2004 or almost 13% of all global deaths. In 2013, there were 25.8% people living with hypertension in Indonesia. The cost of hypertension in United States reached \$47.5 billion per day in 2013. In Indonesia, the cost reached 5440 billion rupiahs in 2007. Citrulline is an alpha amino acid that is metabolized to L-arginine in the vascular endothelium, renal, and other cells. Citrulline decreases systolic and diastolic blood pressure significantly. Watermelon is rich in non-essential amino acid citrulline and also dietary fiber. The rind contains more citrulline than the flesh on a dry weight basis (24.7 and 16.7 mg/g, respectively) but less on a fresh weight basis (1.3 and 1.9 mg/g, respectively). Watermelon rind contains the components of dietary fiber approximately 20% cellulose, 23% hemicellulose, 10% lignin, and 13% pectin per 100 gram. Indonesia produced 460.628 tons of watermelons in 2013 and all the rinds of those watermelons eventually just ended up in the waste container. To provide innovative functional food (nutritious, healthy, low cost product and also have good storage capacity) for people with hypertension using watermelon rind flour, we make watermelon rind meatball. Organoleptic test was used to test the acceptance of watermelon rind meatball. The indicators were based on the assessment of the shape, colour, size, texture, and taste of watermelon rind meatball. The scoring scale ranged from 1 to 7. Twenty two students of University of Indonesia were randomly selected as panellist in the present study. Result of this study showed that watermelon rind meatball may be consumed as a main course or snack. One piece of watermelon rind meatball (± 8 g) contains 10.73 g energy, 0.245 g protein, 0.188 g fat, 2.007 g carbohydrate, 1.337 g fiber, and 0.003 g citrulline. People with hypertension should be given alternative nutritious foods to stay healthy. Watermelon rind meatball may be one of the functional foods for people with

hypertension because it contains citrulline, high fiber, and is also low fat.

Keywords—citrulline, functional food, hypertension, meatball, watermelon rind

I. INTRODUCTION

Hypertension, also known as high or raised blood pressure, is a condition in which the blood vessels have persistently raised pressure, when systolic blood pressure is equal to or above 140 mm Hg and/or a diastolic blood pressure equal to or above 90 mm Hg the blood pressure is considered to be raised or high¹. High blood pressure is a major risk factor for coronary heart disease and ischemic as well as hemorrhagic stroke². In 2004, hypertension was considered directly responsible for 7.5 million deaths in 2004 or almost 13% of all global deaths³. Globally, because of population growth and ageing, the number of people with uncontrolled hypertension rose from 600 million in 1980 to nearly 1 billion in 2008⁴. In 2013, there are 25.8% people with hypertension in Indonesia⁵.

In United States, hypertension costs up to \$47.5 billion each day, including the cost of health care services, medications to treat high blood pressure, and missed days of work⁵. In Indonesia, hypertension costs up to 5440 billion rupiah⁶.

Some causes of hypertension are smoking tobacco, eating foods high in sodium and low in potassium, not getting enough physical activity, being obese, and also drinking excessive alcohol⁷. Major cause of hypertension is unhealthy life style. Therefore, we need to change it especially for eating habit.

Citrulline (L-Citrulline) is an alpha amino acid that is metabolized in the vascular endothelium, renal, and other cells to L-arginine. L-citrulline decreases significantly systolic and

diastolic blood pressure⁸. Watermelon (*Citrullus vulgaris* Schrad.) is a natural and rich source of the non-essential amino acid citrulline. Rind contains more citrulline than flesh on a dry weight basis (24.7 and 16.7 mg/g dwt, respectively) but less on a fresh weight (fwt) basis (1.3 and 1.9 mg/g fwt, respectively)⁹. One study stated that the rind contains 93.8% moisture, 0.49% ash, 0,1 % nitrogen, and 2.1% sugars (Bawa et al., 1977 on Campbell 2006)¹⁰. Fiber is a heterogeneous mixture of plant food components that are indigestible in the small intestine. The typical components of dietary fiber include cellulose, hemicellulose, lignins, and pectins¹¹. Sources of dietary fiber may displace hyperlipidemic¹². Hyperlipidemic, in the long period, may cause hypertension. Watermelon is one of nutritious fruits. Watermelon rind contains the components of dietary fiber approximately 20% cellulose, 23% hemicellulose, 10% lignin, and 13% pectin per 100 gram¹³. Indonesia produced 460.628 ton watermelon in 2013¹⁴. However, watermelon rind in Indonesia become wasted.

Based on the background, we provide a functional food as a variation food for hypertension using watermelon rind that has low cost and nutritious. On the other hand, utilization of watermelon rind as alternative food helps to reduce the waste. Therefore, the authors have an innovative idea about **“Watermelon Rind Meatball, Functional Food to Normalize Blood Pressure for People with Hypertension”**.

II. METHODOLOGY

Experimental design was used in present study. Watermelon rind (81 g), garlic (2 cloves), starch flour (81 g), pepper (1/2 tsp), egg (1 pcs), carrot (53 g) were used in this study. Preparation of meatball: Watermelon rind flour was mixed with starch flour, carrot, and egg. Pepper, garlic, and salt were added into the meatball dough. Dough were made in rounded shape and boiled for 15-20 minutes.

To measure the acceptance of watermelon rind meatball, organoleptic test was used in present study. Organoleptic test measured the acceptance of the product based on the shape, color, size, texture, and taste. The panellist gave their objective scoring with scoring scale in each indicators use score from 1 until 7 point. Small point indicates the panellist do not like the product and big point indicates the panellist like the product. Twenty two students of University of Indonesia were randomly selected as panellist in the present study.

III. RESULTS

Watermelon rind meatball might be considered as one of healthy and nutritious food because of dietary fiber and citrulline content. The nutrient contents of watermelon rind meatball is shown in table 1:

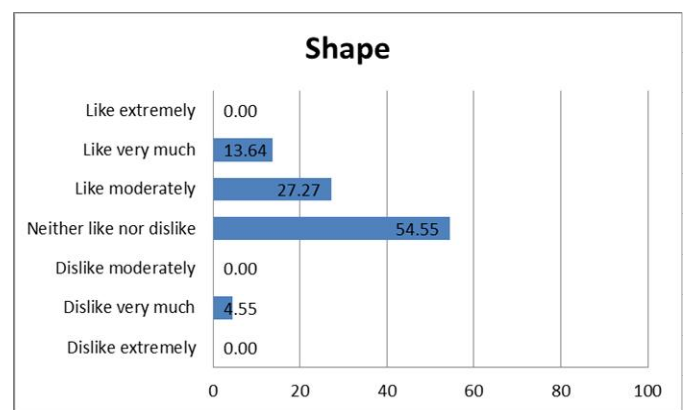
Table 1. The Nutrient Contents of Watermelon Rind Meatball

Nutrients	Nutrition value per 100 gram	Nutrition value per 1 pcs (8 gram)
Energy (kcal)	137.12	10.730
Protein (gram)	3.12	0.245
Fat (gram)	2.41	0.188
Carbohydrate (gram)	25.65	2.007
Fiber (gram)	17.08	1.337
Citrulline (gram)	0.034	0.003

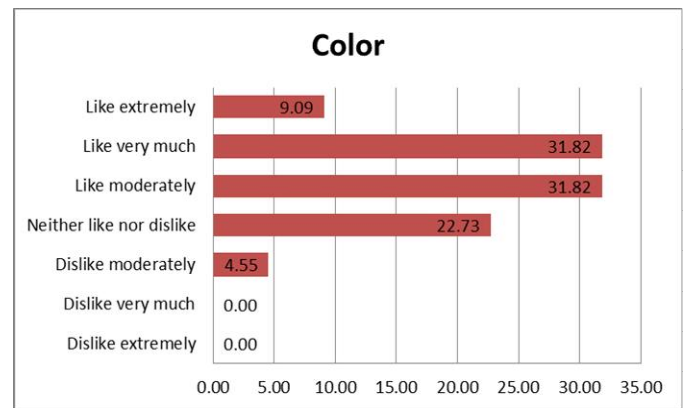
Note: This calculation based on Tabel Komposisi Pangan Indonesia (PERSAGI, 2009)¹⁵, Rimando AM, and Campbell (2006)

Based on organoleptic test¹⁶, every characteristic has different results. The results of organoleptic test are displayed as in Picture 1:

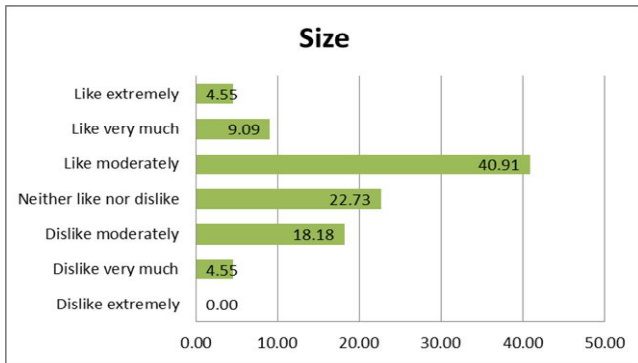
Picture 1.1 Organoleptic Test based on The Shape of Watermelon Rind Meatball



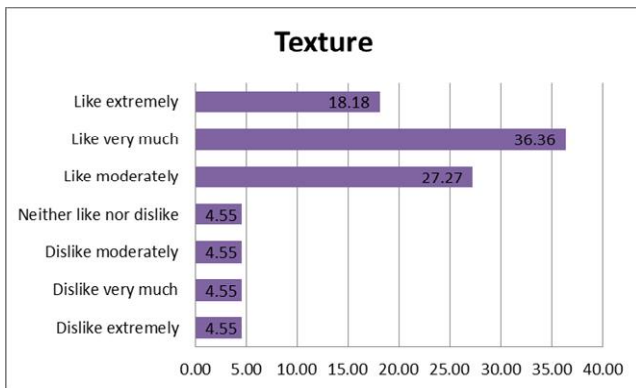
Picture 1.2 Organoleptic Test based on The Color of Watermelon Rind Meatball



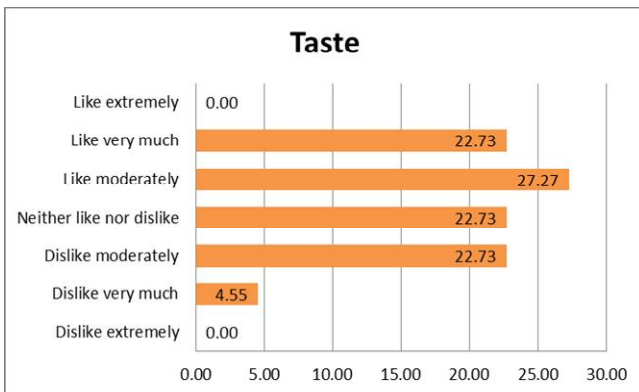
Picture 1.3 Organoleptic Test based on The Size of Watermelon Rind Meatball



Picture 1.4 Organoleptic Test based on The Texture of Watermelon Rind Meatball



Picture 1.5 Organoleptic Test based on The Taste of Watermelon Rind Meatball



Based on the results of organoleptic test in twenty two healthy people as panelist, the highest score for the shape is neither like nor dislike (54.55%). Based on the color, the highest score are like very much and like moderately with the same percentage, 31.82%. Based on the size, the highest score is like moderately (40.91%). Based on the texture, the highest score is like very much (36.36%). Based on the taste, the highest score is like moderately (27.27%).

Based on the storage, watermelon rind meatball that put in temperature room has expired time less from 24 hours.

Watermelon rind meatball that put in chiller has expired time till 3 days and watermelon rind meatball that put in freezer has expired time till 6 days.

Table 2. Food Storage of Watermelon Rind Meatball

Type of Storage	Expired Time
Room temperature	24 hours
Chiller	3 days
Freezer	6 days

IV. CONCLUSION

Watermelon rind meatball might be considered as one of healthy and nutritious foods. It contains high amount of fiber and citrulline, but low amount of fat. Watermelon rind meatball can be used as a frozen food because it has long time enough for the storage capacity if put it on chiller and freezer. Therefore, watermelon rind meatball potentially have beneficial effect to prevent hypertension and other cardiovascular disease.

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