The effect of maturity level on pH, total soluble solid, protein and fat content of asam gelugur (*Garcinia atroviridis*) from North Sumatera

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Abstract. Asam Gelugur (*Garcinia atroviridis*) a type of endemic plant that is found in Indonesia widely planted by farmers. Asam gelugur have been used for traditional food like gulai pindang, asam pedas, arsik and manisan. This paper deal about effect maturity level on pH, total soluble solid, fat content of asam gelugur (*Garcinia atroviridis*) from North Sumatera. The results showed that when the level of maturity increased the protein decreased, meanwhile when the level maturity increased the pH, total soluble solid and fat content increased.

1. Introduction

*Garcinia atroviridis* have been used for traditional food like gulai pindang, asam pedas, arsik and sweet pickle in Indonesia. Asam Gelugur is a commodity that has the potential to be exported. In North Sumatera generally the gelugur fruit is thinly cut and dried and then mixed into vegetable cooking [1] Strain of Garcinia plants (asam gelugur) in Indonesia that always found is *Garcinia atroviridis*, meanwhile another strain of Garcinia plants in Southern India is *Garcinia cambogia* [2]. Garcinia plants have been used for years and semi growing wild plants [3]. *Garcinia atroviridis* plants can grow in regions like tropical and sub-tropical [4]. Garcinia is classified as a plant from Indonesia’s forests. There are estimated to be about 400 types of Garcinia. This means that there are many Garcinia species in Indonesia [5]. Gelugur acid maturity is determined by colour and hardness. The gelugur fruits maturity have yellowish skin and softened texture. Discolouration that occurs in gelugur acid is often used as the main criteria to determine the ripeness or rawness of asam gelugur [6].

2. Material and methods

Garcinia were purchased from the farmers at five districts in Sumatera Utara (Indonesia), consists of Simalungun, Delitua, Sembah, Batubara, Tapanuli Tengah. We divide 3 levels of maturity of Garcinia that consisting of ripe, half ripe and raw, respectively yellow colourist on entire, yellow ripe, and green ripe.

Analysis consist of pH [7], Total Soluble Solid (TSS) [8], Protein using Kjedh1 Method [9] and fat content using soxhlet method [9]. Data analysis using randomized design were analysed using SPSS version 22 for windows.
3. Results and discussion

3.1. pH
Table 1 showed pH of asam gelugur of 5 districts varies from 1.1934 until 2.4410. Table 1 showed that asam gelugur from raw, half ripe and ripe indicated an increase in pH, but there is no significant effect on pH of asam gelugur. Land conditions in 5 district that asam gelugur where gelugur acid grows may affect the difference of pH. The difference of the chemical content in a plant is influenced by land conditions (soil fertility, topography, soil type and climate) [10].

The more maturity, the total acid decreased. This is because organic acids are converted into simple sugars such as glucose and fructose as the fruit ripens, so the acidity in a fruit will decrease [11].

Table 1. The effect of maturity level on pH of asam gelugur from 5 districts

|                    | Raw     | Half Ripe | Ripe   |
|--------------------|---------|-----------|--------|
| Tapanuli Tengah    | 2.4410  | 2.4380    | 2.3950 |
| Batubara           | 1.1934  | 1.2251    | 1.2989 |
| Delitua            | 1.4222  | 1.4876    | 1.6342 |
| Sembahe            | 1.6650  | 1.7060    | 1.7980 |
| Simalungun         | 1.4300  | 1.5000    | 1.6500 |

Figure 1. The effect of maturity level on pH of asam gelugur from 5 districts in North Sumatera

3.2. Total soluble solid
Table 2 showed total soluble solid of asam gelugur of 5 districts varies from 4.2500 until 16.5000. The maturity level make effect on total soluble solid of asam gelugur. The increasing of maturity on asam gelugur can make an increase of total soluble solid. The total sugar content in it will also be higher due to changes in organic acids into simple sugars. Total sugar in fruit is the dominant component in total dissolved solids [12]. The increase in dissolved solid content is caused by changes in polysaccharides (starch, peetin and hemicellulose) into simple dissolved sugars [13].

![Figure 1](image-url)
Table 2. The effect of maturity level on total soluble solid of asam gelugur from 5 districts

| District          | Raw    | Half Ripe | Ripe    |
|-------------------|--------|-----------|---------|
| Tapanuli Tengah   | 4.5000e<sup>def</sup>C<sup>D</sup> | 5.2500e<sup>def</sup>C<sup>D</sup> | 6.2500e<sup>def</sup>C<sup>D</sup> |
| Batubara          | 4.2500<sup>GD</sup> | 4.7500<sup>CD</sup> | 5.7500<sup>def</sup>C<sup>D</sup> |
| Delitua           | 5.0000e<sup>def</sup>C<sup>CD</sup> | 5.5000e<sup>def</sup>C<sup>CD</sup> | 6.5000<sup>def</sup>C<sup>CD</sup> |
| Sembahé           | 10.0000<sup>c</sup>4<sup>BCD</sup> | 15.0000<sup>a</sup>A | 16.5000<sup>c</sup>def<sup>CD</sup> |
| Simalungun        | 6.0000<sup>c</sup>e<sup>def</sup>C<sup>CD</sup> | 7.0000<sup>c</sup>def<sup>CD</sup> | 9.0000<sup>b</sup>B |

Figure 2. The effect of maturity level on total soluble solid of asam gelugur from 5 districts in North Sumatera

3.3. Protein content

Table 3 showed protein content of asam gelugur of 5 districts varies from 0.4300 until 1.700. Table 3 showed that asam gelugur from raw, half ripe and ripe indicated a decrease in protein content, but there is no significant effect on pH of asam gelugur. Protein is a nutrient that is formed from nitrogen in soil nutrients. The formation of nitrogen by binding of microorganisms in the soil and nitrogen in the air, from soil organic matter, fertilizers and rainwater [14]. The difference of the chemical content in a plant is influenced by land conditions (soil fertility, topography, soil type and climate) [10].

Table 3. The effect of maturity level on protein content of asam gelugur from 5 districts

| District          | Raw    | Half Ripe | Ripe    |
|-------------------|--------|-----------|---------|
| Tapanuli Tengah   | 1.0684 | 0.9159    | 0.8417  |
| Batubara          | 0.9610 | 0.8375    | 0.6394  |
| Delitua           | 0.9667 | 0.7191    | 0.6698  |
| Sembahé           | 1.0400 | 0.6800    | 0.4300  |
| Simalungun        | 1.7000 | 1.5300    | 1.3800  |
3.4. Fat content

Table 4 showed fat content of asam gelugur of 5 districts varies from 0.4661 until 1.4050. Table 3 showed that asam gelugur from raw, half ripe until ripe indicated an increase in fat content. The difference of the chemical content in a plant is influenced by land conditions (soil fertility, topography, soil type and climate) [10].

Table 4. The effect of maturity level on fat content of asam gelugur from 5 districts

| The level of maturity (%) | Raw       | Half Ripe | Ripe      |
|---------------------------|-----------|-----------|-----------|
| Tapanuli Tengah           | 0.9324de,BCD | 1.0352b,B  | 1.0352bc,BC |
| Batubara                  | 0.7236de,DE  | 0.8456ede,CD | 0.6216a,A  |
| Delitua                   | 0.4661e,F   | 0.5188fg,F  | 0.7357de,DE |
| Sembaha                   | 0.5570eg,EF  | 0.5740fg,EF  | 0.6230gf,EF |
| Simalungun                | 1.3100h,AB   | 1.3300h,A   | 1.4050h,A   |

Figure 3. The effect of maturity level on protein content of asam gelugur from 5 districts in North Sumatera

Figure 4. The effect of maturity level on fat content of asam gelugur from 5 districts in North Sumatera
4. Conclusion
The results showed that when the level of maturity increased the protein decreased, meanwhile when the level maturity increased the ph, total soluble solid and fat content increased.

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