

# The Nutritional Composition of Red Durians from Banyuwangi, Indonesia

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## Abstract

Banyuwangi regency has red fleshed durians which grow naturally and also cannot be found in other areas because of it is an endemic species from Banyuwangi. The information about red durian nutrients compositions are not available yet, whereas those composition are important in determining of red durian nutrient composition, handling techniques, and further processes. This research was conducted to analyze the nutrient composition of eight (8) variant of Banyuwangi's red durians, and compare the nutritional compositions of yellow and white durians which can be found around the location of red durians. The eight variants of Banyuwangi's red durians which used in this study are *Serat*, *Serat Pink*, *Musang Merah*, *Tallun Jeruk*, *Sun rice of Java*, *Red Horny Jameela*, *Red King*, and *Pelangi*. In this research, the nutrient content in 100 g of fresh durian flesh samples for 10 parameters were analyzed, such as protein (%), fat (%), carbohydrates (%), total sugar (%), calories (cal/g), vitamin C (mg/100g), Zinc (Zn) (ppm), iron (Fe) (ppm), potassium (K) (%), and sulfur (S) (%). Furthermore, the data were analyzed descriptively. The results showed that *Serat Pink* durian has higher protein content than other red durians and white durians. All red durian have lower protein content than yellow durians. *Tallun jeruk* durian has higher fat, calories, and sulfur (S) content than other red durians, yellow and white durians. *Red Horny Jameela* durian has higher carbohydrate content than other red durians and white durians, but it is lower than yellow durians. *Musang Merah* durian contain the highest vitamin C and potassium (K) among other durians (red, yellow, and white). *Pelangi* durian has higher content of zink (Zn) and iron (Fe) than other red durians, white and yellow durians.

**Keywords:** Nutrient compositions, Red durians, Banyuwangi

## 1. Introduction

Durian is called as "The King of Fruit" (Heaton, 2006), because of its specific aroma and its delicious taste. It also has important nutrients which needed in body protection from various kinds of diseases. Durians contain high sugar (McGee, 2004), vitamin C, potassium, tryptophan amino acid (Wolfe, 2002), carbohydrate, protein, fat (Heaton, 2006), vitamin B1, vitamin B2, vitamin E, phosphor, calcium, iron, active substances such as esther, sulphur-containing alkanes, thioacetals, thioesters, thiolanes and alcohol. Durians fruit also has some benefits such as anti-oxidants, lowering cholesterol, get over constipation, skin rejuvenation treat skin diseases (Ashari, 2014), and can be used as an aphrodisiac (Brown,1997; Venkatesh, *et al*, 2009; Sing, *et al*, 2010, and Wani *et al*, 2011).

Durians have yellow or white flesh in general, but there is an exception with Durian in Banyuwangi regency. Flesh of Banyuwangi durian is red, more tempting and tastier. Red durian is an endemic, species from Banyuwangi regency. It only can be found in Banyuwangi regency. At first, red fleshy durians are expected as Kalimantan origins. This is possible, because Kalimantan is one of the genetic variation sources which important durian distribution in Indonesia also worldwide (Uji, 2005a, 2005b). Banyuwangi red durians is different from Kalimantan red durians, such as *Durio graveolens* (durian anggang), *Durio dulcis* (lahong), *Durio kutejensis* (lai/pempaken).

There are 32 variants of red durians which have differences in taste, smell, and flesh color (Rusmiati *et al*, 2013). There are only 25 of those 32 variants are edible, while the rest of those are bitter and thin fleshed. Those 25 variants of edible red durians are spread in 5 districts. The districts are Glagah, Songgon, Licin, Giri, and Kalipuro. Based on their flesh colors, red durians are classified into three groups. The groups are totally red, rainbow (red-yellow-orange), and red pattern. The red and red pattern durians are presumed as the result of hybridization between white durian (*Durio zibethinus*) and *Durio graveolens*, while the rainbow durians are the result of hybridization between yellow durian (*D. zibethinus*) and *D. graveolens* (Mulyanto, 2013). Red durian in Songgon has the deepest red color durian flesh. Red durians in Kemiren village has light red color—and combination of red, but in Kaliputro are orange and yellow. Presumably, they are originated from *D. kutejensis*, *D. graveolens*, and *D. zibethinus*. The characters of *D. kutejensis* can be seen from the color of their orange flesh *D. graveolens* from their red flesh, and *D. zibethinus* from their strong smell (Anonymous, 2012).

Red durians have similar look with durian (*D. zibethinus*) in general, but it smaller than regular durian (with weight of 1 - 1.5 kg per piece). There are some morphological differences between *D. zibethinus* in general with red durian. The leaf bottom color is silvery in red durian, but it is brown in general durian. Red durian top surface section is looks like bumpy. Red durian leaf margins is curved, for protection of skin touch. Leaf size is the same as another durian, except red durian offspring lai (*D. kutejensis*). Leaf size of durian offspring lai is similar with leaf size of red durian from desa Kampung Anyar, district Kalipuro, it is longer than the other durian. Red durians have a flower with four petals in addition, regular durian only have 3 petals (Rusmiati, *et al.*, 2014).

Recent red durians demand is increasing because of their benefits, such as rich of nutrient, vitamin, and mineral which contained on it. While the test result of Durian Research Center Laboratory in Brawijaya University shows that red durians contain high level of anthocyanin, they are rich of phytosterol protein, and phytohormone which can act as anti-stress, anti-hypertension, and aphrodisiac agent (arises sexuality/libido) (Anonymous, 2011). Considering the benefits of red durians, it can be confirmed that red durians have high nutrients content. The information about nutrient composition in red durians are not available yet, whereas those composition are important in determining of red durian nutrient composition, handling techniques, and further processes. Those are the reason of nutritional composition research on eight variants of Banyuwangi red durians covering proximate nutrient composition (protein, fat, carbohydrate), total sugars, and calories. In addition, durians are also the source of vitamins and minerals which have important function in the body as the regulator of metabolism process (Brown, 1997), therefore this research also studied their vitamin C and minerals contents of red durians, such as zinc (Zn), iron (Fe), kalium (K), and sulfur (S).

The purpose of this research is to analyze the nutrient composition of eight (8) variants of Banyuwangi red durian also the comparison of their nutritional composition to yellow and white durians which can be found around the area of red durians grow. The result of this research is expected can provide the information about nutrient composition of red durians. According to these information, it can be identified which variant of red durians is has the most benefits. These information also can provide data for further development through different aspects, such as seeding to harvesting which can make the red durian can compete in the market. Red durians have the potentials to be developed as one of the best products of tropical fruits.

## 2. Material and Methods

There are 8 (eight) variants of Banyuwangi's red durians which used in this research, *Serat*, *Serat Pink*, *Musang Merah*, *Tallun Jeruk*, *Sun rice of Java*, *Red Horny jamela*, *Red King*, *Pelangi* and 1 variant of white and yellow durian from surrounding location for comparison. All variants of red durian are from different places in Banyuwangi regency. Those durians are gathered from their owners which planted and grown in the yard or garden when they completely ripe. The nutrient content test was conducted in Laboratorium Sentral Hayati (LSIH) UB Malang. Analyzing The nutrient content was analyzed from 100 g of fresh durian flesh samples. The data which observed are protein (%), fat (%), carbohydrate by difference (%), total sugar (%), calorie (cal/g), Vitamin C (mg/100g) levels, Zn (ppm), Fe (ppm), S (ppm), K (%). The protein level was measured using Inhouse Method (IKP/1.0.4.03/LSIH), fat level was measured using SNI 01-2891-1992 article 8 method, total sugar content was measured using Luff Schoorl method, titration (Jacobs) for measuring vitamin C, carbohydrate by difference was calculated using carbohydrate (by difference), and Bomb Calorimeter for measuring calorie. Zinc (Zn), iron (Fe) and potassium (K) level were measured using AAS method with reagent HNO<sub>3</sub>. Sulfur (S) level was measured using spectrophotometric method with reagent Mg(NO<sub>3</sub>)<sub>2</sub>BaCl<sub>2</sub>. Observed data will be analyzed descriptively by comparing the nutrient content in each variants of red, white, and yellow durians.

### 3. Results

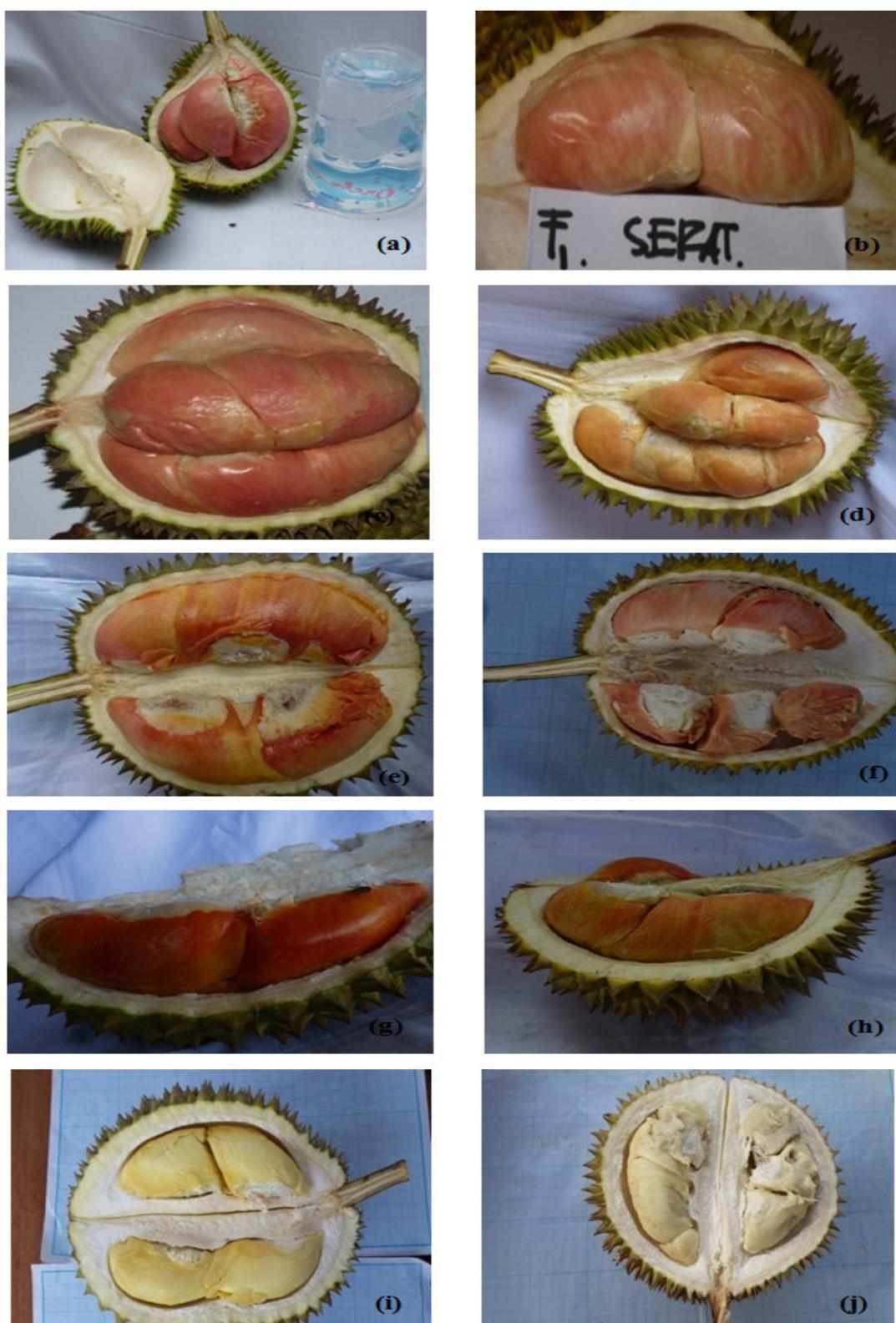


Figure 1. Red durians: (a) *Serat*, (b) *Serat Pink*, (c) *Musang Merah*, (d) *Tallun Jeruk*, (e) *Sun rice of Java*, (f) *Red Horny Jameela*, (g) *Red King*, (h) *Pelangi*, (i) Yellow durians, and (j) White durians.

Nutrient content of durian was analyzed to identify the variations of nutrient content from each durian variant. Proximate nutrient composition (protein, fat, carbohydrate), total sugars, calories, (vitamin C), and minerals (Zn, Fe, K, and S) data from red, white, and yellow durians in Banyuwangi Regency can be seen in Table 1 and Table 2 below.

Table 1. Proximate nutrient composition (protein, fat, carbohydrate), total sugars, and calories red, white, and yellow durians in Banyuwangi Regency

<b>Variants of durian</b>	<b>Parameters</b>				
	<b>Protein (%)</b>	<b>Fat (%)</b>	<b>Carbohydrate (%)</b>	<b>Sugar Total</b>	<b>Calorie (Cal/g)</b>
1. Serat	2,46	0,22	24,51	11,49	1289,05
2. Serat pink	2,50	0,29	27,31	18,29	1479,61
3. Tallun Jeruk	1,92	0,43	35,38	16,48	2018
4. Musang merah	2,18	0,25	32,35	17,30	1582,77
5. Sun rise of java	2,28	0,40	34,76	19,53	1712,56
6. Red Horn jameela	2,26	0,30	37,27	21,14	1876,16
7. Pelangi	2,16	0,23	31,24	19,18	1708,50
8. Red King	2,40	0,17	35,05	22,47	1687,58
9. White	2,21	0,27	36,58	15,24	1923,87
10. Yellow	2,74	0,33	40,01	18,13	1968,58

Table 2. Nutrient composition (vitamin C) and minerals (Zn, Fe, K, and S) red, white, and yellow Durians in Banyuwangi Regency

<b>Variants of durian</b>	<b>Parameters</b>					
	<b>Vitamin C (mg)</b>	<b>Zn (ppm)</b>	<b>Fe (ppm)</b>	<b>Kalium (%)</b>	<b>Sulfur (ppm)</b>	
1. Serat	144,34	1,7828	2,8434	3,25	20,8060	
2. Serat pink	114,34	1,5227	2,4641	0,54	24,8539	
3. Tallun Jeruk	171,64	1,6160	1,4866	0,98	58,2271	
4. Musang merah	279,75	1,3816	1,7830	9,67	37,2234	
5. Sun rise of java	150,48	1,3645	1,8914	1,85	22,8909	
6. Red Horn jameela	211,26	1,2333	1,7624	1,23	43,4992	
7. Pelangi	140,82	2,4493	4,8860	0,77	28,3711	
8. Red King	168,98	1,7730	2,0481	1,06	39,5211	
9. White	65,13	2,0497	1,7549	1,97	55,8406	
10. Yellow	168,09	1,2283	3,4572	3,61	22,4545	

#### 4. Discussion

There are some variations of durian taste because the species which observed in this study are from different variants. Beside of taste, there are another differences which can be seen from the color of the flesh, and aroma. The results of the study Rusmiati, *et al* (2013) found that: *Serat* durian flesh is sweet, savory, fluffy, and has very tempting aroma. *Serat Pink* durians has very thick, soft, and savory flesh with quite sweet aroma. *Tallun jeruk* durian has dense, dry, less aroma, thick, and a little bit bitter but sweet flesh. *Musang Merah* durian flesh is quite sweet, very savory, sticky in mouth flesh texture is very rough, and fluffy. *Sun Rice of java* is sweet, thick flesh, and has specific color degradation. *Red Horn Jameela* has sweet and fluffy flesh, but dry. *Red King* durian flesh is very sweet and thick. *Pelangi* durian flesh is sweet with pandan aroma.

The observation results show that there is no significantly differences of nutritional composition in each durians. Potassium level of each durian is the only one parameter which has variations. These results suggest that the different location of durians grow cause the variation of red durians nutrient composition. Astawan (2009) stated that durian fruit nutritional composition is very diverse; which depending on type, age (maturity), and its place to grow. Another factors which determined mineral contents in fruits and vegetables are genetic, agricultural practices, variations of soil mineral content, soil fattening, soil pH, and some environmental factor (Clydesdale, 1988).

#### 4.1 The Proximate Composition

##### 4.1.1 Protein Content

Protein content of *Serat Pink* durian is the highest among other red and white durians (table 1). *Serat pink* durian has protein content similarity with the observations of Nutrition Directorate of The Ministry of Health of Indonesia (1981). It stated that protein content in red durians is 2,5% and 2,74% in yellow durians which means red durian protein content is lower than yellow durian. Protein has some roles in body, its functions are construct enzyme to control metabolism, build body immunity, and act as important transporter (Aberoumand, 2011).

##### 4.1.2 Fat Content

*Tallun Jeruk* durian has the highest fat content (0.43%) among other durians. Nutrition Directorate of The

Ministry of Health of Indonesia (1981) observed that fat content in durian is 3% which means that Banyuwangi durians fat content is much lower than another durian, and it safe to be consumed. High fat content will increasing the calorie level. Fat function as body builder andform body structure in human. It also generates and stores energy, set body temperature, heat loss protection, protein storage, and dissolving vitamins A, D, E, K (Kartasapoetra and Marsetyo, 2010).

#### 4.1.3 Carbohydrate Content

*Red Horny Jameela* durian had the highest carbohydrate content (37.27%) among other red durians and white durians (36.58 %). All red durian variants in this study are had lower carbohydrate content than yellow durian carbohydrate content (40.01%). Observations of Nutrition Directorate of the Ministry of Health of Indonesia (1981) states that carbohydrate content in durian is only 28%, which mean that Banyuwangi durian contains high carbohydrate, and it is suitable to be used as a companion to a natural diet. This is because by eating durian fruit can make full long sensations. Although can it be a good source of energy, but durian consumption should be limited because the consumption it can lead to the risk of diabetes and heart disease (Mann, 2007).

#### 4.1.4 Sugar Total Content

*Red King* durian has the highest total sugar content among other durian variants. This is similar with Rusmiati *et al* (2013) study which states that the *Red King* durian has very sweet flesh. High content of sugar can cause diabetic. Durians are not good to be consumed by pregnant woman.

#### 4.1.5 Calorie Content

*Tallun jeruk* durian has higher calorie content (2018 cal / g) than other red durian, white durian (1923.87 cal / g) and yellow durian (1968.58 cal / g). It is important to monitor the calorie content of durian, because the excessive consumption of durian can cause weight gain.

### 4.2 Vitamin C and Mineral Composition

#### 4.2.1 Vitamin C Content

Vitamin C is one of antioxidant which effectively scavenge the free radicals that can damage cells / tissues (Kartasapoetra and Marsetyo, 2010). *Musang Merah* durian has higher vitamin C content (279.75 mg / 100 g) than other red durian, durian white (65.13 mg / 100 g), and yellow durian (168.09 mg / 100 g) . Vitamin C can help boost the immune system against various infections (Astawan, 2009).

#### 4.2.2 Zinc Content

*Pelangi* durian has higher Zn content (2.4493 ppm) than other red durian, durian white (2.0497 ppm) and yellow durian (1.2283 ppm). It is already known that Zinc is a mineral in the human body which act as a cofactor to ensure the optimization enzyme function. Deficiency of this minerals will inhibit sexual growth and sexual maturation (Astawan, 2009).

#### 4.2.3 Fe Content

*Pelangi* durian has higher Fe content (4.886 ppm) than other red durian, white durian (1.7549 ppm) and yellow durian (3.4572 ppm). Fe content is beneficial to carry oxygen and carbon dioxide, formation of blood cells, part of the enzyme, and antibody production (Muchtadi, 2009).

#### 4.2.4 Potassium Content

*Musang Merah* durian has higher potassium content (9.67%) than other red durian, white (1.97%) and yellow durian (3.61%). Potassium is an important electrolyte of cell and body fluids that helps control heart rate and blood pressure, prevent strokes, get involved in muscles movement, and trigger ganglion. High potassium will facilitate the oxygen delivery to the brain and keep body fluid balance (Astawan, 2009).

#### 4.2.5 Sulfur Content

*Tallun jeruk* durian has a higher sulfur content (58.2271 ppm) than other red durian, white (55.8406 ppm) and yellow durian (22.4545 ppm). Sulfur in durian is also known get involved in alcohol metabolism inhibition. This substance plays an important role in blood clotting process, energy transfer reactions, liver detoxification, collagen and mucopolysaccharides synthesis (Muchtadi, 2009).

## 5. Conclusion

*Serat Pink* durian has the highest protein content among other durians (red, white, and yellow). All red durians have lower protein content than yellow durian. *Tallun Jeruk* durian has the highest fat, calories, and sulfur content among other durians (red, white, and yellow). *Red Horny Jameela* durian has higher carbohydrate content among other red durians and white durians, but it is lower than yellow durians. *Red King* durian has the highest content of total sugar among other durians (red, white, and yellow). *Musang merah* durian contain the highest vitamin C and potassium level durians (red, white, and yellow). *Pelangi* durian Zn and Fe content is the highest among other durians (red, white, and yellow).

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