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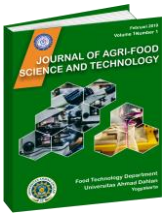


# Quality Control Analysis of Black Tea Raw Ingredients (*Camellia sinensis*) PT ABC

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**ABSTRACT**

*One of the companies that produce black tea in Indonesia is PT ABC. In PT ABC, the processing system Orthodox Rotorvane produces black tea powder according to market demand, which has a small particle size (broken tea) and quick brewing by applying SNI 01-1902-2016 as a reference for production activities and monitoring the production process. This study contribution to investigate the quality of tea leaf shoots used as production raw materials, especially in the flow of raw material handling, the quality control of raw materials, and the value of the proportion of damage to raw materials. The method used is an analysis based on data Tops Not Eligible/Pucuk Tidak Memenuhi Syarat (PTMS) obtained from each plantation block. The output results obtained show that the value of the proportion of damage to raw materials is still within the control limits where there are only one of the six plantation blocks, namely the Kembang plantation block, produces a value of the proportion of damageoutside the control limits with the main factors causing it fromhuman factors, equipment, raw materials and working method used. This research contributes to knowing the value of the proportion of shoot damage for each plantation block at PT ABC.*



## 1. INTRODUCTION

Tea is one of the most popular natural beverage ingredients in the community because tea contains bioactive components called polyphenols. In general, polyphenols in plants consist of flavonoids and phenolic acids. Flavonoids are the largest group of polyphenols which are also very effective as antioxidants (Astawan and Kasih, 2008).

The tea plant (*Camellia sinensis*) is a green plant originating from the subtropics

which grows optimally at 25°–35°North Latitude and 95°–105°East Longitude. Most tea plantations are found in India, China and Sri Lanka (Kusuma, 2008). Several factors that affect the growth of tea are climate and sunlight. A good air temperature ranges from 13°–15°C, the relative humidity during the day is more than 70%, and the annual rainfall is not less than 2000 mm. The sun's rays greatly affect the tea plantations. The more sunlight, the higher the temperature; when the temperature reaches 30°C, the growth of the tea plant will be delayed (Setyamidjaja, 2000).

Tea is obtained from processing the tea plant leaves (*Camellia sinensis*) from the family Theaceae. The tea plant can thrive in the tropics and subtropics with enough sunshine and rain throughout the year. Tea plants can thrive with a height of about 6–9 m. Therefore, tea plantations are maintained with a height of only about 1 m with periodic pruning. Is done to facilitate the picking of leaves and to obtain quite a lot of tea buds (Siswoputranto, 1978).

In Indonesia, plantations are growing rapidly and widely because plantations have an important role and position in generating foreign exchange for the country. One type of plantation is a tea plantation. Its role is quite large in supporting the national economy. Abu Mufakir (2011) said tea is a labour-intensive industrial sector. The tea industry in Indonesia in 1999 alone absorbed 300,000 workers and supported 1.2 million people. In addition, tea plays a role as Indonesia's export commodity as a foreign exchange earner in addition to oil and gas (Yusroni, 2012).

The tea leaves contain four chemicals: phenolic substances (catechins and flavanols), phenolic substances (pectin, resins, vitamins, and minerals), aromatic substances, and enzymes. These four groups together support the formation of suitable properties in tea if the control during the processing process can be carried out correctly (Arifin, 1994).

According to Bambang and Kutamiyati (1994), the content of quality determinants (catechins) and caffeine is found in tea leaves; the younger the shoots, the higher the levels. In other words, the finer the shoots, the higher the quality of the shoots. Raw materials are the key to running the production process, which will later be processed from raw form into finished products. The fresh leaf shoots of PT Perkebunan Tambi UP Bedakah were obtained from 6 tea plantation blocks, namely Bismo, Rinjani, Argopuro, Kembang, Mandala and Muria. The tea plants that grow in each block can be different; the tea plants developed at the Bedakah Plantation Unit include TB Tambi Merah, Sukhoi, Gambung 3, Gambung 7, TRI 2024, and TRI 2025. Based on the tea leaf processing, according to Paramita et al. (2019), tea can be classified into four types, namely green tea (without the fermentation process), black or red tea (through the fermentation process), and oolong tea (semi-fermented). Black tea is obtained through a fully fermented process by the polyphenol oxidase enzyme found in tea leaves. The fermentation process on tea leaf shoots can give color, taste, and aroma to black tea products, so the fermentation process's length dramatically determines the final product's quality. Tea contains four groups of chemicals, namely phenolic substances, phenolic substances, aromatic substances, and enzymes. According to Widyasanti et al. (2016), Black tea has several properties such as antibacterial, antioxidant, anticancer, antiaging, and anti-obesity. Black tea processing systems can be divided into Orthodox and CTC (Crushing, Tearing, Curling). The two systems can be distinguished based on milling and enzymatic oxidation processes. CTC processing is a rolling method that requires very light wilting rates with moisture content reaching 67% to 70% with complex rolling properties, while the Orthodox processing system requires heavy wilting rates with water content reaching 52% to 58% with lighter rolling properties (Setiawati dan Nasikun, 1991). The physical characteristics found in CTC tea are, among

others, characterized by the type of curly cut that dissolves quickly, and the steeping water is darker in colour with a more pungent taste. In contrast, Orthodox tea has advantages in quality and flavour (Setiawati and Nasikun, 1991). An example of this application to follow market developments PT ABC, in its production process, has used the orthodox rotor vane system to produce tea with a smaller particle size (broken tea) and fast brewing (quick brewing).

The Orthodox system processing uses an Open Top Roller (OTR), Rotorvane (RV) and Press Cup Roller (PCR) milling machine. In contrast, the CTC system uses a Crusher-Tearing Curling (CTC) milling machine. Along with globalization and industrial development, manufacturers must produce high- quality products. Food quality control plays an essential role in the production process so that the quality and safety of the product are guaranteed until the product is distributed to the market. Quality control is an activity of reviewing product quality from various factors, one of which is raw materials which are the key to the running of the production process and the quality of the final product produced. The flow of raw material handling, such as determining the picking rotation system, handling pests and diseases, maintaining plants, handling raw materials during the picking and post-picking process to the process of receiving raw materials, must be carried out correctly and adequately to obtain raw materials with high-quality standards. The provision of quality assurance for PT ABC plantation is carried out with SNI 01-1902-2016 as a reference for production activities and monitoring the production process. This paper contribution to investigate the quality of tea leaf shoots used asproduction raw materials, especially in the flow of raw materialhandling, the quality control of raw materials, and the value ofthe proportion of damage to raw materials.

## 2. MATERIALS AND METHODS

### 2.1. Materials

In obtaining the data needed in preparing this report, namely by direct observation at PT ABC, starting from the picking process to producing black tea products and through literature studies by collecting data and taking quotes from books provided by the company or from other sources.

### 2.2. Research Methods

The step of the research methods is shown in Figure 1.

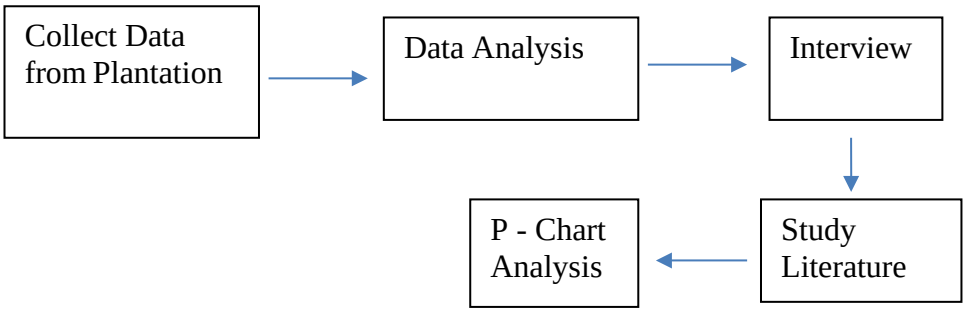


Figure 1. Flow chart of research methods

Control charts are used to help detect deviations by setting control limits, such as a) Upper Control Limit/UCL is the upper limit line for a deviation that is still permitted; b) Control Line/CL is a line that symbolizes the absence of deviations from

the characteristics of the sample; c) Lower Control Line/ LCL is the lower limit of a deviation that is still permitted.

## 3. RESULT AND DISCUSSION

In the era of the industrial revolution 4.0 where increasingly advanced technological developments make processing raw materials in a company easier, faster and modern. Good quality products are the key to efforts to encourage customer assurance. According to (Walujo et al, 2020) quality that is maintained as a target will eliminate accidents or zero accidents, eliminate damage or zero defects and eliminate complaints or zero compliant.

There are several references to previous research regarding the quality control of raw materials for the black tea production process, including research by Natalia Oryza Permatasari in 2017 entitled "Quality Control of Black Tea Raw Materials at PT ABC". This study's quality control process includes process, raw material, and final product control. The process of controlling the qualityof raw materials is divided into several activities, such as determining the shift in picking tea leaves, handling tea leaf raw materials, transporting tea leaf raw materials, re-weighing at the factory for cross-checks, picking analysis, and shooting analysis. In addition, a study by Linda Yunitasari in 2010 entitled "Quality Control of Black Tea Processing at the Tambi Plantation Unit, PT Tambi Plantation, Wonososbo". In this study, quality control of raw materials was divided into two activities: control of picking to post-harvest and control during transportation to receipt of shoots. Therefore, to know the quality of black tea from PT ABC, it is necessary to examine the shoots consisting of two kinds, namely the analysis of picking and analysis of shoots.

1. Except for analysis

   The calculation of the number of shoots aims to determine the plant's health through the number of bird shoots and can be used as an evaluation in the following picking process. The implementation of picking analysis is done by taking a sample of shoots, one handful each (from 30 pickers under one foreman), mixed evenly and taken as much as 1 kg. From the sample, 200 grams were separated according to the type of shoot and the picking formula. The separation results were weighed, and the percentage of shoot types was calculated by comparing the weight of each group of shoots concerned. Quality control when analysis of the passage is carried out, namely at the time of separation and grouping of the types of passages. Then check the scales used to check the accuracy and prevent errors when weighing. After that, it is necessary to be careful when calculating the analysis of plucking to reduce the error rate of the analysis report from each plucking.

2. Peak analysis

   Shoot analysis was carried out to analyze the quality of shoots produced in each block,which refers to *Standard Operational Procedure* (SOP) with a percentage value of 50%. At PT ABC shoot analysis was carried out by randomlytaking ten samples from different places in each plantation block and mixing them evenly. The samples that have been separated take 200 grams to be weighed and analyzed, of which 200 grams of the sample represents 500 kg of shoots. Next, separatethe shoots that meet the processing requirements based on the picking formula, namelyP+3 and B+2. Reports of receipt and analysis of shoots can be seen in Table 1.

   Afterwards, Weigh Eligible Shoots/*Pucuk Memenuhi Syarat* (PMS) and Tops Not Eligible /*Pucuk Tidak Memenuhi Syarat* (PTMS), then put them in a container named the picking placeor garden block. The container has three holes in each plantation block; the first hole is a shootthat meets the processing requirements, and the second and third

holes are shoots that do not meet the processing requirements. Quality control in shoot analysis is carried out by carefullyseparating and grouping tea leaf shoots according to the processing requirements. Then checkthe scales used to check the accuracy and prevent errors when weighing. From the data that hasbeen obtained, the percentage of Tops Not Eligible/*Pucuk Tidak Memenuhi Syarat* (PTMS) processing on the acceptance report and shoot analysis obtained an average of 54.41%; the value is still above the value of *Standard Operational Procedure* (SOP) applied is a maximumof 50%.

Table 1. Revenue report and analysis

| Block name | Weight of sample (g) | Peak analysis | | Monitoring foreign object | | |
|---|---|---|---|---|---|---|
| | | PMS (g) | PTMS (g) | Type | Amount | TK |
| Bismo | 200 | 45.03 | 54.97 | Silver oak | 0.1 | Thrown away |
| Rinjani | 200 | 45.30 | 54.70 | Silver oak | 0.1 | Thrown away |
| Mandala | 200 | 46.12 | 53.82 | Silver oak | 0.1 | Thrown away |
| Argopuro | 200 | 46.55 | 53.45 | Silver oak | 0.1 | Thrown away |
| Kembang | 200 | 45.37 | 54.63 | Silver oak | 0.1 | Thrown away |
| Muria | 200 | 45.60 | 54.40 | Silver oak | 0.1 | Thrown away |

Source: Office Unit Bedakah Plantation

PTMS data processing is carried out through P chart control using the Microsoft Excel application. The following are the results of the P chart control analysis that has been carried out. According to Ginting (2007), a control chart is a tool used to monitor and evaluate an activity or process in statistical quality control or not, so that management can solve problemsand produce quality improvements. From the analysis carried out with the P chart control, it can be concluded that the quality control of the shot analysis conducted by PT ABC is within the control limits. The output of the P chart control obtained from the six plantation blocks of UP Bedakah 5 plantation blocks are within the threshold, namely the Bismo, Rinjani, Mandala, Argopuro, and Muria plantation blocks. However, 1 area with a PTMS proportion value exceeds the lower threshold or Lower Control Line (LCL), namely theKembang plantation block. Data above the threshold indicates a deviation and requires furtheranalysis to determine the causal factors.

## 4. CONCLUSIONS

The results of the short analysis gave the proportion value of PTMS in the Bismo plantation block of 54.97 g, Rinjani of 54.7 g, Mandala 53.82 g, Argopuro of 53.45 g, Kembang of 54.63 g, and Muria of 54.40 g.

## REFERENCES

Arifin, S. (1994). Petunjuk teknis pengolahan teh. Pusat penelitian teh dan kina. Bandung.
Bambang, Kustamiyati. (1994). Petunjuk teknis pengolahan teh. Pusat Penelitian Teh dan

Kina–Gambung.

Ginting, Rosnani. (2007). Sistem produksi. Yogyakarta: Graha Ilmu.

Kusuma, W. (2008). Analisis Pucuk Tanaman Teh (*Camellia sinensis* (l.) o. kuntze) di Perkebunan Rumpun Sari Kemuning, PT. Sumber Abadi Tirta Sentosa, Karanganyar, Jawa Tengah. Skripsi. IPB. Bogor.

Mufakhir, A. (2011). Perkebunan teh dan reproduksi kemiskinan. *Jurnal Kajian Perubahan SEDANE*, 11(1), 10-20.

Putra, A. D. (2019). Pengawasan mutu proses produksi teh hitam (studi kasus di pabrik teh sumber daun di Desa Hegarmanah Kecamatan Takokak Kabupaten Cianjur). *Ummi*, 13(1), 1-6.

Paramita, N. L. P. V., Andiani, N. M. D., Putri, I. A. P. Y., Indriani, N. K. S., & Susanti, N. M. P. (2019). Karakteristik Simplisia teh hitam dari tanaman camelia sinensis var. Assam mica dari perkebunan teh bali cahaya amerta, desa angseri, kecamatan batu riti, kabupaten tabanan, bali. *Jurnal kimia (journal of chemistry).[serial online]. Januari*, *13*(1).

Setyamidjaja, D. (2000). Budidaya dan pengolahan pasca panen tanaman teh. Kanisius. Yogyakarta.

Setiawati dan Nasikun. (1991). Teh: kajian sosial–ekonomi. Aditya Media: Yogyakarta.

Siswoputranto, P. S. (1978). Perkembangan teh, kopi, cokelat internasional: perkembangan produksi, perdagangan internasional peraturan ekspor-impor dan prospeknya. PT Gramedia.

Walujo, D. A., Koesdijati, T., & Utomo, Y. (2020). Pengendalian kualitas. Scopindo media pustaka.

Widyasanti, A., C. L. Farddani, dan D. Rohdiana. 2016. Pembuatan sabun padat transparan menggunakan minyak kelapa sawit (palm oil) dengan penambahan bahan aktif ekstrak teh putih *(Camellia sinesis). J. Teknik Pertanian Lampung*. 5 (3): 125-136.